1.3.1 List and description of the courses which address the Gender, Environment and Sustainability, Human Values and Professional Ethics into the Curriculum

S. No	Course Code	Name of Course	Program Name	Semester	Description of Course
1	AU Zoo 103	Biodiversity and Wildlife	M.Sc. Zoology	1	It deals with the loss of biodiversity as a result of human activities has become a central preoccupation among natural scientists, and many social scientists as well. Although we do not know the exact scale of the problem, in particular the extent to which human beings have been responsible for the loss of biodiversity as compared to the natural evolution, the process of species extinction, green house effects and critical changes in the earth's biochemical cycle are now increasingly emphasized. The concept of human welfare is equally tangled. In general terms, it relates to the provision of improved conditions of living. Human welfare is linked with the preservation of biodiversity in varieties of ways. Biodiversity forms the basis of a global-life support system. Human beings have fulfilled many of their needs by taking advantage of the existence of many genes, species, as well as a "balanced" ecosystem.
2	AU Zoo 104	Environmental Biology and Toxicology	M.Sc. Zoology	1	This course describes about applied aspect of Zoology
3	AU.DM.501	E Course on Disaster Management	MSc. Agriculture Plant Pathology	1	Knowledge about existing global frameworks and existing agreements
4	AU. Agron. 504	Principles and Practices of Water Management	MSc. Agriculture Agronomy	1	This course deals with quality of water and air. Different parameters which areused to determine water and air quality are described in detail.
5	AU Soils 515	LAND DEGRADATION AND RESTORATION	MSc. Agriculture Agronomy	1	Corrective methods (land rehabilitation and ecosystem restoration practices) that aim to halt and reverse degradation through, for example, conservation of soil and water, protection of vegetation, ecological engineering, and re-establishment of functional ecosystems

6	AU.ENT 505	INSECT ECOLOGY	MSc. Agriculture Entomology	1	Find, read, interpret, and summarize primary literature in insect ecology
7	AU.Agron. 123	Water Management including Micro-irrigation	BSc Agriculture (Hons)	2	This course deals with quality of water and air. Different parameters which are used to determine water and air quality are described in detail.
8	AU.Ag. Engg. 232	Renewable Energy	BSc Agriculture (Hons)	3	resources, with a scientific examination of the energy field and an emphasis on alternate energy sources and their technology and application. The class will explore society's present needs and future energy demands, examine conventional energy sources and systems, including fossil fuels and nuclear energy, and then focus on alternate, renewable energy sources such as solar, biomass (conversions), wind power, geothermal, and hydro. Energy conservation methods will be
9	AU.Ento. 242	Insect Ecology and Integrated Pest Management including Beneficial Insects	BSc Agriculture (Hons)	4	Students sought to improve the efficacy of pest management efforts against a diverse range of pest insects using a variety of stimuli and conditioning paradigms.
10	AU.Env.361	Environmental Science	BSc Agriculture (Hons)	6	They will understand and interpret the interrelationships between landforms, weather, water and ecosystems
11	AU.Ag.Econ.479	Natural Resources and Economic Management	BSc Agriculture (Hons)	8	Students will understand how the environment influences plant growth and crop yields, and ways to modify the environment to improve plant growth and yields
12	AUBAED201	Environmental Studies	BA BED	2	Understand strengths & limitations of environmental management
13	AUBAED207	General Geography	BA BED	2	Students will learn to conduct legitimate and original research on geographical topics

14	AUBAED409	Environmental Geography	BA BED	4	Students will be able to design legitimate geographic methodology
15	AUBAED602	Gender, School and Society	BA BED	6	Explain the meaning of gender socialisation and gender roles; • Identify the agents of gender socialisation; • Specify the nature of gender roles; and
16	AUBAED802	Human Values And Human Values Ethics (Understanding the self)	BA BED	8	Identify and analyze an ethical issue in the subject matter under investigation or in a relevant field
18	AUBSCED201	Environmental Studies	BSC BED	2	Environmental science deals with detailed studies of environmental science, pollution and issues. This subject includes the solid and hazardous waste management and current environmental issues in India. This course further introduces the environmental policies and practices on environmental issues.
19	AUBSCED602	Gender, School and Society	BSC BED	6	Explain the meaning of gender socialisation and gender roles; • Identify the agents of gender socialisation; • Specify the nature of gender roles; and
20	AUBSCED802	Human Values And Human Values Ethics (Understanding the self)	BSC BED	8	Assess their own ethical values and the social context of problems
21	AUMCHI-11	Chemistry of Life & Environmental Chemistry	M.Sc. Chemistry	2	Demonstrate the ability to identify the role of Environmental Science in formulating sustainable solutions to the environmental problems
22	AUBP206T	Environmental sciences	B. Pharmacy (Allopathy)	2	Graduate has gained thorough understanding of Environmental Science as collated in the curriculum and developed the capability of self-learning to continue the search for knowledge

23	AUMBA-103	Human Values and Professional Ethics	MBA	1	Identify the multiple ethical interests at stake in a real-world situation or practice
24	(AUMBAHR-04)	Human Resource Planning and Development	MBA	3	Explain the importance of human resources and their effective management in organizations
25	AUMBAIB-02	International Business Environment and Foreign Exchange Economics	MBA	2	Explain liberalization of world trade, and international trade.
26	AUMBAIB-06	International business ethics and social responsibility	MBA	3	Evaluate globalization, and developments in international trade.
27	AUMBA-302	Business Law	MBA	3	The objective of this paper is to make the students more clear about the importance of ethics in business and practices of good corporate governance. It also talks about the corporate social responsibility.
42	AUBSCMLT-305	Environmental Sciences	Bsc MLT	3	Environmental science deals with detailed studies of environmental science, pollution and issues. This subject includes the solid and hazardous waste management and current environmental issues in India. This course further introduces the environmental policies and practices on environmental issues.

PG COURSE CATALOGUE
Department of Entomology
MASTER OF ENTOMOLOGY

Major Courses of Entomology

S.NO.	CODE COURSE	TITLE	CREDITS	SEMESTER
1	AU.ENT 501*	INSECT MORPHOLOGY	1+1	I
2	AU.ENT 502*	INSECT ANATOMY, PHYSIOLOGY AND NUTRITION	2+1	II
3	AU.ENT 503	PRINCIPLES OF TAXONOMY	2+0	I&I I
4	AU.ENT 504*	CLASSIFICATION OF INSECTS	2+1	I
5	AU.ENT 505*	INSECT ECOLOGY	1+1	II
6	AU.ENT 506*	B I O L OGICAL CONTROL OF CROP PESTS AND WEEDS	1+1	II
7	AU.ENT 507	TOXICOLOGY OF INSECTICIDES	* 2+1	I
8	AU.ENT 508	PLANT RESISTANCE TO INSECTS	1+1	I&II
9	AU.ENT 509*	PRINCIPLES OF INTEGRATED PEST MANAGEMENT	1+1	I
10	AU.ENT 510*	PESTS OF FIELD CROPS	1+1	I
13	AU.PL PATH 511/ ENT 511	PLANT QUARANTINE	2+0	I&II
11	AU.ENT 512*	PESTS OF HORTICULTURAL AND PLANTATION CROPS	1+1	I&II
12	AU.ENT 513*	TECHNIQUES IN PLANT PROTECTION	0+1	II
13	AU. ENT 591	MASTER'S SEMINAR	1+0	I &II
14	AU. ENT 599*	MASTER'S RESEARCH	20	I &II

*** Compulsory for Master's Programme**

Minor Courses for Entomology

1.	AU.PL PATHO 504*	PRINCIPLES OF PLANT PATHOLOGY	3+0	I
2.	AU.PL PATHO 506	PRINCIPLES OF PLANT DISEASE MANAGEMENT	2+1	II

Supporting courses for Entomology

Sr.No.	COURSE CODE	TITLE	CREDITS	SEMESTER
1	AU.Stat.501	Statistical Methods for Applied Sciences	3+1	I&II
2	AU.Comp. 501	Computer Fundamentals and Programming	2+1	I&II
3	AU.Lib.501	Library and Information Services	1+0	I&II
4	AU.DM.501	E Course on Disaster Management	1+0	I&II

Course contents

AU.ENT 501 INSECT MORPHOLOGY 1+1

Theory

UNIT I: Principles, utility and relevance: insect body wall structure, cuticular outgrowths, colouration and special integumentary structures in insects, body tagmata, sclerites and segmentation.

UNIT II: Head- origin, structure and modification, types of mouthparts and antennae, tentorium and neck sclerites.

UNIT III: Thorax- areas and sutures of tergum, sternum and pleuron, pterothorax, wings: structure and modifications,venation,wing coupling apparatus and mechanism of flight,legs:structure and modifications.

UNIT IV: Abdomen-segmentation and appendages, genitalia and their modifications, embryonic and post-embryonic development, types of metamorphosis, insect sense organs (mechano-, photo- and chemo- receptors).

Practical: Study of insect segmentation; various tagmata and their appendages; preparation of permanent mounts of different body parts and their appendages of taxonomic importance including male and female genitalia; sense organs.

AU ENT 502 INSECT ANATOMY, PHYSIOLOGY AND NUTRITION 2+1

Theory

UNIT I: Scope and importance of insect anatomy and physiology.

UNIT II: Structure, modification and physiology of different systems- digestive, circulatory, respiratory, excretory, nervous, sensory, reproductive, musculature, endocrine and exocrine glands.

UNIT III: Thermodynamics, physiology of integument, moulting, growth, metamorphosis and diapause.

UNIT IV: Extra and intra-cellular micro- organisms and their role in physiology.

Practical: Dissection of different insects to study comparative anatomical details of different systems; preparation of permanent mounts of internal systems; chromatographic analysis of free amino acids of haemolymph; determination of chitin in insect cuticle; examination of insect haemocytes; determination of respiratory quotient.

AU ENT 503 PRINCIPLES OF TAXONOMY 2+0

Theory

UNIT I: Introduction to history and principles of systematics and importance of taxonomy, functions of systematic, identification, purpose, methods of identification, taxonomic keys, levels of systematic with special reference to insect-pests of agricultural crops, descriptions- subjects of descriptions, characters, nature of characters, analogy vs homology, parallel vs convergent evolution, intraspecific variation in characters, polythetic and polymorphic taxa, sexual dimorphism.

UNIT II: Classification of animals: schools of classification- phenetics, cladistics and evolutionary classification. components of biological classification: hierarchy, rank, category and taxon. Species concepts, cryptic, sibling and etho-species, infra-specific categories, introduction to numerical, biological and cytogenetical taxonomy.

UNIT III: Nomenclature,common vs scientific names, international code of zoological nomenclature, criteria for availability of names, validity of names, categories of names under consideration of ICZN, publications, principles of priority, and homonymy, synonymy, type

concept in zoological nomenclature, speciation, anagenesis vs cladogenesis, allopatric, sympatric and parapatric processes.

AU ENT 504 CLASSIFICATIONS OF INSECTS 2+1

Theory

UNIT I: Brief evolutionary history of insects-introduction to phylogeny of insects and major classification of superclass hexapoda – classes – ellipura (collembola, protura), diplura and insectaorders contained.

UNIT II: Distinguishing characters, general biology, habits and habitats of insect orders and economically important families contained in them, collembola, protura, diplura, class insecta: subclass apterygota–archaeognatha,thysanura,subclass:pterygota,divisionpalaeoptera–odonataand phemeroptera, division: neoptera: subdivision: orthopteroid and blattoid orders (=oligoneoptera: plecoptera, blattodea, isoptera, mantodea, grylloblattodea, dermaptera, orthoptera, phasmatodea, mantophasmatodea, embioptera, zoraptera), subdivision: hemipteroid orders (=paraneoptera): psocoptera, phthiraptera, thysanoptera and hemiptera.

UNIT III: Distinguishing characters, general biology, habits and habitats of insect orders and economically important families contained in them, division neoptera – subdivision endopterygota, section neuropteroid- coleopteroid orders: strepsiptera, megaloptera, raphidioptera, neuropteraand coleoptera, section panorpoid orders mecoptera, siphonaptera, diptera, trichoptera, lepidoptera, and section hymenopteroid orders: hymenoptera.

Practical: Study of orders of insects and their identification using taxonomic keys; keying out families of insects of different major orders;odonata;orthoptera;blattodea;mantodea;isoptera;hemiptera; thysanoptera;phthiraptera;neuroptera;coleoptera; diptera; lepidoptera and hymenoptera. field visits to collect insects of different orders.

AU ENT 505 INSECT ECOLOGY 1+1

Theory

UNIT I: History and definition. basic concepts. organisation of the biological world, plato's natural balance vs ecological dynamics as the modern view, abundance and diversity of insects-estimates and causal factors, study of abundance and distribution and relation between the two, basic principles of abiotic factors and their generalised action on insects, implications for abundance and distribution of organisms including insects- law of the minimum, law of tolerance, and biocoenosis, systems approach to ecology.

UNIT II: Basic concepts of abundance- model vs real world, population growth- basic models – exponential vs logistic models, discrete vs continuous growth models, concepts of carrying capacity, environmental resistance and optimal yield, vital statistics- life tables and their application to insect biology, survivorship curves, case studies of insect life tables, population dynamics- factors affecting abundance- environmental factors, dispersal and migration, seasonality in insects- classification and mechanisms of achieving different seasonality- diapause (quiescence) - aestivation, hibernation.

UNIT III: Biotic factors- food as a limiting factor for distribution and abundance, nutritional ecology, food chain-web and ecological succession. interspecific interactions- basic factors governing the interspecific interactions - classification of interspecific interactions - the argument of cost-benefit ratios, competition- lotka-volterra model, concept of niche- ecological homologues, competitive exclusion, preypredator interactions- basic model- lotka-volterra model, volterra's principle, functional and numerical response. defense mechanisms against predators/parasitoids- evolution of mimicry, colouration, concept of predator satiation, evolution of life history strategies.

UNIT IV: Community ecology-concept of guild, organisation of communities- hutchinson ratio, may's d/w: relation between the two and their association with dyar's law and przibram's law, relative distribution of organisms, concept of diversity- the wallacian view, assessment of diversity, diversitystability debate relevance to pest management, pest management as applied ecology.

Practical: Types of distributions of organisms;methods of sampling insects;estimation of densities of insects and understanding the distribution parameters-measures of central tendencies;poisson distribution; negative binomial distribution;determination of optimal sample size;learning to fit basic populationgrowth models and testing the goodness of fit; fitting holling's disc equation, assessment of prey-predator densities from natural systems and understanding the correlation between the two;assessing and describing niche of some insects of a single guild; calculation of niche breadth;activity breadthand diagramatic representation of niches of organisms; calculation of some diversity indices- shannon's; simpson's and avalanche index and understanding their associations and parameters that affect their values;problem solving in ecology;field visits to understand different ecosystems and to study insect occurrence in these systems.

AU ENT 506 BIOLOGICAL CONTROL OF CROP PESTS AND WEEDS 1+1

Theory

UNIT I: History, principles and scope of biological control, important groups of parasitoids, predators and pathogens, principles of classical biological control- importation, augmentation and conservation.

UNIT II: Biology, adaptation, host seeking behaviour of predatory and parasitic groups of insects. Role of insect pathogenic nematodes, viruses, bacteria, fungi, protozoa etc., their mode of action. Biological control of weeds using insects.

UNIT III: Mass production of quality biocontrol agents- techniques, formulations, economics, field release/application and evaluation, role of natural enemies in integrated pest management with special reference to hill agriculture.

UNIT IV: Successful biological control projects, analysis, trends and future possibilities of biological control. Importation of natural enemies- Quarantine regulations, biotechnology in biological control. Semiochemicals in biological control.

Practical: Identification of common natural enemies of crop pests (parasitoids, predators, microbes) and weed killers;visits (only where logistically feasible) to bio-control laboratories to learn rearing and mass production of egg; egg-larval; larval; larval-pupal and pupal parasitoids; common predators; microbes and their laboratory hosts;phytophagous natural enemies of weeds; field collection of parasitoids and predators;hands-on training in culturing;identification of common insect pathogens;quality control and registration standards for biocontrol agents.

AU ENT 507 TOXICOLOGY OF INSECTICIDES 2+1

Theory

UNIT I: Definition and scope of insecticide toxicology, history of chemical control, pesticide use and pesticide industry in india.

UNIT II: Classification of insecticides and acaricides based on mode of entry,mode of action and chemical nature,structure and mode of action of organo-chlorines, organophosphates, carbamates, pyrethroids, tertiary amines, neonicotinoids, oxadiazines, phenyl pyrozoles, insect growth regulators, microbials, botanicals, new promising compounds, etc.

UNIT III: Principles of toxicology, evaluation of insecticide toxicity, joint action of insecticides synergism, potentiation and antagonism, factors affecting toxicity of insecticides, insecticide

compatibility, selectivity and phytotoxicity,principles and application of bioassay in toxicological studies.
UNIT IV: Insecticide metabolism, pest resistance to insecticides, mechanisms and types of resistance, insecticide resistance management and pest resurgence.
UNIT V: Insecticide residues, their significance and environmental implications, insecticide act, registration and quality control of insecticides, safe use of insecticides, diagnosis and treatment of insecticide poisoning.
Practical: Insecticide formulations and mixtures; quality control of pesticide formulations; laboratory and field evaluation of bioefficacy of insecticides; bioassay techniques; probit analysis; evaluation of insecticide toxicity and joint action; toxicity to beneficial insects; pesticide appliances; working out doses and concentrations of pesticides; visit to toxicology laboratories; good laboratory practices.

AU ENT 508 PLANT RESISTANCE TO INSECTS 1+1
Theory
UNIT I: History and importance of resistance, principles, classification, components, types and mechanisms of resistance.
UNIT II: Insect-host plant relationships, theories and basis of host plant selection in phytophagous insects.
UNIT III: Chemical ecology, tritrophic relations, volatiles and secondary plant substances,basis of resistance,induced resistance - acquired and induced systemic resistance.
UNIT IV: Factors affecting plant resistance including biotypes and measures to combat them.
UNIT V: Screening techniques, breeding for insect resistance in crop plants, exploitation of wild plant species, gene transfer, successful examples of resistant crop varieties in india and world.
UNIT VI: Role of biotechnology in plant resistance to insects.
Practical: Screening techniques for measuring resistance; measurement of plant characters and working out their correlations with plant resistance; bioassay of plant extracts of susceptible/resistant varieties; demonstration of antibiosis; tolerance and antixenosis.

AU ENT 509 PRINCIPLES OF INTEGRATED PEST MANAGEMENT 1+1
Theory
UNIT I: History and origin, definition and evolution of various related terminologies.
UNIT II:Concept and philosophy,ecological principles,economic threshold concept and economic consideration.
UNIT III:Tools of pest management and their integration- legislative, cultural, physical and mechanical methods, pest survey and surveillance, forecasting, types of surveys including remote sensing methods, factors affecting surveys, political, social and legal implications of ipm, pest risk analysis, pesticide risk analysis, cost-benefit ratios and partial budgeting, case studies of successful ipm programmes.
Practical: Characterization of agro-ecosystems; sampling methods and factors affecting sampling; population estimation methods; crop loss assessment- direct losses; indirect losses, potential losses; avoidable losses; unavoidable losses; computation of eil and etl; designing and implementing ipm system.

AU ENT 510 PESTS OF FIELD CROPS 1+1
Theory
Systematic position, identification, distribution, host-range, bionomics, nature and extent of damage, seasonal abundance and management of insect and mite pests and vectors.

UNIT I: Insect pests of cereals and millets and their management,insect pests of pulses, tobacco, oilseeds and their management.
UNIT II: Insect pests of fibre crops, forages, sugarcane and their management.
UNIT III: Polyphagous pests and non insect-pests, grasshoppers, locusts, termites, white grubs, cutworms, hairy caterpillars, and non-insect pests (mites, birds, rodents, snails, slugs etc.).
Practical: Field visits;collection and identification of important pests and their natural enemies; detection and estimation of infestation and losses in different crops; study of life history of important insect pests.

AU.PL PATH 511/ ENT 511 PLANT QUARANTINE 2+0

Theory
UNIT I: Definition of pest, pesticides and transgenics as per govt. notification, relative importance, quarantine–domestic and international,quarantine restrictions in the movement of agricultural produce, seeds and planting material, case histories of exotic pests/diseases and their status.
UNIT II: Plant protection organization in india,acts related to registration of pesticides and transgenics, history of quarantine legislations, pq order 2003,environmental acts,industrial registration, apeda,import and export of bio-control agents.
UNIT III: Identification of pest/disease free areas, contamination of food with toxigens, microorganisms and their elimination, symptomatic diagnosis and other techniques to detect pest/pathogen infestations, VHT and other safer techniques of disinfestation/salvaging of infected material.
UNIT IV: WTO regulations, non-tariff barriers, pest risk analysis, good laboratory practices for pesticide laboratories, pesticide industry, sanitary and phytosanitary measures.

AU ENT 512 PESTS OF HORTICULTURAL AND PLANTATION CROPS 1+1
Theory
Systematic position, identification, distribution, host range, bionomics and seasonal abundance, nature and extent of damage and management of insect pests of various crops.
UNIT I: Fruit crops- mango, guava, banana, jack, papaya, pomegranate, litchi, grapes, *ber*, fig, citrus, *aonla*, pineapple, apple, peach and other temperate fruits.
UNIT II: Vegetable crops- tomato, potato, radish, carrot, beetroot, cole crops, french beans, brinjal, okra, all gourds, garden pea, capsicum, leafy vegetables etc.
UNIT III: Plantation crop-coffee, tea, rubber, coconut, arecanut, cashew, cocoa etc., spices and condiments- pepper, cardamom, clove, nutmeg, chillies, turmeric, ginger, beetlevine etc.
UNIT IV: Ornamental, medicinal and aromatic plants and pests in polyhouses/ protected cultivation.
Practical: Collection and identification of important pests and their natural enemies on different crops; study of life history of important insect pests and non- insect pests.

AU ENT 513 TECHNIQUES IN PLANT PROTECTION 0+1
Practical
UNIT I: Pest control equipments;principles;operation; maintenance;selection;application of pesticides and biocontrol agents; seed dressing;soaking;root-dip treatment;dusting;spraying;application through irrigation water.

UNIT II: Soil sterilization;solarization;deep ploughing;flooding;techniques to check the spread of pests through seed;bulbs;corms;cuttings and cut flowers.
UNIT III: Use of light;transmission and scanning electron microscopy.
UNIT IV: Protein isolation from the pest and host plant and its quantification using spectrophotometer and molecular weight determination using SDS/PAGE.
UNIT V:Use of tissue culture techniques in plant protection;computer application for predicting/ forecasting pest attack and identification.

MINOR COURSES

AU. PL PATHO 504 PRINCIPLES OF PLANT PATHOLOGY 3+0

Theory
UNIT I: Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes and classification of plant diseases.
UNIT II: Pathogenesis- survival, growth, reproduction, and dispersal of important plant pathogens, role of environment and host nutrition on disease development.
UNIT III: Host parasite interaction, recognition concept and infection, symptomatology, mechanism of infection- role of enzymes, toxins, growth regulators; defense strategies- oxidative burst; Phenolics, Phytoalexins, PR proteins, Elicitors, altered plant metabolism as affected by plant pathogens.
UNIT IV: Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance.
UNIT V: Disease management strategies.

AU. PL PATHO 506 PRINCIPLES OF PLANT DISEASE MANAGEMENT 2+1

Theory
UNIT I: Principles of plant disease management through cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures (IDM- module) of plant diseases, disease resistance and molecular approach for disease management.
UNIT II: Foliage, seed and soil application of chemicals, role of stickers, spreaders and other adjuvants, health vis-à-vis environmental hazards, residual effects and safety measures.
UNIT III: History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.

Practical
In vitro and *in vivo* evaluation of chemicals against plant pathogens; ED and MIC values;
study of structural details of sprayers and dusters.

SUPPORTING COUSES:

AU. Stat. 511 STATISTICAL METHODS FOR APPLIED SCIENCES 3+1

Theory

UNIT I: Theory of probability, random variable and mathematical expectation, discrete and continuous probability distributions: binomial, Poisson, negative binomial, normal distribution and their applications.

UNIT II: Introduction to Theory of estimation and confidence intervals, concept of sampling distribution and test of significance, chi-square, t and F distributions, and their applications in tests of significance.

UNIT III: Non-parametric tests - sign, Wilcoxon, Mann-Whitney U-test, run test and, median test.

UNIT IV: Correlation and regression, simple and multiple linear regression model, least squares technique, estimation of parameters, predicted values and residuals, correlation coefficient, rank correlation, partial and multiple correlation coefficients, coefficient of determination, test of significance of correlation and regression coefficients, non-linear regression- polynomial, exponential and logarithmic.

Practical: Fitting of distributions-binomial; Poisson; negative binomial and normal; large sample tests; testing of hypothesis based on exact sampling distributions-chi-square; t and F; nonparametric tests; estimators for population parameters and their properties; correlation and regression analysis; fitting of non-linear regression.

AU. Comp. 501 COMPUTER FUNDAMENTALS AND PROGRAMMING 2+1

Theory:

UNIT I: Computer fundamentals-number systems, decimal, octal, binary and hexadecimal, representation of integers, fixed and floating point numbers, character representation, ASCII, EBCDIC.

UNIT II: Functional units of computer, I/O devices, primary and secondary memories.

UNIT III: Programming fundamentals with C - algorithm, techniques of problem solving, flowcharting, stepwise refinement, representation of integer, character, real, data types, constants and variables, arithmetic expressions, assignment statement, logical expression.

UNIT IV: Sequencing, alteration and iteration, arrays, string processing.

UNIT V: Sub-programs, recursion, pointers and files.

UNIT VI: Program correctness, debugging and testing of programs. Practical: Conversion of different number types; creation of flow chart; conversion of algorithm/flowchart to program; mathematical operators; operator precedence; sequence, control and iteration; arrays and string processing; pointers and file processing.

AU. Lib. 501 LIBRARY AND INFORMATION SERVICES 1+0

Theory:

Introduction to library services; Role of libraries in University education, research, extension and technology transfer; Classification systems and organization of Library; Sources of information Primary Sources, Secondary Sources and Teritiary Sources, with emphasis on reference tools and digital resources; Intricacies of abstracting and indexing, CAS, SDI services,

(Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts etc.); Tracing information from reference sources, information explosion and language barrier; Literature survey; Citation techniques/Bibliographic control and Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-abbreviations like ibid etc.

AU. DM. 501 E - COURSE ON DISASTER MANAGEMENT 1+0

UNIT I: Natural Disasters: Meaning and Nature, Types and Effects etc; Floods, Drought, Cyclone; Earthquakes, Landslides, Avalanches; Volcanic Eruptions; Heat and Cold waves; Climatic Change- Global warming, Sea level rise; Ozone Depletion.

UNIT II: Man-made Disasters: Nuclear disasters, Chemical disasters, Biological disasters: Building Fire, Coal fire, Forest fire; Oil fire; Air pollution, Water pollution, Industrial Wastewater pollution, Deforestation: Road and rail accidents; Air and sea accidents.

UNIT III: Disaster Management: Disaster management system; National Disaster management authority: National Institute of Disaster Management.

UNIT IV: National Disaster Management Framework; Financial Arrangements, National Disaster Response Force; Challenges in Disaster Management Plan; International Day for Risk Reduction.

PG COURSE CATALOGUE
Department of Agronomy
MASTER OF SCIENCE AGRONOMY

Major Courses of Agronomy

SR NO.	CODE	COURSE TITLE	CREDITS	SEMESTER
1.	AU. Agron. 501*	Modern Concepts in Crop Production	3+0	I
2.	AU. Agron. 502*	Principles and Practices of Soil Fertility and Nutrient Management	2+1	I
3.	AU. Agron. 503*	Principles and Practices of Weed Management	2+1	I
4.	AU. Agron. 504*	Principles and Practices of Water Management	2+1	I
5.	AU. Agron. 505	Agrometeorology and Crop Weather Forecasting	2+1	II
6.	AU. Agron. 506	Agronomy of Major Cereals and Pulses	2+1	I
7.	AU. Agron. 507	Agronomy of Oilseed, Fibre and Sugar Crops	2+1	II
8.	AU. Agron. 508	Agronomy of Medicinal, Aromatic and Under-utilized Crops	2+1	II
9.	AU. Agron. 509	Agronomy of Fodder and Forage Crops	2+1	I
10.	AU. Agron. 510	Agrostology and Agroforestry	2+1	II
11.	AU. Agron. 511	Cropping Systems	2+0	II
12.	AU. Agron. 512	Dryland Farming	2+1	II
13.	AU. Agron. 513	Principles and Practices of Organic Farming	2+1	II
14.	AU. Agron. 591*	Master Seminar	1+0	I
15.	AU. Agron. 599*	Master Research	0+20	I & II

*** Compulsory for Master's Programme**

Minor Courses for Agronomy

CODE	COURSE TITLE	CREDITS	SEMESTER
AU Soils 501	SOIL PHYSICS	2+1	I
AU Soils 502	SOIL FERTILITY AND FERTILIZER USE	3+1	II
AU Soils 503	SOIL CHEMISTRY	2+1	I
AU Soils 504	SOIL MINERALOGY, GENESIS, CLASSIFICATION AND SURVEY	2+1	I
AU Soils 505	SOIL EROSION AND CONSERVATION	2+1	II
AU Soils 506	SOIL BIOLOGY AND BIOCHEMISTRY	2+1	I
AU Soils 507	GEOMORPHOLOGY AND GEOCHEMISTRY	2+0	II
AU Soils 508	RADIOISOTOPES IN SOIL AND PLANT STUDIES	1+1	I
AU Soils 509	SOIL,WATER AND AIR POLLUTION	2+1	II
AU Soils 510	REMOTE SENSING AND GIS TECHNIQUES FOR SOIL AND CROP STUDIES	2+1	II
AU Soils 511	ANALYTICAL TECHNIQUES AND INSTRUMENTALMETHODS IN SOIL AND PLANT ANALYSIS	0+2	II
AU Soils 512	SYSTEM APPROACHES IN SOIL AND CROP STUDIES	2+1	I
AU Soils 513	MANAGEMENT OF PROBLEMATIC SOILS AND WATERS	2+1	I
AU Soils 514	FERTILIZER TECHNOLOGY	1+0	I
AU Soils 515	LAND DEGRADATION AND RESTORATION	1+0	I

Supporting Courses for Agronomy

SR NO.	CODE	COURSE TITLE	CREDITS	SEMESTER
1.	AU. Stat. 511	Statistical Methods for Applied Sciences	3+1	I & II
2.	AU. Comp.501	Computer Fundamentals and Programming	2+1	I & II
3.	AU. Lib. 501	Library and Information Services	1+0	I & II
4.	AU. DM. 501	E Course on Disaster Management	1+0	I & II

AU. Agron.501 MODERN CONCEPTS IN CROP PRODUCTION 3+0

Theory

UNIT I: Crop growth analysis in relation to environment, Agroclimatic zones of Himachal Pradesh and India.

UNIT II: Inverse yield nitrogen law, Mitscherlich's yield equation, its interpretation and applicability, Baule unit.

UNIT III: Effect of lodging in cereals, physiology of grain yield in cereals, optimization of plant population and planting geometry in relation to different resources, concept of ideal plant type and crop modelling for desired crop yield.

UNIT IV: Scientific principles of crop production, seed production techniques in various crops, crop response production functions, concept of soil plant relations, yield and environmental stress.

UNIT V: Integrated farming systems, organic farming, resource conservation technology including modern concept of tillage, dry farming, determining the nutrient needs for yield potentiality of crop plants, precision agriculture.

AU. Agron. 502 PRINCIPLES AND PRACTICES OF SOIL FERTILITY AND NUTRIENT MANAGEMENT 2+1

Theory

UNIT I: Soil fertility and productivity- factors affecting, features of a good soil management, problems of supply and factors affecting availability of nutrients, relation between nutrient supply and crop growth, organic farming - basic concepts and definitions.

UNIT II: Criteria of essentiality of nutrients, essential plant nutrients – their functions and deficiency symptoms, transformation and dynamics of major plant nutrients in soil.

UNIT III: Preparation and use of farmyard manure, compost, green manures, vermicompost, bio fertilizers and other organic concentrates, their composition, availability and crop responses, recycling of organic wastes and residue management.

UNIT IV: Commercial fertilizers, composition, relative fertilizer value and cost, crop response to different nutrients, residual effects and fertilizer use efficiency, fertilizer mixtures and grades, agronomic, chemical and physiological methods of estimating and techniques of increasing fertilizer use efficiency, nutrient interactions.

UNIT V: Time and methods of manures and fertilizers application, foliar application and its concept, relative performance of organic and inorganic manures, economics of fertilizer use, concept of balanced nutrition and integrated nutrient management, use of vermi-compost and residue wastes in crops.

Practical: Identification of nutrients deficiency symptoms; determination of soil pH; EC; organic C; total N; available N; P; K and S in soils; determination of total N; P; K and S in plants; interpretation of interaction effects and computation of economic and yield optima.

AU. Agron. 503 PRINCIPLES AND PRACTICES OF WEED MANAGEMENT 2+1

Theory

UNIT I: Classification and characteristics of weeds, special weed problems including aquatic and parasitic weeds, ecology and physiology of major weeds, ecophysiology of crop-weed competition including allelopathy.

UNIT II: Principles and methods of weed control, concept of integrated weed management, principles of chemical weed control, weed control through bioherbicides.

UNIT III: Mode and mechanism of action of herbicides, herbicide selectivity, herbicide combinations, adjuvants and safeners, degradation of herbicides in soils and plants, effect of herbicides in relation to environment, herbicide resistance in weeds and crops.
UNIT IV: Weed management in major crops and cropping systems, weed shifts in cropping systems, control of weeds in non-cropped situations including grasslands, pastures, tea gardens, orchards and aquatic ecosystem in hills.
UNIT V: Cost: benefit analysis of weed management, weed indices. Practical: Identification of important weeds of different crops; preparation of a weed herbarium; weed survey in crops and cropping systems; crop-weed competition studies; calculation of doses of herbicides; preparation of spray solutions of herbicides for high and low volume sprayers; use of various types of spray pumps and nozzles; their calibration and related calculations; economics of weed control.

AU. Agron. 504 PRINCIPLES AND PRACTICES OF WATER MANAGEMENT 2+1

Theory
UNIT I: Water and its role in plants, water resources of India, major irrigation projects, extent of irrigated area under different crops in India and in different states.
UNIT II: Concept of water potential, water movement in soils and plants, transpiration, soil-water-plant relationships, water absorption by plants, crop plants response to water stress, crop plant adaptation to moisture stress condition.
UNIT III: Soil, plant and meteorological factors determining water needs of crops, scheduling of irrigation, depth and methods of irrigation, micro-irrigation systems, fertigation, management of water in controlled environment and polyhouses.
UNIT IV: Water management in crops and cropping systems, quality of irrigation water and management of saline water for irrigation, water use efficiency and practices to enhance water productivity.
UNIT V: Excess of soil water and plant growth, water management in problem soils, drainage requirement of crops and methods of field drainage, their layout and spacing.

Practical: Measurement of soil water potential by using tensiometer, resistance block and pressure plate and membrane apparatus; soil-moisture characteristics curves; determination of FC and PWP; water flow measurements using different devices; determination of infiltration rate; determination of irrigation requirements; calculation of irrigation efficiency; determination of saturated hydraulic conductivity.

AU. Agron. 505 AGROMETEOROLOGY AND CROP WEATHER FORECASTING 2+1

Theory
UNIT I: Agro-meteorology - aim, scope and development in relation to crop environment, composition of atmosphere, distribution of atmospheric pressure and wind.
UNIT II: Characteristics of solar radiation, energy balance of atmosphere system, radiation distribution in crop canopies, radiation utilization by field crops, photosynthesis and efficiency of radiation utilization by field crops, energy budget of plant canopies.
UNIT III: Temperature profile in air, soil, crop canopies, soil and air temperature effects on plant physiological processes, measures of atmospheric temperature, relative humidity, vapour pressure and their relationships, evapo-transpiration and meteorological factors determining evapo-transpiration.
UNIT IV: Modification of plant environment: artificial rain, heat transfer, controlling heat load, heat trapping and shading, protection from cold, sensible and latent heat flux, controlling soil moisture, monsoon- origin, characteristics, onset, progress and withdrawal, weather hazards, drought monitoring and planning for mitigation.

UNIT V: Weather forecasting in India – short, medium and long range, aerospace science and weather forecasting, benefits of weather services to agriculture, remote sensing and its present status in India, atmospheric pollution and its effect on crop production, climate change and its impact on agriculture.

Practical: Recording of meteorological parameters viz.; sun-shine duration; wind velocity; wind direction; relative humidity; soil and air temperature; evaporation; precipitation and atmospheric pressure; measurement of solar radiation outside and within crop canopies; measurement/estimation of evapotranspiration by various methods; measurement/estimation of soil water balance; rainfall variability, determination of heat-unit requirement for different crops; measurement of crop canopy temperature; measurement of soil temperature at different depths in field crops; remote sensing and familiarization with agro-advisory service bulletins; study of synoptic charts and weather reports, working principle of automatic weather station.

AU. Agron. 506 AGRONOMY OF MAJOR CEREALS AND PULSES 2+1

Theory: Origin and history, adaptability, area and production, classification, improved varieties, climate, soil, nutrition, water and cultural requirements, quality components, post-harvest handling and processing of:
UNIT I: Kharif cereals
UNIT II: Rabi cereals
UNIT III: Kharif pulses
UNIT IV: Rabi pulses

Practical: Phenological studies of important crops; estimation of crop yield on the basis of yield attributes; formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities; computation of growth indices (LER, CGR, RGR, NAR, LAD); aggressivity; relative crowding coefficient, monetary yield advantage and area-time equivalent ratio (ATER) of prominent intercropping systems; estimation of protein content in pulses; planning of field experiments on cultural, fertilizer, weed control and water management aspects; layout of field experiments; Intercultural operations in different crops; computation of cost of cultivation of different crops; visit to nearby villages for identification of constraints in crop production.

AU. Agron. 507 AGRONOMY OF OILSEED, FIBRE AND SUGAR CROPS 2+1

Theory: Origin and history, area and production, classification, improved varieties, adaptability, climate, soil, nutrition, water and cultural requirements, quality components, post-harvest handling and processing of:
UNIT I: Kharif oilseeds - Groundnut, sesame, castor, sunflower, soybean, etc.
UNIT II: Rabi oilseeds – Rapeseed and mustard, linseed, safflower, etc.
UNIT III: Fiber crops - Cotton, jute, sunhemp, etc.
UNIT IV: Sugar crops – Sugar-beet and sugarcane.

Practical: Phenological studies of important crops; familiarization with planting and growing techniques of sugarcane; estimation of crop yield on the basis of yield attributes; formulation of cropping schemes for various farm sizes and calculation of cropping and rotational intensities; computation of growth indices (LER, CGR, RGR, NAR, LAD); aggressivity; relative crowding coefficient, monetary yield advantage and area-time equivalent ratio (ATER) of prominent intercropping systems; Estimation of quality parameters of various crops; planning of field experiments on cultural, fertilizer, weed control and water management aspects; layout of field

experiments; intercultural operations in different crops; computation of cost of cultivation of different crops; visit to nearby villages for identification of constraints in crop production.

AU. Agron. 508 AGRONOMY OF MEDICINAL, AROMATIC AND UNDER-UTILIZED CROPS 2+1

Theory

UNIT I: Importance of medicinal and aromatic plants in human health, national and state economy and industry, classification of medicinal and aromatic plants according to botanical characteristics and uses.

UNIT II: Climate and soil requirements, cultural practices, yield and important constituents of medicinal plants (Isabgol, Rauwolfia, Poppy, Aloe vera, Satavar, Stevia, Safed Musli, Kalmegh, Asafoetida, Nux vomica, Roselle, Aconite, Viola, etc).

UNIT III: Climate and soil requirements, cultural practices, yield and important constituents of aromatic plants (Citronella, Palmarosa, Mentha, Basil, Lemon grass, Rose, Patchouli, Geranium, Lavender, Tagetes, Kuth, etc.).

UNIT IV: Climate and soil requirements, cultural practices, yield of under-utilized crops (Ricebean, Lathyrus, Sesbania, Clusterbean, French bean, Buckwheat, Chenopodium, Fenugreek, Grain Amaranth, Coffee, Tea and Tobacco, etc.).

Practical: Identification of crops based on morphological and seed characteristics; raising of herbarium of medicinal; aromatic and under-utilized plants; quality characters in medicinal and aromatic plants; methods of analysis of essential oils and other chemicals of importance in medicinal and aromatic plants; visit to herbal garden.

AU. Agron. 509 AGRONOMY OF FODDER AND FORAGE CROPS 2+1

Theory

UNIT I: Adaptation, distribution, improved varieties, agro-techniques and quality aspects including antiquality factors of important fodder crops like maize, sorghum, bajra, guar, cowpea, oats, barley, berseem, senji, etc.

UNIT II: Adaptation, distribution, improved varieties, agro-techniques and quality aspects including antiquality factors of important forage crops/grasses & legumes like, Napier grass, setaria, Panicum, Lasiurus, Cenchrus, clovers, lucerne, fescue grass, brome grass, etc.

UNIT III: Year-round fodder production and management, preservation and utilization of forage and pasture crops.

UNIT IV: Principles and methods of hay and silage making, chemical and biochemical changes, nutrient losses and factors affecting quality of hay and silage, use of physical and chemical enrichments and biological methods for improving nutritive value, value addition of poor quality fodder.

UNIT V: Economics of forage cultivation and seed production techniques

Practical: Training on raising fodder crops; canopy measurement; yield and quality estimation; viz.; crude protein; NDF; ADF; lignin; silica; cellulose; etc. of various fodder and forage crops; anti-quality components like HCN in sorghum and such factors in other crops; hay and silage making and economics of their preparation.

AU. Agron. 510 AGROSTOLOGY AND AGROFORESTRY 2+1

Theory

UNIT I: Agrostology, definition and importance, grassland ecology – community, climax, dominant species, succession, biotype, ecological status of grasslands in India, grass cover of India, problems and management of grasslands.

UNIT II: Importance, classification (various criteria), scope, status and research needs of pastures, establishment, improvement and renovation of natural and cultivated pastures, common pasture grasses.

UNIT III: Agroforestry: definition and importance, agroforestry systems, agrisilviculture, silvipasture, agrisilvipasture, agrihorticulture, aquasilviculture, alley cropping and energy plantation.

UNIT IV: Crop production technology in agro-forestry and agrostology system, silvipastoral system: meaning and importance for wasteland development, selection of species, planting methods and problems of seed germination in agro-forestry systems, irrigation and manuring in agro-forestry systems, associative influence in relation to above ground and underground interferences, lopping and coppicing in agro-forestry systems, social acceptability and economic viability, nutritive value of trees, tender operation, desirable tree characteristics.

Practical: Study of different pastures and agro-forestry systems of India through illustrations; identification of seeds and plants of common grasses, legumes and trees of economic importance with reference to agro-forestry; seed treatment for improved germination; methods of propagation/planting of grasses and trees in silvipastoral system; estimation of nutritional and anti- nutritional components; estimation of calorie value of wood of important fuel trees; estimation of total biomass and fuel wood; computation of cost of cultivation; visit to important agro-forestry based models.

AU. Agron. 511 CROPPING SYSTEMS 2+0

Theory

UNIT I: Cropping system: definition, indices and its importance, physical resources, soil and water management in cropping systems, assessment of land use.

UNIT II: Concept of sustainability in cropping systems and farming systems, scope and objectives, production potential under monoculture cropping, multiple cropping, alley cropping, sequential cropping and intercropping, mechanism of yield advantage in intercropping systems.

UNIT III: Above and below ground interactions and allelopathic effects, competition relations, multistoreyed cropping and yield stability in intercropping, role of non-monetary inputs and low cost technologies, research need on sustainable agriculture.

UNIT IV: Crop diversification for sustainability, role of organic matter in maintenance of soil fertility, crop residue management, fertilizer use efficiency and concept of fertilizer use in intensive cropping systems.

UNIT V: Plant ideotypes for drylands, plant growth regulators and their role in sustainability.

AU. Agron. 512 DRYLAND FARMING 2+1

Theory

UNIT I: Definition, concept and characteristics of dry land farming areas/regions, dry land versus rainfed farming, significance and dimensions of dry land farming in Indian agriculture.

UNIT II: Soil and climatic parameters with special emphasis on rainfall characteristics, constraints of crop production in dry land areas, types of drought, characterization of

environment for water availability, contingent crop planning for erratic and aberrant weather conditions.
UNIT III: Stress physiology and resistance to drought, adaptation of crop plants to drought, drought management strategies, preparation of appropriate crop plans for dry land areas, mid season contingent crop plan for aberrant weather conditions.
UNIT IV: Tillage, tilth, frequency and depth of cultivation, compaction with soil tillage, concept of conservation tillage, tillage in relation to weed control and moisture conservation, techniques and practices of soil moisture conservation (use of mulches, kinds, effectiveness and economics), antitranspirants, soil and crop management techniques, seeding and efficient fertilizer use for increasing water use efficiency.
UNIT V: Watershed- concept, resource management, problems, approach and components.

Practical: Seed treatment, seed germination and crop establishment in relation to soil moisture contents; moisture stress effects and recovery behaviour of important crops; estimation of moisture index and aridity index; spray of anti-transpirants and their effect on crops; collection and interpretation of data for water balance equations; methods of increasing water use efficiency; preparation of crop plans for different drought conditions; study of field experiments relevant to dryland farming; visit to watershed projects.

AU. Agron. 513 PRINCIPLES AND PRACTICES OF ORGANIC FARMING 2+1

Theory
UNIT I: Organic farming - concept and definitions, its relevance to India and global agriculture and future prospects, biodynamic farming, vedic farming, land and water management - land use, minimum tillage, shelter zones, hedges, pasture management, agro-forestry.
UNIT II: Organic farming and water use efficiency, soil fertility, nutrient recycling, organic residues, organic manures, composting, soil biota and decomposition of organic residues, earthworms and vermicompost, green manures and biofertilizers.
UNIT III: Crop rotations, multiple and relay cropping systems, intercropping in relation to maintenance of soil productivity.
UNIT IV: Control of weeds, diseases and insect pest management, biological agents and pheromones, biopesticides.
UNIT V: Socio-economic impacts, certification, labeling and accreditation procedures, organic farming and national economy, marketing and export potential.

Practical: Preparation of vermicompost and bioformulations, etc.; aerobic and anaerobic methods of making compost; identification and nursery raising of important agro-forestry trees and trees for shelter belts; efficient use of biofertilizers, technique of treating legume seeds with Rhizobium cultures, use of Azotobacter, Azospirillum and PSB cultures in field; quality standards, inspection, certification, labeling and accreditation procedures for farm produce from organic farms; visits to organic experiments/farms.

AU. Agron. 591 MASTER'S SEMINAR 1+0

AU. Agron. 599 MASTER'S RESEARCH 0+20

Minor Courses for Agronomy

AU SOILS 501 SOIL PHYSICS (2+1)

Theory

UNIT I: Scope of soil physics and its relation with other branches of soil science; soil as a three phase system.

UNIT II: Soil texture, textural classes, mechanical analysis, specific surface.

UNIT III: Soil consistence; dispersion and workability of soils; soil compaction and consolidation; soil strength; swelling and shrinkage - basic concepts.

UNIT IV: Soil structure - genesis, types, characterization and management soil structure; soil aggregation, aggregate stability; soil tilth, characteristics of good soil tilth; soil crusting - mechanism, factors affecting and evaluation; soil conditioners; puddling, its effect on soil physical properties; clod formation.

UNIT V: Soil water: content and potential, soil water retention, soil-water constants, measurement of soil water content, energy state of soil water, soil water potential, soil-moisture characteristic curve; hysteresis, measurement of soil-moisture potential.

UNIT VI: Water flow in saturated and unsaturated soils, Poiseuille's law, Darcy's law; hydraulic conductivity, permeability and fluidity, hydraulic diffusivity; measurement of hydraulic conductivity in saturated and unsaturated soils.

UNIT VII: Infiltration; internal drainage and redistribution; evaporation; hydrologic cycle, field water balance; soil-plant-atmosphere continuum, hypotheses of soil water availability

UNIT IX: Composition of soil air; renewal of soil air - convective flow and diffusion; measurement of soil aeration; aeration requirement for plant growth; soil air management.

UNIT X: Modes of energy transfer in soils; energy balance; thermal properties of soil; measurement of soil temperature; soil temperature in relation to plant growth; soil temperature management.

Practical

Mechanical analysis by pipette and international methods, Measurement of Atterberg limits, Aggregate analysis - dry and wet, Measurement of soil-water content by different methods, Measurement of soil-water potential by using tensiometer and gypsum blocks, Determination of soil-moisture characteristics curve and computation of pore-size distribution, Determination of hydraulic conductivity under saturated and unsaturated conditions, Determination of infiltration rate of soil, Determination of aeration porosity and oxygen diffusion rate, Soil temperature measurements by different methods, Estimation of water balance components in bare and cropped fields.

AU SOILS 502 SOIL FERTILITY AND FERTILIZER USE (3+1)

Theory

UNIT I: Soil fertility and soil productivity; nutrient sources – fertilizers and manures; essential plant nutrients – functions and deficiency symptoms, laws of soil fertility

UNIT II: Soil and fertilizer nitrogen – sources, forms, immobilization and mineralization, nitrification, denitrification; biological nitrogen fixation -types, mechanism, microorganisms and factors affecting; nitrogenous fertilizers and their fate in soils; management of fertilizer nitrogen in lowland and upland conditions for high fertilizer use efficiency, leaf colour chart for N recommendations

UNIT III: Soil and fertilizer phosphorus - forms, immobilization, mineralization, reactions in acid and alkali soils; factors affecting phosphorus availability in soils; phosphatic fertilizers - behavior in soils and managementunder field conditions.

UNIT IV: Potassium - forms, equilibrium in soils and its agricultural significance; mechanism of potassium fixation; management of potassium fertilizers under field conditions.

UNIT V: Sulphur - source, forms, fertilizers and their behavior in soils; calcium and magnesium– factors affecting their availability in soils; management of sulphur, calcium and magnesium fertilizers.

UNIT VI: Micronutrients – critical limits in soils and plants; factors affecting their availability and correction of their deficiencies in plants; role of chelates in nutrient availability.

UNIT VII: Common soil test methods for fertilizer recommendations; quantity intensity relationships; soil test crop response correlations and response functions.

UNIT VIII: Fertilizer use efficiency; blanket fertilizer recommendations – usefulness and limitations; site-specificnutrient management; plant need based nutrient management; integrated nutrient management.

UNIT IX: Soil fertility evaluation - biological methods, soil, plant and tissue tests; soil quality in relation to sustainable agriculture

Practical

Principles of colorimetry, Flame-photometry and atomic absorption spectroscopy, Chemical analysis of soil for total and available nutrients, Analysis of plants for essential elements

AU SOILS 503 SOIL CHEMISTRY (2+1)

Theory

UNIT I: Chemical (elemental) composition of the earth's crust.

UNIT II: Elements of equilibrium thermodynamics, chemical equilibria, electrochemistry and chemical kinetics.

UNIT III: Soil colloids: inorganic and organic colloids - origin of charge, concept of point of zero-charge (PZC) and its dependence on variable-charge soil components, surface charge characteristics of soils; diffuse double layer theories of soil colloids, zeta potential, stability, electrometric properties of soil colloids; sorption properties of soil colloids; soil organic matter – characterization of organic matter, fractionation of soil organic matter and different fractions, clay-organic interactions.

UNIT IV: Ion exchange processes in soil; cation exchange- theories based on law of mass action (Kerr-Vanselow, Gapon equations, hysteresis, Jenny's concept), adsorption isotherms, donnan-membrane equilibrium concept, Different approaches to describe cation exchange equilibria, law of mass action and solubility product, factors affecting cation exchange equilibria in soils, AEC, CEC; experimental methods to study ion exchange phenomena and practical implications in plant nutrition.

UNIT V: Potassium, phosphate and ammonium fixation in soils covering specific and non-specific sorption; precipitation-dissolution equilibria; management aspects.

UNIT VI: Chemistry of acid soils and their management; active and potential acidity; lime potential, sub-soil acidity.

UNIT VII: Chemistry of salt-affected soils and amendments; soil pH, ECe, ESP, SAR and important relations; soil management and amendments.

UNIT VIII: Chemistry and electrochemistry of submerged soils.

Practical

Determination of CEC and AEC of soils, Analysis of equilibrium soil solution for pH, EC, Eh by the use of Eh-pH meter and conductivity meter, Determination of point of zero-charge and associated surface charge characteristics by the serial potentiometric titration method, Adsorption-desorption of phosphate/sulphate by soil using simple adsorption isotherm, Determination of titratable acidity of an acid soil by BaCl2-TEA method, Determination of lime requirement of an acid soil by buffer method, Determination of gypsum requirement of an alkali soil

SOILS 504 SOIL MINERALOGY, GENESIS, CLASSIFICATION AND SURVEY (2+1)

Theory

UNIT I: Fundamentals of crystallography, space lattice, coordination theory, isomorphism and polymorphism.

UNIT II: Classification, structure, chemical composition and properties of clay minerals; genesis and transformation of crystalline and non-crystalline clay minerals; identification techniques; amorphous soil constituents and other non-crystalline silicate minerals and their identification; clay minerals in Indian soils.

UNIT III: Factors of soil formation, soil formation models; soil forming processes; weathering of rocks and mineral transformations; soil profile; weathering sequences of minerals with special reference to Indian soils.

UNIT IV: Concept of soil individual; soil classification systems – historical developments and modern systems of soil classification with special emphasis on soil taxonomy; soil classification, soil mineralogy and soil maps –usefulness.

UNIT V: Soil survey and its types; soil survey techniques - conventional and modern; soil series – characterization and procedure for establishing soil series; benchmark soils and soil correlations; soil survey interpretations; soil mapping, thematic soil maps, cartography, mapping units, techniques for generation of soil maps.

UNIT VI: Landform – soil relationship; major soil groups of India with special reference to respective states; land capability classification and land irrigability classification; land evaluation

and land use type (LUT) – concept and application; approaches for managing soils and landscapes in the framework of agro-ecosystem.

Practical

Identification and quantification of minerals in soil fractions, Morphological properties of soil profile in different landforms, Classification of soils using soil taxonomy, Calculation of weathering indices and its application in soil formation, Grouping soils using available data base in terms of soil quality, Aerial photo and satellite data interpretation for soil and land use, Cartographic techniques for preparation of base maps and thematic maps, processing of field sheets,, compilation and obstruction of maps in different scales, Land use planning exercises using conventional and RS tools

SOILS 505 SOIL EROSION AND CONSERVATION (2+1)

Theory

UNIT I: History, distribution, identification and description of soil erosion problems in India.

UNIT II: Forms of soil erosion; effects of soil erosion and factors affecting soil erosion; types and mechanisms of water erosion; raindrops and soil erosion; rainfall erosivity - estimation as EI30 index and kinetic energy; factors affecting water erosion; empirical and quantitative estimation of water erosion; methods of measurement and prediction of runoff; soil losses in relation to soil properties and precipitation.

UNIT III: Wind erosion- types, mechanism and factors affecting wind erosion; extent of problem in the country.

UNIT IV: Principles of erosion control; erosion control measures – agronomical and engineering; erosion control structures - their design and layout.

UNIT V: Soil conservation planning; land capability classification; soil conservation in special problem areas such as hilly, arid and semi-arid regions, waterlogged and wet lands.

UNIT VI: Watershed management - concept, objectives and approach; water harvesting and recycling; flood control in watershed management; socioeconomic aspects of watershed management; case studies in respect to monitoring and evaluation of watersheds; use of remote sensing in assessment and planning of watersheds.

Practical

Determination of different soil erodibility indices - suspension percentage, dispersion ratio, erosion ratio, clay ratio, clay/moisture equivalent ratio, percolation ratio, raindrop erodibility index, Computation of kinetic energy of falling rain drops, Computation of rainfall erosivity index using rain gauge data, Visits to a watershed

SOILS 506 SOIL BIOLOGY AND BIOCHEMISTRY (2+1)

Theory

UNIT I: Soil biota, soil microbial ecology, types of organisms in different soils; soil microbial biomass; microbial interactions; un-culturable soil biota.

UNIT II: Microbiology and biochemistry of root-soil interface; phyllosphere; soil enzymes, origin, activities and importance; soil characteristics influencing growth and activity of microflora.

UNIT III: Microbial transformations of nitrogen, phosphorus, sulphur, iron and manganese in soil; biochemical composition and biodegradation of soil organic matter and crop residues, humus formation; cycles of important organic nutrients.

UNIT IV: Biodegradation of pesticides, organic wastes and their use for production of biogas and manures; biotic factors in soil development; microbial toxins in the soil.

UNIT V: Preparation and preservation of farmyard manure, animal manures, rural and urban composts and vermicompost.

UNIT VI: Biofertilizers – definition, classification, specifications, method of production and role in crop production.

Practical

Determination of soil microbial population, Soil microbial biomass, Elemental composition, fractionation of organic matter and functional groups, Decomposition of organic matter in soil, Soil enzymes, Measurement of important soil microbial processes such as ammonification, nitrification, N2 fixation, S oxidation, P solubilization and mineralization of other micro nutrients, Study of rhizosphere effect

SOILS 507 GEOMORPHOLOGY AND GEOCHEMISTRY (2+0)

Theory

UNIT I: General introduction to geology and geochemistry, major and minor morphogenic and genetic landforms, study of schematic landforms and their elements with special reference to India.

UNIT II: Methodology of geomorphology, its agencies, erosion and weathering; soil and physiography relationships; erosion surface of soil landscape.

UNIT III: Geochemical classification of elements; geo-chemical aspects of weathering and migration of elements; geochemistry of major and micronutrients and trace elements.

SOILS 508 RADIOISOTOPES IN SOIL AND PLANT STUDIES (1+1)

Theory

UNIT I: Atomic structure, radioactivity and units; radioisotopes - properties and decay principles; nature and properties of nuclear radiations; interaction of nuclear radiations with matter

UNIT II: Principles and use of radiation monitoring instruments - proportional, Geiger Muller counter, solid and liquid scintillation counters; neutron moisture meter, mass spectrometry, auto radiography

UNIT III: Isotopic dilution techniques used in soil and plant research; use of stable isotopes; application of isotopes in studies on organic matter, nutrient transformations, ion transport, rooting pattern and fertilizer use efficiency; carbon dating

UNIT IV: Doses of radiation exposure, radiation safety aspects regulatory aspects, collection, storage and disposal of radioactive wastes

Practical

Storage and handling of radioactive materials, Determination of half life and decay constant, Preparation of soil and plant samples for radioactive measurements, Setting up of experiment on fertilizer use efficiency and cation exchange equilibria using radioisotopes, Determination of A, E and L values of soil using 32P/ 65Zn, Use of neutron probe for moisture determination , Sample preparation and measurement of 15N enrichment by mass spectrophotometery/ emission spectrometry

SOILS 509 SOIL, WATER AND AIR POLLUTION (2+1)

Theory

UNIT I: Soil, water and air pollution problems associated with agriculture, nature and extent.

UNIT II: Nature and sources of pollutants – agricultural, industrial, urban wastes, fertilizers and pesticides, acid rains, oil spills etc.; air, water and soil pollutants - their CPC standards and effect on plants, animals and human beings.

UNIT III: Sewage and industrial effluents – their composition and effect on soil properties/health, and plant growth and human beings; soil as sink for waste disposal.

UNIT IV: Pesticides – their classification, behavior in soil and effect on soil microorganisms.

UNIT V: Toxic elements – their sources, behavior in soils, effect on nutrients availability, effect on plant and human health.

UNIT VI: Pollution of water resources due to leaching of nutrients and pesticides from soil; emission of greenhouse gases – carbon dioxide, methane and nitrous oxide.

UNIT VIII: Remediation/amelioration of contaminated soil and water; remote sensing applications in monitoring and management of soil and water pollution.

Practical

Sampling of sewage waters, sewage sludge, solid/liquid industrial wastes, polluted soils and plants, Estimation of dissolved and suspended solids, chemical oxygen demand (COD), biological oxygen demand (BOD), nitrate and ammonical nitrogen and phosphorus, heavy metal content in effluents, Heavy metals in contaminated soils and plants

SOILS 510 REMOTE SENSING AND GIS TECHNIQUES FOR SOIL, WATER AND CROP STUDIES (2+1)

Theory

UNIT I: Introduction and history of remote sensing; sources, propagation of radiations in atmosphere; interactions with matter.

UNIT II: Sensor systems - camera, microwave radiometers and scanners; fundamentals of aerial photographs and image processing and interpretations.

UNIT III: Application of remote sensing techniques - land use soil surveys, crop stress and yield forecasting, prioritization in watershed and drought management, wasteland identification and management.

UNIT IV: Significance and sources of the spatial and temporal variability in soils, variability in relation to size of sampling; classical and geo-statistical techniques of evaluation of soil variability.

UNIT V: Introduction to GIS and its application for spatial and non-spatial soil and land attributes.

Practical

Familiarization with different remote sensing equipments and data products, Interpretation of aerial photographs and satellite data for mapping of land resources, Analysis of variability of different soil properties with classical and geostatistical technique, Creation of data files in a database program, Use of GIS for soil spatial simulation and analysis, To enable the students to conduct soil survey and interpret soil survey reports in terms of land use planning

SOILS 511 ANALYTICAL TECHNIQUES AND INSTRUMENTAL METHODS IN SOIL AND PLANT ANALYSIS (0+2)

Practical

UNIT I: Preparation of solutions for standard curves, analytical reagents, qualitative reagents, indicators and standard solutions for acid-base, oxidation-reduction and complexometric titration; soil, water and plant sampling techniques, their processing and handling.

UNIT II: Determination of nutrient potentials and potential buffering capacities of soils for phosphorus and potassium; estimation of phosphorus, ammonium and potassium fixation capacities of soils.

UNIT III: Principles of visible, ultraviolet and infrared spectrophotometery, atomic absorption, flame-photometry, inductively coupled plasma spectrometry; chromatographic techniques, mass spectrometry and X-ray defractrometery; identification of minerals by X-ray by different methods.

UNIT IV: Electrochemical titration of clays; determination of cation and anion exchange capacities of soils; estimation of exchangeable cations (Na, Ca, Mg, K); estimation of root cation exchange capacity.

SOILS 512 SYSTEM APPROACHES IN SOIL AND CROP STUDIES (2+1)

Theory

UNIT I: Systems concepts - definitions, general characteristics; general systems theory; systems thinking, systems dynamics, systems behavior and systems study.

UNIT II: Model: definition and types- Empirical and mechanistic; mathematical models and their types; modeling: concepts, objectives, processes, simulation models, their verification and validation, calibration; representation of continuous systems simulation models - procedural

UNIT III: Simulation - meaning and threats; simulation experiment, its design and analysis.

UNIT IV: Application of simulation models in understanding system behavior, optimizing system performance, evaluation of policy options under different soil, water, nutrient, climatic and cultural conditions; decision support system, use of simulation models in decision support system.

Practical

Use of flow chart in the program writing , Writing a small example simulation model program , Conducting simulation experiments in DSSAT, Conducting simulation experiments in WOFOST, Conducting simulation experiments in EPIC with requirement of report and conclusion, Computation of fertilizer equations using STCR Model

SOILS 513 MANAGEMENT OF PROBLEMATIC SOILS AND WATERS (2+1)

Theory

UNIT I: Area and distribution of problem soils – acidic, saline, sodic and physically degraded soils; origin and basic concept of problematic soils, and factors responsible.

UNIT II: Morphological features of saline, sodic and saline-sodic soils; characterization of salt-affected soils - soluble salts, ESP, pH; physical, chemical and microbiological properties.

UNIT III: Management of salt-affected soils; salt tolerance of crops - mechanism and ratings; monitoring of soil salinity in the field; management principles for sandy, clayey, red lateritic and dry land soils.

UNIT IV: Acid soils - nature of soil acidity, sources of soil acidity; effect on plant growth, lime requirement of acid soils; management of acid soils; biological sickness of soils and its management, Acid sulphate soils and their management, calcareous soils-problems and management and waterlogged soils- problems and management

UNIT V: Quality of irrigation water; management of brackish water for irrigation; salt balance under irrigation; characterization of brackish waters, area and extent; relationship in water use and quality.

UNIT VI: Agronomic practices in relation to problematic soils; cropping pattern for utilizing poor quality ground waters.

Practical

Characterization of acid, acid sulfate, salt-affected and calcareous soils, Determination of cations (Na+, K+, Ca++ and Mg++) in ground water and soil samples, Determination of anions (Cl-, SO4--, CO3--and HCO3-) in ground waters and soil samples, Lime and gypsum requirements of acid and sodic soils

SOILS 514 FERTILIZER TECHNOLOGY (1+0)

Theory

UNIT I: Fertilizers – production, consumption and future projections with regard to nutrient use in the country and respective states; fertilizer control order.

UNIT II: Manufacturing processes for different fertilizers using various raw materials, characteristics and nutrient contents.

UNIT III: Recent developments in secondary and micronutrient fertilizers and their quality control as per fertilizer control order.

UNIT IV: New and emerging issues in fertilizer technology – production and use of slow and controlled release fertilizers, supergranules fertilizers and fertilizers for specific crops/situations, fortified and customized fertilizers

SOILS 515 LAND DEGRADATION AND RESTORATION (1+0)

Theory

UNIT I: Type, factors and processes of soil/land degradation and its impact on soil productivity, including soil fauna, biodegradation and environment.

UNIT II: Land restoration and conservation techniques - erosion control, reclamation of salt-affected soils; mine land reclamation, afforestation, organic products.

UNIT III: Extent, diagnosis and mapping of land degradation by conventional and modern RS-GIS tools; monitoring land degradation by fast assessment, modern tools, land use policy, incentives and participatory approach for reversing land degradation; global issues for twenty first century, USLE equation and its importance

SUPPORTING COUSES:

AU. Stat. 511 STATISTICAL METHODS FOR APPLIED SCIENCES 3+1

Theory

UNIT I: Theory of probability, random variable and mathematical expectation, discrete and continuous probability distributions: binomial, Poisson, negative binomial, normal distribution and their applications.

UNIT II: Introduction to Theory of estimation and confidence intervals, concept of sampling distribution and test of significance, chi-square, t and F distributions, and their applications in tests of significance.

UNIT III: Non-parametric tests - sign, Wilcoxon, Mann-Whitney U-test, run test and, median test.

UNIT IV: Correlation and regression, simple and multiple linear regression model, least squares technique, estimation of parameters, predicted values and residuals, correlation coefficient, rank correlation, partial and multiple correlation coefficients, coefficient of determination, test of significance of correlation and regression coefficients, non-linear regression- polynomial, exponential and logarithmic.

Practical: Fitting of distributions-binomial; Poisson; negative binomial and normal; large sample tests; testing of hypothesis based on exact sampling distributions-chi-square; t and F; nonparametric tests; estimators for population parameters and their properties; correlation and regression analysis; fitting of non-linear regression.

AU. Comp. 501 COMPUTER FUNDAMENTALS AND PROGRAMMING 2+1

Theory:

UNIT I: Computer fundamentals-number systems, decimal, octal, binary and hexadecimal, representation of integers, fixed and floating point numbers, character representation, ASCII, EBCDIC.

UNIT II: Functional units of computer, I/O devices, primary and secondary memories.

UNIT III: Programming fundamentals with C - algorithm, techniques of problem solving, flowcharting, stepwise refinement, representation of integer, character, real, data types, constants and variables, arithmetic expressions, assignment statement, logical expression.

UNIT IV: Sequencing, alteration and iteration, arrays, string processing.

UNIT V: Sub-programs, recursion, pointers and files.

UNIT VI: Program correctness, debugging and testing of programs. Practical: Conversion of different number types; creation of flow chart; conversion of algorithm/flowchart to program; mathematical operators; operator precedence; sequence, control and iteration; arrays and string processing; pointers and file processing.

AU. Lib. 501 LIBRARY AND INFORMATION SERVICES 1+0

Theory:

Introduction to library services; Role of libraries in University education, research, extension and technology transfer; Classification systems and organization of Library; Sources of information Primary Sources, Secondary Sources and Teritiary Sources, with emphasis on reference tools and digital resources; Intricacies of abstracting and indexing, CAS, SDI services, (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts etc.); Tracing information from reference sources, information explosion and language barrier; Literature survey; Citation techniques/Bibliographic control and Preparation of bibliography;

Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-abbreviations like ibid etc.

AU. DM. 501 E - COURSE ON DISASTER MANAGEMENT 1+0

UNIT I: Natural Disasters: Meaning and Nature, Types and Effects etc; Floods, Drought, Cyclone; Earthquakes, Landslides, Avalanches; Volcanic Eruptions; Heat and Cold waves; Climatic Change- Global warming, Sea level rise; Ozone Depletion.

UNIT II: Man-made Disasters: Nuclear disasters, Chemical disasters, Biological disasters: Building Fire, Coal fire, Forest fire; Oil fire; Air pollution, Water pollution, Industrial Wastewater pollution, Deforestation: Road and rail accidents; Air and sea accidents.

UNIT III: Disaster Management: Disaster management system; National Disaster management authority: National Institute of Disaster Management.

UNIT IV: National Disaster Management Framework; Financial Arrangements, National Disaster Response Force; Challenges in Disaster Management Plan; International Day for Risk Reduction.

PG COURSE CATALOGUE
Department of Plant Pathology
MASTER OF PLANT PATHOLOGY

Major Courses of Plant Pathology

S.NO.	CODE COURSE	TITLE	CREDITS	SEMESTER
1	AU. PL PATHO501	* MYCOLOGY	2+1	I
2	AU.PL PATHO 502*	PLANT VIROLOGY	2+1	I
3	AU.PL PATH0 503*	PLANT BACTERIOLOGY	2+1	I
4	AU.PL PATHO 504*	PRINCIPLES OF PLANT PATHOLOGY	3+0	I
5	AU.PL PATHO 505*	DETECTION AND DIAGNOSIS OF PLANT DISEASES	0+2	I
6	AU.PL PATHO 506	PRINCIPLES OF PLANT DISEASE MANAGEMENT	2+1	II
7	AU.PL PATHO 507	SEED HEALTH TECHNOLOGY	2+1	II
8	AU.PL PATHO 508	CHEMICALS IN PLANT DISEASE MANAGEMENT	2+1	II
9	AU.PL PATHO 509	DISEASE RESISTANCE IN PLANTS	2+0	I
10	AU.PL PATHO 510	EPIDEMIOLOGY AND FORECASTING OF PLANT DISE ASES	2+1	I
11	AU.PL PATHO 511/ ENTO 511	PLANT QUARANTINE	2+0	I
12	AU.PL PATHO 591	MASTER'S SEMINAR	1+0	I &II
13	AU.PL PATHO 599*	MASTER'S RESEARCH	20	I &II

*Compulsory for Master's Programme

Minor courses of Plant Pathology

S.NO	COURSES CODE	TITLE	CREDITS	SEMESTER
1	AU.PBG.501	Principles of Genetics	2+1	I
2	AU.PBG.503	Principles of Plant Breeding	2+1	II

Supporting courses for Entomology and Plant Pathology

Sr.No.	COURSE CODE	TITLE	CREDITS	SEMESTER
1	AU.Stat.501	Statistical Methods for Applied Sciences	3+1	I&II
2	AU.Comp. 501	Computer Fundamentals and Programming	2+1	I&II
3	AU.Lib.501	Library and Information Services	1+0	I&II
4	AU.DM.501	E Course on Disaster Management	1+0	I&II

AU. PL PATHO 501 MYCOLOGY
2+1

Theory
UNIT I: Introduction, definition of different terms, basic concepts.
UNIT II: Importance of mycology in agriculture, Importance of fungi to man, history of mycology.
UNIT III: Concepts of nomenclature and classification, fungal biodiversity, reproduction in fungi.
UNIT IV: The comparative morphology, ultrastructure, characters of different groups of fungi up to generic level: (a) Myxomycota and (b) Eumycota- i) Mastigomycotina ii) Zygomycotina, iii) Ascomycotina, iv) Basidiomycotina, v) Deuteromycotina. Lichens, variability in fungi.

Practical
Detailed comparative study of different groups of fungi; collection; identification and preservation of specimens; isolation and identification of plant pathogenic fungi.

AU. PL PATHO 502 PLANT VIROLOGY
2+1

Theory
UNIT I: History of plant viruses, composition and structure of viruses.
UNIT II: Symptomatology of important plant viral diseases, transmission, chemical and physical properties, virus-host interaction, virus-vector relationship.
UNIT III: Virus nomenclature and classification, genome organization, replication and movement of viruses.
UNIT IV: Virus isolation and purification, electron microscopy, protein and nucleic acid based diagnostics.
UNIT V: Mycoviruses, phytoplasma, arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, prions, principles of the working of electron-microscope and ultra-microtome.
UNIT VI: Virus origin and evolution, mechanism of resistance, genetic engineering, ecology, and management of plant viruses.

Practical: Study of symptoms caused by viruses; transmission; assay of viruses; physical properties; purification; and method of raising antisera; serological tests; electron microscopy and ultratomy; PCR.

AU. PL PATHO 503 PLANT BACTERIOLOGY 2+1

Theory

UNIT I: History and introduction to phytopathogenic procarya, viz., bacteria, MLOs, spiroplasmas and other fastidious procarya. Importance of phytopathogenic bacteria.

UNIT II: Evolution, classification and nomenclature of phytopathogenic procarya and important diseases caused by them.

UNIT III: Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic procarya.

UNIT IV: General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios.

UNIT V: Procaryotic inhibitors and their mode of action against phytopathogenic bacteria.

UNIT VI: Survival and dissemination of phytopathogenic bacteria.

Practical

Isolation, purification; identification and host inoculation of phytopathogenic bacteria; staining methods; biochemical and serological characterization; isolation of plasmid and use of antibacterial chemicals/antibiotics.

AU. PL PATHO 504 PRINCIPLES OF PLANT PATHOLOGY 3+0

Theory

UNIT I: Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes and classification of plant diseases.

UNIT II: Pathogenesis- survival, growth, reproduction, and dispersal of important plant pathogens, role of environment and host nutrition on disease development.

UNIT III: Host parasite interaction, recognition concept and infection, symptomatology, mechanism of infection- role of enzymes, toxins, growth regulators; defense strategies- oxidative burst; Phenolics, Phytoalexins, PR proteins, Elicitors, altered plant metabolism as affected by plant pathogens.

UNIT IV: Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance.

UNIT V: Disease management strategies.

AU. PL PATHO 505 DETECTION AND DIAGNOSIS OF PLANT DISEASES 0+2

Practical

UNIT I: Methods to prove Koch's postulates with biotroph and necrotroph pathogens; pure culture techniques; use of selective media to isolate pathogens.
UNIT II: Preservation of plant pathogens and disease specimens; use of haemocytometer; micrometer; centrifuge; pH meter; camera lucida.
UNIT III: Microscopic techniques and staining methods; phase contrast system; chromatography; use of electron microscope; spectrophotometer; ultracentrifuge and electrophoretic apparatus; disease diagnostics; serological and molecular techniques for detection of plant pathogens; evaluation of fungicides; bactericides etc.; field experiments; data collection and preparation of references.

AU. PL PATHO 506 PRINCIPLES OF PLANT DISEASE MANAGEMENT
2+1

Theory
UNIT I: Principles of plant disease management through cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures (IDM- module) of plant diseases, disease resistance and molecular approach for disease management.
UNIT II: Foliage, seed and soil application of chemicals, role of stickers, spreaders and other adjuvants, health vis-à-vis environmental hazards, residual effects and safety measures.
UNIT III: History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy, nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.

Practical
In vitro and *in vivo* evaluation of chemicals against plant pathogens; ED and MIC values; study of structural details of sprayers and dusters.

AU. PL PATHO 507 SEED HEALTH TECHNOLOGY
2+1

Theory
UNIT I: History and economic importance of seed pathology in seed industry, plant quarantine and SPS under WTO, morphology and anatomy of typical monocotyledonous and dicotyledonous infected seeds.
UNIT II: Recent advances in the establishment and subsequent cause of disease development in seed and seedling, localization and mechanism of seed transmission in relation to seed infection, seed to plant transmission of pathogens.
UNIT III: Seed certification and tolerance limits, types of losses caused by seed-borne diseases in true and vegetatively propagated seeds, evolutionary adaptations of crop plants to defend seed invasion by seed-borne pathogens, epidemiological factors influencing the transmission of seed-borne diseases, forecasting of epidemics through seed-borne infection.
UNIT IV: Production of toxic metabolites affecting seed quality and its impact on human, animal and plant health, management of seed-borne pathogen/diseases and procedure for healthy seed production, seed health testing, methods for detecting microorganism.

Practical

Conventional and advanced techniques in the detection and identification of seed-borne fungi; bacteria and viruses; relationship between seed-borne infection and expression of the disease in the field.

AU. PL PATHO 508 CHEMICALS IN PLANT DISEASE MANAGEMENT 2+1

Theory

UNIT I: History and development of chemicals; definition of pesticides and related terms, advantages and disadvantages of chemicals.

UNIT II: Classification of chemicals used in plant disease control and their characteristics.

UNIT III: Chemicals in plant disease control, viz., fungicides, bactericides, nematicides, antiviral chemicals and botanicals.

UNIT IV: Formulations, mode of action and application of different fungicides, chemotherapy and phytotoxicity of fungicides.

UNIT V: Handling, storage and precautions to be taken while using fungicides, compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides.

UNIT VI: General account of plant protection appliances, environmental pollution, residues and health hazards, fungicidal resistance in plant pathogens and its management.

Practical

Acquaintance with formulation of different fungicides and plant protection appliances; Formulation of fungicides; bactericides and nematicides; *in vitro* evaluation techniques; preparation of different concentrations of chemicals including botanical pesticides based on active ingredients against pathogens; persistence; compatibility with other agro-chemicals; detection of naturally occurring fungicide resistant mutants of pathogen; methods of application of chemicals.

AU. PL PATHO 509 DISEASE RESISTANCE IN PLANTS 2+0

Theory

UNIT I: Introduction and historical development, dynamics of pathogenicity, process of infection, variability in plant pathogens, gene centre's as sources of resistance, disease resistance terminology.

UNIT II: Disease escapes, disease tolerance, disease resistance, types of resistance, identification of physiological races of pathogens, disease progression in relation to resistance, stabilizing selection pressure in plant pathogens.

UNIT III: Host defense system, morphological and anatomical resistance, preformed chemicals in host defense, post infectional chemicals in host defense, phytoalexins, hypersensitivity and its mechanisms.

UNIT IV: Gene-for-gene concept, protein-for-protein and immunization basis, management of resistance genes, strategies for gene deployment.

AU. PL PATHO 510 EPIDEMIOLOGY AND FORECASTING OF PLANT DISEASES 2+1

Theory

UNIT I: Epidemic concept and historical development, pathometry and crop growth stages, epidemic growth and analysis.

UNIT II: Common and natural logrithms, function fitting area under disease progress curve and correction factors, inoculum dynamics, population biology of pathogens, temporal spatial variability in plant pathogens.

UNIT III: Survey, surveillance and vigilance, crop loss assessment and models for prediction of crop losses.

UNIT IV: Principles and pre-requisites of forecasting, systems and factors affecting various components of forecastings, some early forecasting, procedures based on weather and inoculum potential, modeling disease growth and disease prediction.

Practical

Measuring diseases; spore dispersal and trapping; weather recording; survey; multiplication of inoculums; computerized data analysis; function fitting; model preparation and validation.

AU. PL PATHO 511/ ENTO 511 PLANT QUARANTINE 2+0

Theory

UNIT I: Definition of pest, pesticides and transgenics as per Government notification, relative importance, quarantine – domestic and international, quarantine restrictions in the movement of agricultural produce, seeds and planting material, case histories of exotic pests/diseases and their status.

UNIT II: Plant protection organization in India, Acts related to registration of pesticides and transgenics, history of quarantine legislations, PQ Order 2003, Environmental Acts, Industrial registration; APEDA, import and export of bio-control agents.

UNIT III: Identification of pest/disease free areas; contamination of food with toxigens and microorganisms, and their elimination, symptomatic diagnosis and other techniques to detect pest/pathogen infestations, VHT and other safer techniques of disinfestations/salvaging of infected material.

UNIT IV: WTO regulations; non-tariff barriers; pest risk analysis (PRA), good practices for pesticide laboratories; pesticide industry; sanitary and phytosanitary measures.

MONOR COURSES FOR PLANT PATHOLOGY

AU. GP 501 PRINCIPLES OF GENETICS 2+1

Theory

UNIT I: Beginning of genetics, cell structure and cell division, early concepts of inheritance, Mendel's laws, discussion on Mendel's paper, chromosomal theory of inheritance.

UNIT II: Multiple alleles, gene interactions, Sex determination, differentiation and sex-linkage, sex influenced and sex-limited traits, linkage-detection, estimation, recombination and genetic mapping in eukaryotes, somatic cell genetics, extra chromosomal inheritance.

UNIT III: Population, Mendelian population, random mating population, frequencies of genes and genotypes, causes of change, Hardy-Weinberg equilibrium.

UNIT IV: Structural and numerical changes in chromosomes, nature, structure and replication of the genetic material, organization of DNA in chromosomes, genetic code, protein biosynthesis.

UNIT V: Genetic fine structure analysis, allelic complementation, split genes, transposable genetic elements, overlapping genes, pseudogenes, oncogenes, gene families and clusters.

UNIT VI: Regulation of gene activity in prokaryotes, molecular mechanisms of mutation, repair and suppression, bacterial plasmids, insertion (IS) and transposable (Tn) elements, molecular chaperones and gene expression, gene regulation in eukaryotes, RNA editing.

UNIT VII: Gene isolation, synthesis and cloning, genomic and cDNA libraries, PCR based cloning, positional cloning, nucleic acid hybridization and immunochemical detection, DNA sequencing, DNA restriction and modification, anti-sense RNA and ribozymes, micro-RNAs (miRNAs).

UNIT VIII: Genomics, structural and functional proteomics, pharmacogenomics, metagenomics.

UNIT IX: Methods of studying polymorphism at biochemical and DNA level, transgenic bacteria and bioethics, gene silencing, genetics of mitochondria and chloroplasts.

UNIT X: Concepts of eugenics, epigenetics, behavioural genetics, and gnetic disorders.

Practical: Laboratory exercises in probability and chi-square; demonstration of genetic principles using laboratory organisms; chromosome mapping using three point test cross; tetrad analysis; induction and detection of mutations through genetic tests; DNA; extraction and PCR amplification, electrophoresis, basic principles and running of amplified DNA; extraction of proteins and isozymes; use of *agrobacterium* mediated method and biolistic gun; practical demonstrations, detection of transgenes in the exposed plant material; visit to transgenic glasshouse and learning the practical considerations.

AU. GP 503 PRINCIPLES OF PLANT BREEDING 2+1

Theory

UNIT I: History of plant breeding (Pre and post-Mendelian era), objectives of plant breeding, characteristics improved by plant breeding, patterns of evolution in crop plants, centres of origin, biodiversity and its significance.

UNIT II: Genetic basis of breeding self- and cross - pollinated crops including mating systems and response to selection, nature of variability, components of variation, heritability and genetic advance, genotype environment interaction, general and specific combining ability, types of gene actions and implications in plant breeding, plant introduction and role of plant genetic resources in plant breeding.

UNIT III: Self-incompatibility, male sterility and apomixis in crop plants and their commercial

exploitation.
UNIT IV: Pure line theory, pure line selection and mass selection methods, line breeding, pedigree, bulk, backcross, single seed descent and multiline method, population breeding in self-pollinated crops (diallel selective mating approach).
UNIT V: Breeding methods in cross pollinated crops, population breeding-mass selection and ear-to-row methods, S1 and S2 progeny testing, progeny selection schemes, recurrent selection schemes for intra and inter population improvement and development of synthetics and composites, hybrid breeding, genetical and physiological basis of heterosis and inbreeding, production of inbreds, breeding approaches for improvement of inbreds, predicting hybrid performance, seed production of hybrid and their parent varieties/inbreds.
UNIT VI: Breeding methods in asexually/clonally propagated crops, clonal selection apomixis, clonal selection.
UNIT VII: Concept of plant ideotype and its role in crop improvement, transgressive breeding, polyploidy wide hybridization and their significance in crop improvement, double hapolidy breeding following androgenesis, gynogenesis and chromosome elimation-mediated approaches.
UNIT VIII: Special breeding techniques- mutation breeding, breeding for abiotic and biotic stresses.
UNIT IX: Cultivar development- testing, release and notification, maintenance breeding, participatory plant breeding, plant breeders' rights and regulations for plant variety protection and farmers rights.
Practical: Floral biology in self and cross pollinated species, selfing and crossing techniques. Selection methods in segregating populations and evaluation of breeding material; analysis of variance (ANOVA); estimation of heritability and genetic advance; maintenance of experimental records; learning techniques in hybrid seed production using male-sterility in field crops.

SUPPORTING COURSES FOR PLANT PATHOLOGY

AU. STAT 501 STATISTICAL METHODS FOR APPLIED SCIENCES 3+1

Theory

UNIT I: Theory of probability, random variable and mathematical expectation, discrete and continuous probability distributions: binomial, Poisson, negative binomial, normal distribution and their applications.
UNIT II: Introduction to Theory of estimation and confidence intervals, concept of sampling distribution and test of significance, chi-square, t and F distributions, and their applications in tests of significance.
UNIT III: Non-parametric tests - sign, Wilcoxon, Mann-Whitney U-test, run test and, median test.
UNIT IV: Correlation and regression, simple and multiple linear regression model, least squares technique, estimation of parameters, predicted values and residuals, correlation coefficient, rank correlation, partial and multiple correlation coefficients, coefficient of determination, test of significance of correlation and regression coefficients, non-linear regression- polynomial, exponential and logarithmic.
Practical: Fitting of distributions-binomial; Poisson; negative binomial and normal; large sample tests; testing of hypothesis based on exact sampling distributions-chi-square; t and F; nonparametric tests; estimators for population parameters and their properties; correlation and regression analysis; fitting of non-linear regression.

AU. COMP 501 COMPUTER FUNDAMENTALS AND PROGRAMMING 2+1

Theory

UNIT I: Computer fundamentals-number systems, decimal, octal, binary and hexadecimal, representation of integers, fixed and floating point numbers, character representation, ASCII, EBCDIC.

UNIT II: Functional units of computer, I/O devices, primary and secondary memories.
UNIT III: Programming fundamentals with C - algorithm, techniques of problem solving, flowcharting, stepwise refinement, representation of integer, character, real, data types, constants and variables, arithmetic expressions, assignment statement, logical expression.
UNIT IV: Sequencing, alteration and iteration, arrays, string processing.
UNIT V: Sub-programs, recursion, pointers and files.
UNIT VIL: Program correctness, debugging and testing of programs.
Practical: Conversion of different number types;creation of flow chart;conversion of algorithm/flowchart to program;mathematical operators; operator precedence; sequence, control and iteration; arrays and string processing; pointers and file processing.

AU. LIB 501 LIBRARY AND INFORMATION SERVICES 1+0

Theory : Introduction to library services; Role of libraries in University education, research, extension and technology transfer; Classification systems and organization of Library; Sources of information-Primary Sources, Secondary Sources and Teritiary Sources, with emphasis on reference tools and digital resources; Intricacies of abstracting and indexing, CAS, SDI services, (Science Citation Index, Biological Abstracts, Chemical Abstracts, CABI Abstracts etc.); Tracing information from reference sources, information explosion and language barrier; Literature survey; Citation techniques/Bibliographic control and Preparation of bibliography; Use of CD-ROM Databases, Online Public Access Catalogue and other computerized library services; Use of Internet including search engines and its resources; e-abbreviations like ibid etc.

ABHILASHI UNIVERSITY

SCHOOL OF AGRICULTURE, FACULTY OF SCIENCE

Department wise course curriculum for B.Sc. (Hons.) Agriculture (4-year programme)

Name of the degree: B.Sc. (Hons.) Agriculture

Discipline-wise Courses

		Discipline/Course title	**Credit Hrs.**
S.N.	**Course Code**	**Agronomy**	
1.	AU.Agron.111	Fundamentals of Agronomy	4(3+1)
2.	AU.Agron.233	Crop Production Technology – I (*Kharif* crops)	2(1+1)
3.	AU.Agron.244	Introductory Agro-meteorology & Climate Change	2(1+1)
4.	AU.Agron.245	Crop Production Technology – II (*Rabi* crops)	2(1+1)
5.	AU.Agron.246	Farming System & Sustainable Agriculture	1(1+0)
6.	AU.Agron.358	Practical Crop Production - I *(Kharif* crops*)*	2(0+2)
7.	AU.Agron.359	Geoinformatics and Nano-technology and Precision Farming	2(1+1)
8.	AU.Agron.3611	Practical Crop Production - II *(Rabi* crops*)*	2(0+2)
9.	AU.Agron.3612	Principles of Organic Farming	2(1+1)
10	AU.Agron.3613	Rainfed Agriculture & Watershed Management	2(1+1)
Genetics & Plant Breeding			
1.	AU.PBG.121	Fundamentals of Genetics	3(2+1)
2.	AU.PBG.232	Fundamentals of Plant Breeding	3(2+1)
3.	AU.PBG.243	Principles of Seed Technology	3(1+2)
4.	AU.PBG.354	Crop Improvement-I (*Kharif* crops)	2(1+1)
5.	AU.PBG.366	Crop Improvement-II (*Rabi* crops)	2(1+1)
Soil Science & Agricultural Chemistry			
1.	AU.Soils.111	Fundamentals of Soil Science	3(2+1)
2.	AU.Soils.242	Problematic soils and their Management	2(2+0)
3.	AU.Soils.353	Manures, Fertilizers and Soil Fertility Management	3(2+1)
Entomology			
1.	AU.Ento.121	Fundamentals of Entomology	4(3+1)

2.	AU.Ento.352	Pests of Crops and Stored Grain and their Management	3(2+1)
3.	AU.Ento.363	Management of Beneficial Insects	2(1+1)
		Agricultural Economics	
1.	AU.Ag.Econ.121	Fundamentals of Agricultural Economics	2(2+0)
2.	AU.Ag.Econ.232	Agricultural Finance and Co-Operation	3(2+1)
3.	AU.Ag.Econ.243	Agricultural Marketing Trade & Prices	3(2+1)
4.	AU.Ag.Econ.365	Farm Management, Production & Resource Economics	2(1+1)
		Agricultural Engineering	
1.	AU.Ag.Engg.121	Introductory Soil and Water Conservation Engineering	2(1+1)
2.	AU.Ag.Engg.232	Farm Machinery and Power	2(1+1)
3.	AU.Ag.Engg.243	Renewable Energy and Green Technology	2(1+1)
4.	AU.Ag.Engg.365	Protected Cultivation and Secondary Agriculture	2(1+1)
		Plant Pathology	
1.	AU.Pl.Patho.121	Fundamentals of Plant Pathology	4(3+1)
2.	AU.Pl.Patho.352	Diseases of Field and Horticultural Crops and their Management-I	3(2+1)
3.	AU.Pl.Patho.353	Diseases of Field and Horticultural Crops and their Management-II	3(2+1)
4.	AU.Pl.Patho.364	Principles of Integrated Pest and Disease Management	3(2+1)
		Horticulture	
1.	AU.Hort.111	Fundamentals of Horticulture	2(1+1)
2.	AU.Hort.232	Production Technology for Vegetables and Spices	2(1+1)
3.	AU.Hort.243	Production Technology for Fruit and Plantation Crops	2(1+1)
4.	AU.Hort.244	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
5.	AU.Hort.365	Post-harvest Management and Value Addition of Fruits and Vegetables	2(1+1)
		Food Science and Technology	
1.	AU.FST.362	Principles of Food Science & Nutrition	2(2+0)
		Agricultural Extension	
1.	AU.Ag.Extn.111	Rural Sociology & Educational Psychology	2(2+0)
2.	AU.Ag.Extn.122	Fundamentals of Agricultural Extension Education	3(2+1)
3.	AU.Ag.Extn.123	Communication Skills and Personality Development	2(1+1)

4.	AU.Ag.Extn.354	Entrepreneurship Development and Business Communication	2(1+1)
Biochemistry / Physiology / Microbiology/ Environmental Sciences			
1.	AU.Biochem.111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
2.	AU.Forest.111	Introduction to Forestry	2(1+1)
3.	AU.Cr.Physiol.121	Fundamentals of Crop Physiology	2(1+1)
4.	AU.Micro.121	Agricultural Microbiology	2(1+1)
5.	AU.Env.DM.231	Environmental Studies & Disaster Management	3(2+1)
Statistics, Computer Application and I.P.R.			
1.	AU.Stat.231	Statistical Methods	2(1+1)
2.	AU.Ag.Info.231	Agriculture Informatics	2(1+1)
3.	AU.IPR.351	Intellectual Property Rights	1(1+0)
Animal Production			
1.	AU.LPM.231	Livestock and Poultry Management	4(3+1)
Language			
1.	AU.Eng.111	Comprehension & Communication Skills in English (Gradial course)	2(1+1)
Remedial Courses			
1.	AU. Agron. 112	Agricultural Heritage	1(1+0)
2.	AU.Bio.111	Introductory Biology	2(1+1)
3.	AU.El.Maths.111	Elementary Mathematics	2(2+0)
Non-Gradial Courses			
1.	AU. NSS/ Phy. Edu./Yoga	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
2.	AU.HVE.111	Human Values & Ethics	1(1+0)
3.	AU. Ed. Tr.	Educational Tour	2(0+2)

Semester- wise distribution of courses

SEMESTER I			
1.	AU.Hort.111	Fundamentals of Horticulture	2 (1+1)
2.	AU.Biochem.111	Fundamentals of Plant Biochemistry and Biotechnology	3(2+1)
3.	AU.Soils.111	Fundamentals of Soil Science	3(2+1)
4.	AU.Forest.111	Introduction to Forestry	2 (1+1)
5.	AU.Eng.111	Comprehension & Communication Skills in English	2 (1+1)
6.	AU.Agron.111	Fundamentals of Agronomy	4(3+1)
7.	AU.Bio.111/ AU.El.Maths.111	Introductory Biology*/Elementary Mathematics*	2 (1+1)/ 2(2+0)*
8.	AU. Agron. 112	Agricultural Heritage*	1(1+0)*
9.	AU.Ag.Extn.111	Rural Sociology & Educational Psychology	2 (2+0)
10	AU.HVE.111	Human Values & Ethics (non gradial)	1(1+0)**
11		NSS/NCC/Physical Education & Yoga Practices**	2 (0+2)**
	TOTAL ***R: Remedial course; **NC: Non-gradial courses**		**18+04*/03*+03****
SEMESTER II			
1.	AU.PBG.121	Fundamentals of Genetics	3(2+1)
2.	AU.Micro.121	Agricultural Microbiology	2(1+1)
3.	AU.Ag.Engg.121	Introductory Soil and Water Conservation Engineering	2(1+1)
4.	AU.Cr.Physiol.121	Fundamentals of Crop Physiology	2(1+1)
5.	AU.Ag.Econ.121	Fundamentals of Agricultural Economics	2(2+0)
6.	AU.Pl.Patho.121	Fundamentals of Plant Pathology	4(3+1)
7.	AU.Ento.121	Fundamentals of Entomology	4(3+1)
8.	AU.Ag.Extn.122	Fundamentals of Agricultural Extension Education	3(2+1)
9.	AU.Ag.Extn.123	Communication Skills and Personality Development	2(1+1)
	Total		**24(16+8)**

SEMESTER III			
1.	AU.Agron.233	Crop Production Technology – I *(Kharif Crops)*	2 (1+1)
2.	AU.PBG.232	Fundamentals of Plant Breeding	3 (2+1)
3.	AU.Ag.Econ.232	Agricultural Finance and Cooperation	3 (2+1)
4.	AU.Ag.Info.231	Agriculture Informatics	2(1+1)
5.	AU.Ag.Engg.232	Farm Machinery and Power	2 (1+1)
6.	AU.Hort.232	Production Technology for Vegetables and Spices	2 (1+1)
7.	AU.Env.DM.231	Environmental Studies and Disaster Management	3(2+1)
8.	AU.Stat.231	Statistical Methods	2(1+1)
9.	AU.LPM.231	Livestock and Poultry Management	4 (3+1)
	Total		**23(14+9)**
SEMESTER IV			
1.	AU.Agron.244	Introductory Agro-meteorology & Climate Change	2(1+1)
2.	AU.Agron.245	Crop Production Technology –II *(Rabi Crops)*	2(1+1)
3.	AU.Hort.243	Production Technology for Fruit and Plantation Crops	2(1+1)
4.	AU.Ag.Engg.243	Renewable Energy and Green Technology	2(1+1)
5.	AU.Soils.242	Problematic Soils and their Management	2(2+0)
6.	AU.Hort.244	Production Technology for Ornamental Crops, MAP and Landscaping	2(1+1)
7.	AU.PBG.243	Principles of Seed Technology	3(1+2)
8.	AU.Agron.246	Farming System & Sustainable Agriculture	1(1+0)
9.	AU.Ag.Econ.243	Agricultural Marketing Trade & Prices	3(2+1)
10.	**Elective Course**		**3 credit**
	AU.FSS.241	Food Safety and Standards	3(2+1)
	AU.Hort.245	Landscaping	3(2+1)
	AU Ag. Ext. 245	Agricultural Journalism	3(2+1)
	AU.Agron./soils247	Agrochemicals	3(2+1)
	Total		**19(11+8) + 3cr.**

SEMESTER V			
1.	AU.Pl.Patho.352	Diseases of Field and Horticultural Crops and their Management -I	3 (2+1)
2.	AU.Soils.353	Manures, Fertilizers and Soil Fertility Management	3 (2+1)
3.	AU.Ento.352	Pests of Crops and Stored Grain and their Management	3 (2+1)
4.	AU.Pl.Patho.354	Principles of Integrated Pest and Disease Management	3(2+1)
5.	AU.PBG.354	Crop Improvement-I *(Kharif Crops)*	2 (1+1)
6.	AU.Ag.Extn.354	Entrepreneurship Development and Business Communication	2 (1+1)
7.	AU.Agron.358	Practical Crop Production – I (*Kharif* crops)	2 (0+2)
8.	AU.Agron.359	Geoinformatics and Nano-technology for Precision Farming	2 (1+1)
9.	AU.IPR.351	Intellectual Property Rights	1(1+0)
10.	**Elective Course**		**3 credit**
	AU.Ag.Econ.354	Agribusiness Management	3(2+1)
	AU.PBG.355	Commercial Plant Breeding	3(1+2)
	AU.Ag.Engg.354	Protected Cultivation	3(2+1)
	AU.Agron.3510	Weed Management	3(2+1)
	Total		**21 (12+09) + 3 Credit**
SEMESTER VI			
1.	AU.Agron.3611	Practical Crop Production –II (*Rabi* crops)	2 (0+2)
2.	AU.Agron.3612	Principles of Organic Farming	2 (1+1)
3.	AU.Agron.3613	Rainfed Agriculture & Watershed Management	2 (1+1)
4.	AU.Ag.Engg.365	Protected Cultivation and Secondary Agriculture	2 (1+1)
5.	AU.Pl.Patho.364	Diseases of Field and Horticultural Crops and their Management-II	3 (2+1)
6.	AU.Hort.365	Post-harvest Management and Value Addition of Fruits and Vegetables	2 (1+1)
7.	AU.Ento.363	Management of Beneficial Insects	2 (1+1)
8.	AU.PBG.366	Crop Improvement-II *(Rabi crops)*	2 (1+1)

9.	AU.Ag.Econ.365	Farm Management, Production & Resource Economics	2 (1+1)
10.	AU.FSN.362	Principles of Food Science and Nutrition	2(2+0)
11.	**Elective Course**		3 credits
	AU.Pl.Patho.365	Biopesticides & Biofertilizers	3(2+1)
	AU.Hort.366	Micro propagation Technologies	3(2+1)
	AU.Hort.367	Hi-tech. Horticulture	3(1+2)
	AU. Agron. 3614	System Simulation and Agro-Advisory	3(2+1)
	Total		**21 (11 + 10)+ 3 cr.**

Elective Courses: A student can select three elective courses out of the following and offer during 4th, 5th and 6th semesters.

SEMESTER VII			
S.N.	**Rural Agricultural Work Experience and Agro-industrial Attachment (RAWE &AIA)**		
	Activities	**No. of weeks**	**Credit Hours**
1	General orientation & On campus training by different faculties	1	14
2.	Village attachment	8	
	Unit attachment in Univ./ College. KVK/ Res. Stn. attachment	5	
3.	Plant Clinic	2	02
	Agro-Industrial Attachment	3	04
4	Project Report Preparation, Presentation and Evaluation	1	
Total weeks for RAWE & AIA		**20**	**20**

- **Agro- Industrial Attachment:** The students would be attached with the agro-industries for a period of 10 weeks to get an experience of the industrial environment and working**.**
- Educational tour will be conducted in break between IV & V Semester or Vi & VII Semester

RAWE Component-I

Village Attachment Training Programme

Sl. No.	**Activity**	**Duration**

1	Orientation and Survey of Village	1 week
2	Agronomical Interventions	1 week
3	Plant Protection Interventions	1 week
4	Soil Improvement Interventions (Soil sampling and testing)	1 week
5	Fruit and Vegetable production interventions	1 week
6	Food Processing and Storage interventations	1 week
7	Animal Production Interventions	1 week
8	Extension and Transfer of Technology activities	1 week

RAWE Component –II
Agro Industrial Attachment

- Students shall be placed in Agro-and Cottage industries and Commodities Boards for 03 weeks.
- Industries include Seed / Sapling production, Pesticides-insecticides, Post-harvest-processing-value addition, Agri-finance institutions, etc.

Activities and Tasks during Agro-Industrial Attachment Programme

- Acquaintance with industry and staff
- Study of structure, functioning, objective and mandates of the industry
- Study of various processing units and hands-on trainings under supervision of industry staff
- Ethics of industry
- Employment generated by the industry
- Contribution of the industry promoting environment
- Learning business network including outlets of the industry
- Skill development in all crucial tasks of the industry
- Documentation of the activities and task performed by the students
- Performance evaluation, appraisal and ranking of students

Modules for Skill Development and Entrepreneurship: A student has to register 20 credits opting for two modules of (0+10) credits each (total 20 credits) from the package of modules in the VIII semester.

Sr.	**Title of the module**	**Credits**

1.	Production Technology for Bioagents and Biofertilizer	0+10
2.	Seed Production and Technology	0+10
3.	Mushroom Cultivation Technology	0+10
4.	Soil, plant , water and seed Testing services	0+10
5.	Commercial Beekeeping	0+10
6.	Poultry Production Technology	0+10
7.	Commercial Horticulture	0+10
8.	Floriculture and Landscaping	0+10
9.	Food Processing	0+10
10.	Agriculture Waste Management	0+10
11.	Organic Production Technology	0+10
12.	Commercial Sericulture	0+10

Evaluation of Experiential Learning Programme/ HOT

Sl.No.	**Parameters**	**Max. Marks**
1.	Project Planning and Writing	10
2.	Presentation	10
3.	Regularity	10
4.	Monthly Assessment	10
5.	Output delivery	10
6.	Technical Skill Development	10
7.	Entrepreneurship Skills	10
8.	Business networking skills	10
9.	Report Writing Skills	10
10.	Final Presentation	10
	Total	100

Discipline-wise summary of credit hours

S.N.	**Group**	**Credits**
1.	Agronomy	21 (10+11)
2.	Genetics & Plant Breeding	13 (7+6)
3.	Soil Science & Agricultural Chemistry	8 (6+2)

4.	Entomology	9 (6+3)
5.	Agricultural Economics	10 (7+3)
6.	Agricultural Engineering	8 (4+4)
7.	Plant Pathology	13 (9+4)
8.	Horticulture	10 (5+5)
9.	Food Science	2 (2+0)
10.	Agricultural Extension	9 (6+3)
11.	Biochemistry / Physiology / Microbiology/ Environmental Sciences	12 (7+5)
12.	Statistics, Computer Application and I.P.R.	5 (3+2)
13.	Animal Production	4 (3+1)
14.	English	2 (1+1)
15.	Remedial Courses	03 (Biol/ Math); 04 (Agriculture)
16.	NSS/NCC/Physical Education & Yoga Practices	2(0+2)
17.	Human Values and Ethics	1(1+0)
18.	Educational Tour	2(0+2)
Total		126+3 (for Bio./Math)/ 01 (Agri) +5NC 126+3+1+5+9 credits elective
RAWE **ELP**		20+20
Grand Total		144+20+20=184
New Courses		**24+4 (remedial) +1 (NC)**

NSS/NCC/Physical Education & Yoga Practices 2 (0+2)

Theory

Course aims at evoking social consciousness among students through various activities viz., working together, constructive and creative social work, to be skilful in executing democratic leadership, developing skill in programme development to be able for self-employment, reducing gap between educated and uneducated, increasing awareness and desire to help sections of society.

- Following activities are to be taken up under the NSS course:

- Introduction and basic components of NSS: Orientation
- NSS programmes and activities
- Understanding youth
- Community mobilisation
- Social harmony and national integration
- Volunteerism and shramdan
- Citizenship, constitution and human rights
- Family and society
- Importance and role of youth leadership
- Life competencies
- Youth development programmes
- Health, hygiene and sanitation
- Youth health, lifestyle, HIV AIDS and first aid
- Youth and yoga
- Vocational skill development
- Issues related environment
- Disaster management
- Entrepreneurship development
- Formulation of production oriented project
- Documentation and data reporting
- Resource mobilization
- Additional life skills
- Activities directed by the Central and State Government

All the activities related to the National Service Scheme course is distributed under four different courses viz., National Service Scheme I, National Service Scheme II, National Service Scheme III and National Service Scheme IV each having one credit load. The entire four courses should be offered continuously for two years. A student enrolled in NSS course should put in at least 60 hours of social work in different activities in a semester other than five regular one day camp in a year and one special camp for duration of 7 days at any semester break period in the two year. Different activities will include orientation lectures and practical works. Activities directed by the Central and State Government have to be performed by all the volunteers of NSS as per direction**.**

SEMESTER I

AU.Hort.111 Fundamentals of Horticulture

Credit hours: 2(1+1) Sem. I

Theory

UNIT I

Horticulture-Its definition and branches, importance and scope; horticultural and botanical classification; climate and soil for horticultural crops.

UNIT II

Plant propagation-methods and propagating structures; principles of orchard establishment; Principles and methods of training and pruning, juvenility and flower bud differentiation; unfruitfulness; pollination, pollinizers and pollinators.

UNIT III

Fertilization and parthenocarpy; medicinal and aromatic plants.

UNIT IV

Importance of plant bio-regulators in horticulture. Irrigation- methods, fertilizer application in horticulture crops.

Practical

Identification of garden tools. Identification of horticultural crops. Preparation of seed bed/nursery bed. Practice of sexual and asexual methods of propagation. Layout and planting of orchard plants. Training and pruning of fruit trees. Transplanting and care of vegetable seedlings. Making of herbaceous and shrubbery borders. Preparation of potting mixture, potting and repotting. Fertilizer application in different crops. Visits to commercial nurseries/orchard.

AU.Biochem.111 Fundamentals of Plant Biochemistry and Biotechnology

Credit hours: 3(2+1) Sem. I

Theory

Unit I

Importance of Biochemistry. Properties of Water, pH and Buffer. Carbohydrate: Importance and classification. Structures of Monosaccharides, Reducing and oxidizing properties of Monosaccharides, Mutarotation; Structure of Disaccharides and Polysaccharides. Lipid: Importance and classification; Structures and properties of fatty acids; storage lipids and membrane lipids. Proteins: Importance of proteins and classification; Structures, titration and zwitterions nature of amino acids; Structural organization of proteins.

Unit II

Enzymes: General properties; Classification; Mechanism of action; Michaelis & Menten and Line Weaver Burk equation & plots; Introduction to allosteric enzymes. Nucleic acids: Importance and classification; Structure of Nucleotides, A, B & Z DNA; RNA: Types and Secondary & Tertiary structure. Metabolism of carbohydrates: Glycolysis, TCA cycle,

Glyoxylate cycle, Electron transport chain. Metabolism of lipids: Beta oxidation, Biosynthesis of fatty acids.

Unit III

Concepts and applications of plant biotechnology: Scope, organ culture, embryo culture, cell suspension culture, callus culture, anther culture, pollen culture and ovule culture and their applications; Micro-propagation methods; organogenesis and embryogenesis, Synthetic seeds and their significance; Embryo rescue and its significance; somatic hybridization and cybrids; Somaclonal variation and its use in crop improvement; cryo-preservation.

Unit IV

Introduction to recombinant DNA methods: physical (Gene gun method), chemical (PEG mediated) and Agrobacterium mediated gene transfer methods; Transgenics and its importance in crop improvement; PCR techniques and its applications; RFLP, RAPD, SSR; Marker Assisted Breeding in crop improvement; Biotechnology regulations.

Practical

Preparation of solution, pH & buffers, Qualitative tests of carbohydrates and amino acids. Quantitative estimation of glucose/ proteins. Titration methods for estimation of amino acids/lipids, Effect of pH, temperature and substrate concentration on enzyme action, Paper chromatography/ TLC demonstration for separation of amino acids/ Monosaccharides. Sterilization techniques. Composition of various tissue culture media and preparation of stock solutions for MS nutrient medium. Callus induction from various explants. Micro-propagation, hardening and acclimatization. Demonstration on isolation of DNA. Demonstration of gel electrophoresis techniques and DNA finger printing.

AU.Soils.111 Fundamentals of Soil Science

Credit hours: 3(2+1) Sem. I

Theory

Unit I

Soil as a natural body, Pedological and edaphological concepts of soil; Soil genesis: soil forming rocks and minerals; weathering, processes and factors of soil formation; Soil Profile, components of soil; Soil physical properties: soil-texture, structure, density and porosity, soil colour, consistence and plasticity; Elementary knowledge of soil taxonomy classification and soils of India.

Unit II

Soil water retention, movement and availability; soil air, composition, gaseous exchange, problem and plant growth; soil temperature, source, amount and flow of heat in soil; Soil reaction-pH, soil acidity and alkalinity, buffering, effect of pH on nutrient availability.

Unit III

Soil colloids - inorganic and organic; silicate clays: constitution and properties; sources of charge ion exchange, cation exchange capacity, base saturation.

Unit IV

Soil organic matter: composition, properties and its influence on soil properties; humic substances - nature and properties; soil organisms: macro and microorganisms, their beneficial and harmful effects; Soil pollution - behaviour of pesticides and inorganic contaminants, prevention and mitigation of soil pollution.

Practical

Study of soil profile in field. Study of soil sampling tools, collection of representative soil sample, its processing and storage. Study of soil forming rocks and minerals. Determination of soil density, moisture content and porosity. Determination of soil texture by feel and Bouyoucos Methods. Studies of capillary rise phenomenon of water in soil column and water movement in soil. Determination of soil pH and electrical conductivity. Determination of cation exchange capacity of soil. Study of soil map. Determination of soil colour. Demonstration of heat transfer in soil. Estimation of organic matter content of soil.

AU.Forest.111 Introduction to Forestry

Credit hours: 2(1+1) Sem. I

Theory

Unit I

Introduction – definitions of basic terms related to forestry, objectives of silviculture, forest classification, salient features of Indian Forest Policies.

Unit II

Forest regeneration, Natural regeneration - natural regeneration from seed and vegetative parts, coppicing, pollarding, root suckers; Artificial regeneration – objectives, choice between natural and artificial regeneration, essential preliminary considerations. Crown classification. Tending operations – weeding, cleaning, thinning – mechanical, ordinary, crown and advance thinning.

Unit III

Forest mensuration – objectives, diameter measurement, instruments used in diameter measurement; Non instrumental methods of height measurement - shadow and single pole method; Instrumental methods of height measurement - geometric and trigonometric principles, instruments used in height measurement; tree stem form, form factor, form quotient, measurement of volume of felled and standing trees, age determination of trees.

Unit IV

Agroforestry – definitions, importance, criteria of selection of trees in agroforestry, different agroforestry systems prevalent in the country, shifting cultivation, taungya, alley cropping, wind breaks and shelter belts, home gardens. Cultivation practices of two important fast growing tree species of the region.

Practical

Identification of tree-species. Diameter measurements using calipers and tape, diameter measurements of forked, buttressed, fluted and leaning trees. Height measurement of standing trees by shadow method, single pole method and hypsometer. Volume measurement of logs

using various formulae. Nursery lay out, seed sowing, vegetative propagation techniques. Forest plantations and their management. Visits of nearby forest based industries.

AU.Eng.111 Comprehension and Communication Skills in English

Credit hours: 2(1+1) Sem. I

Unit-I

War Minus Shooting- The sporting Spirit. A Dilemma- A layman looks at science Raymond B. Fosdick. You and Your English – Spoken English and broken English G.B. Shaw.

Unit-II

Reading Comprehension, Vocabulary- Antonym, Synonym, Homophones, Homonyms, often confused words. Exercises to Help the students in the enrichment of vocabulary based on TOEFL and other competitive examinations.

Unit –III

Functional grammar: Articles, Prepositions, Verb, Subject verb Agreement, Transformation, Synthesis, Direct and Indirect Narration. Written Skills: Paragraph writing, Precise writing, Report writing and Proposal writing.

Unit –IV

The Style: Importance of professional writing. Preparation of Curriculum Vitae and Job applications. Synopsis Writing. Interviews: kinds, Importance and process.

Practical

Listening Comprehension: Listening to short talks lectures, speeches (scientific, commercial and general in nature). Oral Communication: Phonetics, stress and intonation, Conversation practice. Conversation: rate of speech, clarity of voice, speaking and Listening, politeness & Reading skills: reading dialogues, rapid reading, intensive reading, improving reading skills. Mock Interviews: testing initiative, team spirit, leadership, intellectual ability. Group Discussions.

AU.Agron.111 Fundamentals of Agronomy

Credit hours: 4(3+1) Sem. I

Theory

UNIT I

Agronomy and its scope, seeds and sowing, tillage and tilth, crop density and geometry, Crop nutrition, manures and fertilizers, nutrient use efficiency.

UNIT II

Water resources, soil-plant-water relationship, crop water requirement, water use efficiency, irrigation- scheduling criteria and methods, quality of irrigation water, logging.

UNIT III

Weeds- importance, classification, crop weed competition, concepts of weed management principles and methods, herbicides- classification, selectivity and resistance, allelopathy.

UNIT IV

Growth and development of crops, factors affecting growth and development, plant ideotypes, crop rotation and its principles, adaptation and distribution of crops, crop management technologies in problematic areas, harvesting and threshing of crops.

Practical

Identification of crops, seeds, fertilizers, pesticides and tillage implements, study of agroclimatic zones of India and Himachal Pradesh, Identification of weeds in crops, Methods of herbicide and fertilizer application, Study of yield contributing characters and yield estimation, Seed germination and viability test, Numerical exercises on fertilizer requirement, plant population, herbicides and water requirement, Use of tillage implements-reversible plough, one way plough, harrow, leveler, seed drill, Study of soil moisture measuring devices, Measurement of field capacity, bulk density and infiltration rate, Measurement of irrigation water.

AU.Bio.111 Introductory Biology*

Credit hours: 2(1+1) Sem. I

Theory

UNIT I

Introduction to the living world, diversity and characteristics of life, origin of life, Evolution and Eugenics.

UNIT II

Binomial nomenclature and classification Cell and cell division.

UNIT III

Morphology of flowing plants.Seed and seed germination.

UNIT IV

Plant systematic- viz; Brassicaceae, Fabaceae and Poaceae.Role of animals in agriculture.

Practical:

-Morphology of flowering plants – root, stem and leaf and their modifications.
-Internal structure of root, stem and leaf.
-Inflorescence, flower and fruits.
-Cell, tissues & cell division.. Study of specimens and slides.
- Description of plants - Brassicaceae, Fabaceae and Poaceae.

AU.El.Maths.111 Elementary Mathematics*

Credit hours: 2(2+0) Sem. I

Theory

UNIT I

Straight lines : Distance formula, section formula (internal and external division), Change of axes (only origin changed), Equation of co-ordinate axes, Equation of lines parallel to axes, Slope-intercept form of equation of line, Slope-point form of equation of line, Two point form of equation of line, Intercept form of equation of line, Normal form of equation of line, General form of equation of line, Point of intersection of two st. lines, Angles between two st. lines, Parallel lines, Perpendicular lines, Angle of bisectors between two lines, Area of triangle and quadrilateral.

UNIT II

Circle: Equation of circle whose centre and radius is known, General equation of a circle, Equation of circle passing through three given points, Equation of circle whose diameters is line joining two points (x_1, y_1) & (x_2,y_2), Tangent and Normal to a given circle at given point (Simple problems), Condition of tangency of a line $y = mx + c$ to the given circle $x^2 + y^2 = a^2$.Differential Calculus : Definition of function, limit and continuity, Simple problems on limit, Simple problems on continuity, Differentiation of x^n , e^x , sin x & cos x from first principle, Derivatives of sum, difference, product and quotient of two functions, Differentiation of functions of functions (Simple problem based on it), Logarithmic differentiation (Simple problem based on it), Differentiation by substitution method and simple problems based on it, Differentiation of Inverse Trigonometric functions. Maxima and Minima of the functions of the form y=f (x) (Simple problems based on it).

UNIT III

Integral Calculus : Integration of simple functions, Integration of Product of two functions, Integration by substitution method, Definite Integral (simple problems based on it), Area under simple well-known curves (simple problems based on it).

UNIT IV

Matrices and Determinants: Definition of Matrices, Addition, Subtraction, Multiplication, Transpose and Inverse up to 3rd order, Properties of determinants up to 3rd order and their evaluation**.**

AU. Agron. 112 Agriculture Heritage*

Credit hours: 1(1+0) Sem. I

Theory

UNIT I

Introduction of Indian agricultural heritage, Ancient agricultural practices, Relevance of heritage to present day agriculture, Past and present status of agriculture and farmers in the society. **UNIT**

UNIT II

Journey of agriculture and its development from past to modern era; plant production and protection through indigenous traditional knowledge.

UNIT III
Crop voyage in India and world; agriculture scope, importance of agriculture and agricultural resources available in India.

UNIT IV
Crop significance and classifications; National agriculture set up in India; Current Scenaria of Indian agriculture; Indian agriculture concerns and future prospects.

AU.Ag.Extn.111 Rural Sociology & Educational Psychology

Credit hours: 2(2+0) Sem. I

Theory

UNIT I
Sociology and Rural sociology: Definition and scope, its significance in agriculture extension.

UNIT II
Social ecology; Rural society, Social Groups, Social Stratification, Culture concept, Social Institution, Social Change & Development.

UNIT III
Educational psychology: Meaning & its importance in agriculture extension.

UNIT IV
Behavior: Cognitive, affective, psychomotor domain, Personality, Learning, Motivation, Theories of Motivation, Intelligence.

AU.HVE.111 Human Value and Ethics

Credit hours: 1(1+0) Sem. I

Theory

UNIT I
Values and Ethics-An Introduction. Goal and Mission of Life. Vision of Life.

UNIT II
Principles and Philosophy. Self Exploration. Self Awareness. Self Satisfaction.

UNIT III
Decision Making. Motivation. Sensitivity. Success. Selfless Service. Case Study of Ethical Lives.

UNIT IV
Positive Spirit. Body, Mind and Soul. Attachment and Detachment. Spirituality Quotient. Examination.

AU. NSS/Physical Education & Yoga Practices

Credit hours: 2 (0+2) Sem. I

Course Title: National Service Scheme I

Introduction and basic components of NSS:
Orientation: history, objectives, principles, symbol, badge; regular programmes under NSS, organizational structure of NSS, code of conduct for NSS volunteers, points to be considered by NSS volunteers awareness about health.

NSS programmes and activities
Concept of regular activities, special camping, day camps, basis of adoption of village/slums, conducting survey, analysing guiding financial patterns of scheme, youth programme/ schemes of GOI, coordination with different agencies and maintenance of diary.

Understanding youth
Definition, profile, categories, issues and challenges of youth; and opportunities for youth who is agent of the social change.

Community mobilisation
Mapping of community stakeholders, designing the message as per problems and their culture; identifying methods of mobilisation involving youth-adult partnership.

Social harmony and national integration
Indian history and culture, role of youth in nation building, conflict resolution and peace building.

Volunteerism and shramdan
Indian tradition of volunteerism, its need, importance, motivation and constraints; shramdan as part of volunteerism.

Citizenship, constitution and human rights
Basic features of constitution of India, fundamental rights and duties, human rights, consumer awareness and rights and rights to information.

Family and society
Concept of family, community (PRIs and other community based organisations) and society.

Course Title: Physical Education and Yoga Practices

Credit hours: 2(0+2) Sem. I

1. Teaching of skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
2. Teaching of different skills of Football – demonstration, practice of the skills, correction, involvement in game situation (For girls teaching of Tennikoit)
3. Teaching of advance skills of Football – involvement of all the skills in game situation with

teaching of rules of the game

4. Teaching of skills of Basketball – demonstration, practice of the skills, correction of skills, involvement in game situation
5. Teaching of skills of Basketball – demonstration, practice of the skills, involvement in game situation
6. Teaching of skills of Basketball – involvement of all the skills in game situation with teaching of rule of the game
7. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
8. Teaching of skills of Kabaddi – demonstration, practice of the skills, correction of skills, involvement in game situation
9. Teaching of advance skills of Kabaddi – involvement of all the skills in game situation with teaching of rule of the game
10. Teaching of skills of Ball Badminton – demonstration, practice of the skills, correction of skills, involvement in game situation
11. Teaching of skills of Ball Badminton – involvement of all the skills in game situation with teaching of rule of the game
12. Teaching of some of Asanas – demonstration, practice, correction and practice
13. Teaching of some more of Asanas – demonstration, practice, correction and practice
14. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
15. Teaching of skills of Table Tennis – demonstration, practice of skills, correction and practice and involvement in game situation
16. Teaching of skills of Table Tennis – involvement of all the skills in game situation with teaching of rule of the game
17. Teaching – Meaning, Scope and importance of Physical Education
18. Teaching – Definition, Type of Tournaments
19. Teaching – Physical Fitness and Health Education
20. Construction and laying out of the track and field (*The girls will have Tennikoit and Throw Ball).

SEMESTER II

AU.PBG.121 Fundamentals of Genetics

Credit hours: 3(2+1) Sem. II

Theory

Unit I

Pre and Post Mendelian concepts of heredity, Mendelian principles of heredity, architecture of chromosome, chromonemata, chromosome matrix, chromomeres, centromere, secondary contriction and telomere; special types of chromosomes. Chromosomal theory of inheritance-cell cycle and cell division – mitosis, meiosis, Probability and Chi-square. Dominance relationships, epistatic interactions with examples.

Unit II

Multiple alleles, pleiotropism and pseudoalleles, Sex determination and sex linkage, sex limited and sex influenced traits, Blood group genetics, Linkage and its estimation, crossing over mechanisms, chromosome mapping. Structural changes in chromosome and their implications, Use of haploids, dihaploids and doubled haploids in Genetics.

Unit III

Mutation, classification, Methods of inducing mutation & CIB technique, mutagenic agents and induction of mutation. Qualitative & Quantitative traits, Polygenes and continuous variations, multiple factor hypothesis, Cytoplasmic inheritance. Genetic disorders,. Nature, structure & replication of genetic material.

Unit IV

Protein synthesis, Transcription and translational mechanism of genetic material, Gene concept: Gene structure, function and regulation, Lac and Trp operons.

Practical

Study of microscope. Study of cell structure. Mitosis and meiosis cell division. Experiments on monohybrid, dihybrid, trihybrid, test cross and back cross, Experiments on epistatic interactions including test cross and back cross, Practice on mitotic and meiotic cell division, Experiments on probability and Chi-square test. Determination of linkage and cross over analysis (through two point test cross and three point test cross data). Study on sex linked inheritance in Drosophila. Study of models on DNA and RNA structures.

AU.Ag.Micro.121 : Agricultural Microbiology

Credit hour: 2(1+1) Sem. II

UNIT I

Introduction Microbial world: Prokaryotic and eukaryotic microbes. Bacteria: cell structure, chemoautotrophy, photo autotrophy, growth.

UNIT II

Bacterial genetics: Genetic recombination: transformation, conjugation and transduction, plasmids, transposon.

UNIT III

Role of microbes in soil fertility and crop production: Carbon, Nitrogen, Phosphorus and sulphur cycles. Biological nitrogen fixation- symbiotic, associative and aysmbiotic. Azolla, blue green algae and mycorrhiza. Rhizosphere and phyllosphere.

UNIT IV

Microbes in human welfare: silage production, biofertilizers, biopesticides, biofuel production and biodegradation of agro- waste.

Practical

Introduction to microbiology laboratory and its equipments; Microscope- parts, principles of microscopy, resolving power and numerical aperture. Methods of sterilization. Nutritional media and their preparations. Enumeration of microbial population in soil- bacteria, fungi, actinomycetes. Methods of isolation and purification of microbial cultures. Isolation of *Rhizobium* from legume root nodule. Isolation of *Azotobacter* from soil. Isolation of *Azospirillum* from roots. Staining and microscopic examination of microbes.

AU.Ag.Engg.121 Introductory Soil and Water Conservation Engineering

Credit hours: 2(1+1) Sem. II

Theory

Unit I

Introduction to Soil and Water Conservation, causes of soil erosion. Definition and agents of soil erosion, water erosion: Forms of water erosion.

Unit II

Gully classification and control measures. Soil loss estimation by universal Loss Soil Equation. Soil loss measurement techniques.

Unit III

Principles of erosion control: Introduction to contouring, strip cropping. Contour bund. Graded bund and bench terracing. Grassed water ways and their design.

Unit IV

Water harvesting and its techniques. Principles of wind erosion control and its control measures.

Practical

General status of soil conservation in India. Calculation of erosion index. Estimation of soil loss. Measurement of soil loss. Preparation of contour maps. Design of grassed water ways. Design of contour bunds. Design of graded bunds. Design of bench terracing system. Problem on wind erosion.

AU.Cr.Physiol.121 Fundamentals of Crop Physiology

Credit hour: 2(1+1) Sem. II

Theory

Unit-1

Introduction to crop physiology and its importance in Agriculture; Plant cell: an Overview; Diffusion and osmosis; Absorption of water, transpiration and Stomatal Physiology.

Unit-2

Mineral nutrition of Plants: Functions and deficiency symptoms of nutrients, nutrient uptake mechanisms; Photosynthesis: Light and Dark reactions, C3, C4 and CAM plants.

Unit-3

Respiration: Glycolysis, TCA cycle and electron transport chain; Fat Metabolism: Fatty acid synthesis and Breakdown.

Unit-4

Plant growth regulators. Physiological roles and agricultural uses, Physiological aspects of growth and development of major crops: Growth analysis, Role of Physiological growth parameters in crop productivity.

Practical

Study of plant cells, structure and distribution of stomata, imbibitions, osmosis, plasmolysis, measurement of root pressure, rate of transpiration, Separation of photosynthetic pigments through paper chromatography, Rate of transpiration, photosynthesis, respiration, tissue test for mineral nutrients, estimation of relative water content, Measurement of photosynthetic CO_2 assimilation by Infra-Red Gas Analyser (IRGA).

AU. Ag. Econ. 121 Fundamentals of Agricultural Economics

Credit hours: 2 (2+0) Sem. II

Theory

Unit I

Economics: Meaning, scope and subject matter, definitions, activities, approaches to economic analysis; micro and macro economics, positive and normative analysis. Nature of economic theory; rationality assumption, concept of equilibrium, economic laws as generalization of human behavior. Basic concepts: Goods and services, desire, want, demand, utility, cost and price, wealth, capital, income and welfare. Agricultural economics: meaning, definition, characteristics of agriculture, importance and its role in economic development. Agricultural planning and development in the country.

Unit II

Demand: meaning, law of demand, demand schedule and demand curve, determinants, utility theory; law of diminishing marginal utility, equi-marginal utility principle. Consumer's equilibrium and derivation of demand curve, concept of consumer surplus. Elasticity of demand: concept and measurement of price elasticity, income elasticity and cross elasticity. Production:

process, creation of utility, factors of production, input output relationship. *Laws of returns*: Law of variable proportions and law of returns to scale. *Cost:* Cost concepts, short run and long run cost curves. Supply: Stock v/s supply, law of supply, supply schedule, supply curve, determinants of supply, elasticity of supply. Market structure: meaning and types of market, basic features of perfectly competitive and imperfect markets. Price determination under perfect competition; short run and long run equilibrium of firm and industry, shut down and break even points. Distribution theory: meaning, factor market and pricing of factors of production. Concepts of rent, wage, interest and profit.

Unit III

National income: Meaning and importance, circular flow, concepts of national income accounting and approaches to measurement, difficulties in measurement. Population: Importance, Malthusian and Optimum population theories, natural and socio-economic determinants, current policies and programmes on population control. Money: Barter system of exchange and its problems, evolution, meaning and functions of money, classification of money, money supply, general price index, inflation and deflation. Banking: Role in modern economy, types of banks, functions of commercial and central bank, credit creation policy. Agricultural and public finance: meaning, micro v/s macro finance, need for agricultural finance, public revenue and public expenditure. *Tax:* meaning, direct and indirect taxes, agricultural taxation, VAT.

Unit IV

Economic systems: Concepts of economy and its functions, important features of capitalistic, socialistic and mixed economies, elements of economic planning.

AU.Pl.Patho.121 Fundamentals of Plant Pathology

Credit hours: 4(3+1) Sem. II

Theory

Unit I

Introduction: Importance of plant diseases, scope and objectives of Plant Pathology. History of Plant Pathology with special reference to Indian work.Terms and concepts in Plant Pathology.Pathogenesis.Cause and classification of plant diseases. Important plant pathogenic organisms, different groups**:** fungi, bacteria, fastidious vesicular bacteria, phytoplasmas, spiroplasmas, viruses, viroids, algae, protozoa, phanerogamic parasites and nematodes with examples of diseases caused by them. Diseases and symptoms due to abiotic causes.

Unit II

Fungi: general characters, definition of fungus, somatic structures, types of fungal thalli, fungal tissues, modifications of thallus, reproduction (asexual and sexual). Nomenclature, Binomial system of nomenclature, rules of nomenclature, classification of fungi. Key to divisions,sub-divisions, orders and classes.

Bacteria and mollicutes: general morphological characters. Basic methods of classification and reproduction.

Viruses: nature, architecture, multiplication and transmission.

Unit III

Study of phanerogamic plant parasites.

Nematodes: General morphology and reproduction, classification, symptoms and nature of damage caused by plant nematodes (*Heterodera*, *Meloidogyne*, *Anguina*, *Radopholus* etc.)

Unit IV

Principles and methods of plant disease management.

Nature, chemical combination, classification, mode of action and formulations of fungicides and antibiotics.

Practical

Acquaintance with various laboratory equipments and microscopy.Preparation of media, isolation and Koch's postulates.General study of different structures of fungi.Study of symptoms of various plant diseases.Study of representative fungal genera.Staining and identification of plant pathogenic bacteria.Transmission of plant viruses.Study of phanerogamic plant parasites.

Study of morphological features and identification of plant parasitic nematodes.Extraction of nematodes from soil.

Study of fungicides and their formulations.Methods of pesticide application and their safe use. Calculation of fungicide sprays concentrations**.**

AU.Ento.121 Fundamentals of Entomology

Credit hours: 4(3+1) Sem. II

Unit-I

History of Entomology in India. Major points related to dominance of Insecta in Animal kingdom. Classification of phylum Arthropoda upto classes. Relationship of class Insecta with other classes of Arthropoda. Morphology: Structure and functions of insect cuticle and molting. Body segmentation. Structure of Head, thorax and abdomen. Structure and modifications of insect antennae, mouth parts, legs, Wing venation, modifications and wing coupling apparatus. Structure of male and female genital organ. Metamorphosis and diapause in insects. Types of larvae and pupae. Structure and functions of digestive, circulatory, excretory, respiratory, nervous, secretary (Endocrine) and reproductive system, in insects. Types of reproduction in insects. Major sensory organs like simple and compound eyes, chemoreceptor.

Unit -II

Insect Ecology: Introduction, Environment and its components. Effect of abiotic factors– temperature, moisture, humidity, rainfall, light, atmospheric pressure and air currents. Effect of biotic factors – food competition, natural and environmental resistance.

Unit -III

Categories of pests. Host plant resistance, concept of IPM, practices, scope and limitations of IPM. Classification of insecticides, toxicity of insecticides and formulations of insecticides. Chemical control- importance, hazards and limitations. Recent methods of pest control, repellents, antifeedants, hormones, attractants, gamma radiation and genetic control. Insecticides

Act 1968-Important provisions.Application techniques of spray fluids. Phytotoxicity of insecticides. Symptoms of poisoning, first aid and antidotes.

Unit -IV

Systematics: Taxonomy –importance, history and development and binomial nomenclature. Definitions of Biotype, Sub-species, Species, Genus, Family and Order. Classification of class Insecta upto Orders, basic groups of present day insects with special emphasis to orders and families of Agricultural importance like Orthoptera: Acrididae, Tettigonidae, Gryllidae, Gryllotalpidae; Dictyoptera: Mantidae, Blattidae; Odonata; Isoptera: Termitidae; Thysanoptera: Thripidae; Hemiptera: Pentatomidae, Coreidae, Cimicidae, Pyrrhocoridae, Lygaeidae, Cicadellidae, Delphacidae, Aphididae, Coccidae, Lophophidae, Aleurodidae, Pseudococcidae; Neuroptera: Chrysopidae; Lepidoptera: Pieridae, Papiloinidae, Noctuidae, Sphingidae, Pyralidae, Gelechiidae, Arctiidae, Saturnidae, Bombycidae; Coleoptera: Coccinellidae, Chrysomelidae, Cerambycidae, Curculionidae, Bruchidae, Scarabaeidae; Hymenoptera: Tenthridinidae, Apidae. Trichogrammatidae, lchneumonidae, Braconidae, Chalcididae; Diptera: Cecidomyiidae, Tachinidae, Agromyziidae, Culicidae,Muscidae, Tephritidae.

Practical

Methods of collection and preservation of insects including immature stages; External features of Grasshopper/Blister beetle; Types of insect antennae, mouthparts and legs; Wing venation, types of wings and wing coupling apparatus. Types of insect larvae and pupae; Dissection of digestive system in insects (Grasshopper); Dissection of male and female reproductive systems in insects (Grasshopper); Study of characters of orders Orthoptera, Dictyoptera, Odonata, Isoptera, Thysanoptera, Hemiptera, Lepidoptera, Neuroptera, Coleoptera, Hymenoptera, Diptera and their families of agricultural importance. Insecticides and their formulations. Pesticides appliances and their maintenance. Sampling techniques for insect population and damage.

AU.Ag.Extn.121 Fundamentals of Agricultural Extension Education

Credit hours: 3(2+1) Sem. II

Theory

Unit -I

Education: Meaning, definition & Types; Extension Education- meaning, definition, scope and process; objectives and principles of Extension Education; Extension Programme planning-Meaning, Process, Principles and Steps in Programme Development.

Unit -II

Extension systems in India: extension efforts in pre-independence era (Sriniketan, Marthandam, Firka Development Scheme, Gurgaon Experiment, etc.) and post-independence era (Etawah Pilot Project, Nilokheri Experiment, etc.); various extension/ agriculture development programmes launched by ICAR/ Govt. of India (IADP, IAAP, HYVP, KVK, IVLP, ORP, ND,NATP, NAIP, etc.). New trends in agriculture extension: privatization extension, cyber extension/ e-extension, market-led extension, farmer-led extension, expert systems, etc.

Unit -III

Rural Development: concept, meaning, definition; various rural development programmes launched by Govt. of India. Community Dev.-meaning, definition, concept & principles, Physiology of C.D. Rural Leadership: concept and definition, types of leaders in rural context; extension administration: meaning and concept, principles and functions.

Unit -IV

Monitoring and evaluation: concept and definition, monitoring and evaluation of extension programmes; transfer of technology: concept and models, capacity building of extension personnel; extension teaching methods: meaning, classification, individual, group and mass contact methods, media mix strategies; communication: meaning and definition; models and barriers to communication. Agriculture journalism; diffusion and adoption of innovation: concept and meaning, process and stages of adoption, adopter categories.

Practical

To get acquainted with university extension system. Group discussion- exercise; handling and use of audio visual equipments and digital camera and LCD projector; preparation and use of AV aids, preparation of extension literature – leaflet, booklet, folder, pamphlet news stories and success stories; Presentation skills exercise; micro teaching exercise; A visit to village to understand the problems being encountered by the villagers/ farmers; to study organization and functioning of DRDA and other development departments at district level; visit to NGO and learning from their experience in rural development; understanding PRA techniques and their application in village development planning; exposure to mass media: visit to community radio and television studio for understanding the process of programme production; script writing, writing for print and electronic media, developing script for radio and television.

AU.Ag.Extn.124 Communication Skills and Personality Development

Credit hours: 2(1+1) Sem. II

Theory

Unit -I

Communication Skills: Structural and functional grammar; meaning and process of communication, verbal and nonverbal communication; listening and note taking.

Unit -II

Writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures.

Unit -III

Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting.

Unit -IV

Individual and group presentations, impromptu presentation, public speaking; Group discussion. Organizing seminars and conferences.

Practical

Listening and note taking, writing skills, oral presentation skills; field diary and lab record; indexing, footnote and bibliographic procedures. Reading and comprehension of general and technical articles, precise writing, summarizing, abstracting; individual and group presentations.

AU. NSS/ Physical Education & Yoga Practices

Credit hours: 2 (0+2) Sem. II

Course Title: National Service Scheme II

Importance and role of youth leadership

Meaning, types and traits of leadership, qualities of good leaders; importance and roles of youth leadership.

Life competencies

Definition and importance of life competencies, problem-solving and decision-making, inter personal communication.

Youth development programmes

Development of youth programmes and policy at the national level, state level and voluntary sector; youth-focused and youth-led organisations.

Health, hygiene and sanitation

Definition needs and scope of health education; role of food, nutrition, safe drinking water, water born diseases and sanitation (Swachh Bharat Abhiyan) for health; national health programmes and reproductive health.

Youth health, lifestyle, HIV AIDS and first aid

Healthy lifestyles, HIV AIDS, drugs and substance abuse, home nursing and first aid.

Youth and yoga

History, philosophy, concept, myths and misconceptions about yoga; yoga traditions and its impacts, yoga as a tool for healthy lifestyle, preventive and curative method.

Course Title: Physical Education and Yoga Practices

1. Teaching of skills of Hockey – demonstration practice of the skills and correction.
2. Teaching of skills of Hockey – demonstration practice of the skills and correction. And involvement of skills in games situation
3. Teaching of advance skills of Hockey – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game
4. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction.
5. Teaching of skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of the skills in games situation
6. Teaching of advance skills of Kho-Kho – demonstration practice of the skills and correction. Involvement of all the skills in games situation with teaching of rules of the game

7. Teaching of different track events – demonstration practice of the skills and correction.
8. Teaching of different track events – demonstration practice of the skills and correction.
9. Teaching of different track events – demonstration practice of the skills and correction with competition among them.
10. Teaching of different field events – demonstration practice of the skills and correction.
11. Teaching of different field events – demonstration practice of the skills and correction.
12. Teaching of different field events – demonstration practice of the skills and correction.
13. Teaching of different field events – demonstration practice of the skills and correction with competition among them.
14. Teaching of different asanas – demonstration practice and correction.
15. Teaching of different asanas – demonstration practice and correction.
16. Teaching of different asanas – demonstration practice and correction.
17. Teaching of different asanas – demonstration practice and correction.
18. Teaching of weight training – demonstration practice and correction.
19. Teaching of circuit training – demonstration practice and correction.
20. Teaching of calisthenics – demonstration practice and correction.

Note: 1) Compulsory Uniform: Half pants, Tee Shirts, Shoes and socks all white (Girls will have white Tee Shirt and Track pants) 2) The games mentioned in the practical may be inter changed depending on the season and facilities.

SEMESTER III

AU.Agron.233 Crop Production Technology-I (*Kharif* Crops)

Credit hours: 2(1+1) Sem. III

Theory

UNIT I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Kharif* crops. Cereals – rice, maize, sorghum, pearl millet and and minor millets. Pseudo cereals: buckwheat and grain amaranth.

UNIT II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of pulses- pigeonpea, mungbean, rajmash (frenchbean), horsegram, rice-bean, mothbean and urdbean.

UNIT III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of oilseeds- groundnut, sesame, soybean and fibre crops- cotton & jute and sunhemp.

UNIT IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of forage crops- sorghum, maize, cowpea, cluster bean, napier and setaria.

Practical

Rice nursery preparation, transplanting of rice, sowing of soybean, pigeonpea and mungbean. maize, groundnut and cotton, effect of seed size on germination and seedling vigour of *kharif* season crops, effect of sowing depth on germination of *kharif* crops, identification of weeds in *kharif* season crops, top dressing and foliar feeding of nutrients, study of yield contributing characters and yield calculation of *kharif* season crops, study of crop varieties and important Committee agronomic experiments at experimental farm. Study of forage experiments, morphological description of *kharif* season crops, visit to research centres of related crops.

AU.PBG.232 Fundamentals of Plant Breeding

Credit hours: 3(2+1) Sem. III

Theory

Unit I

Historical development, concept, nature and role of plant breeding, major achievements and future prospects; Genetics in relation to plant breeding, modes of reproduction and apomixes, self – incompatibility and male sterility- genetic consequences, cultivar options.

Unit II

Domestication, Acclimatization, introduction; Centre of origin/diversity, component of Genetic variation; Heritability and genetic advance; Genetic basis and breeding methods in self-pollinated crops-mass and pure line selection, hybridization techniques and handling of segregating population; Multiline concept.

Unit III

Concepts of population genetics and Hardy-Weinberg Law, Genetic basis and methods of breeding cross pollinated crops, modes of selection; Heterosis and inbreeding depression, development of inbred lines and hybrids, composite and synthetic varieties; Breeding methods in asexually propagated crops, clonal selection and hybridization; Wide hybridization and pre-breeding; Polyploidy in relation to plant breeding, mutation breeding-methods and uses.

Unit IV

Breeding for important biotic and abiotic stresses; Biotechnological tools-DNA markers and marker assisted selection. Participatory plant breeding; Intellectual Property Rights, Patenting, Plant Breeders and & Farmer's Rights.

Practical

Plant Breeder's kit, Study of germplasm of various crops. Study of floral structure of self-pollinated and cross pollinated crops. Emasculation and hybridization techniques in self & cross pollinated crops. Consequences of inbreeding on genetic structure of resulting populations. Study of male sterility system. Handing of segregation populations. Methods of calculating mean, range, variance, standard deviation, heritability. Designs used in plant breeding experiment, analysis of Randomized Block Design. To work out the mode of pollination in a given crop and extent of natural out crossing. Prediction of performance of double cross hybrids.

AU. Ag. Econ. 232 Agricultural Finance and Co-Operation

Credit hours: 3(2+1) Sem. III

Theory

Unit I

Agricultural Finance- meaning, scope and significance, credit needs and its role in Indian agriculture. Agricultural credit: meaning, definition, need, classification. Credit analysis: 4 R's, and 3C's of credits. Sources of agricultural finance: institutional and non-institutional sources, commercial banks, social control and nationalization of commercial banks, Micro financing including KCC.

Unit II

Lead bank scheme, RRBs, Scale of finance and unit cost. An introduction to higher financing institutions – RBI, NABARD, ADB, IMF, world bank, Insurance and Credit Guarantee Corporation of India. Cost of credit. Recent development in agricultural credit. Preparation and analysis of financial statements – Balance Sheet and Income Statement. Basic guidelines for preparation of project reports- Bank norms – SWOT analysis.

Unit III

Agricultural Cooperation – Meaning, brief history of cooperative development in India, objectives, principles of cooperation, significance of cooperatives in Indian agriculture.

Unit IV

Agricultural Cooperation in India- credit, marketing, consumer and multi-purpose cooperatives, farmers' service cooperative societies, processing cooperatives, farming cooperatives, cooperative warehousing; role of ICA, NCUI, NCDC, NAFED.

Practicals

Determination of most profitable level of capital use. 2 Optimum allocation of limited amount of capital among different enterprise. 3 Analysis of progress and performance of cooperatives using published data. 4 Analysis of progress and performance of commercial banks and RRBs using published data. 5 Visit to a commercial bank, cooperative bank and cooperative society to acquire firsthand knowledge of their management, schemes and procedures. 6 Estimation of credit requirement of farm business – A case study. 7 Preparation and analysis of balance sheet – A case study. 8 Preparation and analysis of income statement – A case study. 9 Appraisal of a loan proposal – A case study. 10 Techno-economic parameters for preparation of projects. 11 Preparation of Bankable projects for various agricultural products and its value added products. 12 Seminar on selected topics.

AU. Ag. Info.231 Agricultural Informatics

Credit hours: 2(1+1) Sem. III

Theory

Unit I

Introduction to Computers, Anatomy of Computers, Memory Concepts, Units of Memory, Operating System, definition and types, Applications of MS-Office for creating, Editing and Formatting a document, Data presentation, tabulation and graph creation, statistical analysis, mathematical expressions, Database, concepts and types, creating database, uses of DBMS in Agriculture, Internet and World Wide Web (WWW), Concepts and components.

Unit II

Computer Programming, General Concepts, Introduction to Visual Basic, Java, Fortran, C/ C++, etc, concepts and standard input/output operations.

Unit III

e-Agriculture, concepts, design and development. Application of innovative ways to use information and communication technologies (IT) in Agriculture. Computer Models in Agriculture: statistical, weather analysis and crop simulation models, concepts, structure, inputs-outputs files, limitation, advantages and application of models for understanding plant processes, sensitivity, verification, calibration and validation. IT application for computation of water and nutrient requirement of crops, Computer-controlled devices (automated systems) for Agri-input management, Smartphone mobile apps in Agriculture for farm advises, market price, postharvest management etc;

Unit IV

Geospatial technology, concepts, techniques, components and uses for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc for supporting Farm decisions. Preparation of contingent crop-planning and crop calendars using IT tools.

Practical

Study of Computer Components, accessories, practice of important DOS Commands. Introduction of different operating systems such as windows, Unix/ Linux, Creating, Files & Folders, File Management. Use of MS-WORD and MS Power-point for creating, editing and presenting a scientific Document. MS-EXCEL - Creating a spreadsheet, use of statistical tools, writing expressions, creating graphs, analysis of scientific data, handling macros. MS-ACCESS: Creating Database, preparing queries and reports, demonstration of Agri-information system. Introduction to World Wide Web (WWW) and its components. Introduction of programming languages such as Visual Basic, Java, Fortran, C, C++. Hands on practice on Crop Simulation Models (CSM), DSSAT/Crop-Info/CropSyst/ Wofost. Preparation of Inputs file for CSM and study of model outputs, computation of water and nutrient requirements of crop using CSM and IT tools. Use of smart phones and other devices in agro-advisory and dissemination of market information. Introduction of Geospatial Technology, for generating information important for Agriculture. Hands on practice on preparation of Decision Support System. Preparation of contingent crop planning.

AU.Ag.Engg.232 Farm Machinery and Power

Credit hours: 2(1+1) Sem. III

Theory

Unit I

Status of Farm Power in India, Sources of Farm Power , I.C. engines, working principles of I C engines, comparison of two stroke and four stroke cycle engines , Study of different components of I.C. engine, I.C. engine terminology and solved problems.

Unit II

Familiarization with different systems of I.C. engines: Air cleaning, cooling, lubrication ,fuel supply and hydraulic control system of a tractor, Familiarization with Power transmission system : clutch, gear box, differential and final drive of a tractor , Tractor types, Cost analysis of tractor power and attached implement.

Unit III

Familiarization with Primary and Secondary Tillage implement, Implement for hill agriculture, implement for intercultural operations

Unit IV

Familiarization with sowing and planting equipment, calibration of a seed drill and solved examples, Familiarization with Plant Protection equipment, Familiarization with harvesting and threshing equipment.

Practicals

Study of different components of I.C. engine. To study air cleaning and cooling system of engine, Familiarization with clutch, transmission, differential and final drive of a tractor, Familiarization with lubrication and fuel supply system of engine, Familiarization with brake, steering, hydraulic control system of engine, Learning of tractor driving, Familiarization with operation of power tiller, Implements for hill agriculture, Familiarization with different types of primary and secondary tillage implements: mould plough, disc plough and disc harrow . Familiarization with seed-cum-fertilizer drills their seed metering mechanism and calibration, planters and transplanter Familiarization with different types of sprayers and dusters Familiarization with different inter-cultivation equipment, Familiarization with harvesting and threshing machinery.

AU.Hort.232 Production Technology for Vegetable and Spices

Credit hours: 2(1+1) Sem. III

Theory

UNIT I

Importance of vegetables & spices in human nutrition and national economy, kitchen gardening.

UNIT II

Brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders of important vegetables and spices (Tomato, Brinjal, Chilli, Capsicum).

UNIT III

Brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders of important vegetables and spices (Cucumber, Melons, Gourds, Pumpkin, French bean, Peas).

UNIT IV

Brief about origin, area, production, improved varieties and cultivation practices such as time of sowing, sowing, transplanting techniques, planting distance, fertilizer requirements, irrigation, weed management, harvesting, storage, physiological disorders of important vegetables and spices (Cole crops such as Cabbage, Cauliflower, Knol-khol; Bulb crops such as Onion, Garlic; Root crops such as Carrot, Raddish, Beet root, Tuber crops such as Potato, Leafy vegetables such as Amaranth, Palak, Perennial Vegetables).

Practical

Identification of vegetables & spices crops and their seeds. Nursery raising. Direct seed sowing and transplanting. Study of morphological characters of different vegetables & spices. Fertilizers applications. Raising of nursery of vegetables & spices. Vegetables & spices seed extraction. Harvesting & preparation for market. Economics of vegetables and spices cultivation.

AU.Env.DM.231 Environmental Studies and Disaster Management

Credit hours: 3(2+1) Sem. III

Theory

Unit I

Multidisciplinary nature of environmental studies Definition, scope and importance.

Natural Resources: Renewable and non-renewable resources, Natural resources and associated problems. a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

• Role of an individual in conservation of natural resources.

• Equitable use of resources for sustainable lifestyles.

Unit II

Ecosystems: Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem. Ecological succession, Food chains, food webs and ecological pyramids. Introduction, types, characteristic features, structure and function of the following ecosystem: a. Forest ecosystem b. Grassland ecosystem c. Desert ecosystem d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: - Introduction, definition, genetic, species & ecosystem diversity and biogeographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. Biodiversity at global, National and local levels, India as a mega-diversity nation. Hot-sports of biodiversity. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts. Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Unit III

Environmental Pollution: definition, cause, effects and control measures of: a. Air pollution b. Water pollution c. Soil pollution d. Marine pollution e. Noise pollution f. Thermal pollution g. Nuclear hazards. Solid Waste Management: causes, effects and control measures of urban and industrial wastes. Role of an individual in prevention of pollution.

Social Issues and the Environment: From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Environmental ethics: Issues and possible solutions, climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. dies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of Pollution) Act. Wildlife Protection Act. Forest

Conservation Act. Issues involved in enforcement of environmental legislation. Public awareness.

Human Population and the Environment: population growth, variation among nations, population explosion, Family Welfare Programme. Environment and human health: Human Rights, Value Education, HIV/AIDS. Women and Child Welfare. Role of Information Technology in Environment and human health.

Unit IV

DISASTER MANAGEMENT

Natural Disasters- Meaning and nature of natural disasters, their types and effects. Floods, drought, cyclone, earthquakes, landslides, avalanches, volcanic eruptions, Heat and cold waves, Climatic change: global warming, Sea level rise, ozone depletion.

Man Made Disasters- Nuclear disasters, chemical disasters, biological disasters, building fire, coal fire, forest fire, oil fire, air pollution, water pollution, deforestation, industrial waste water pollution, road accidents, rail accidents, air accidents, sea accidents.

Disaster Management- Effect to migrate natural disaster at national and global levels. International strategy for disaster reduction. Concept of disaster management, national disaster management framework; financial arrangements; role of NGOs, community –based organizations and media. Central, state, district and local administration; Armed forces in disaster response; Disaster response; Police and other organizations.

Practical

Pollution case studies. Case Studies- Field work: Visit to a local area to document environmental assets river/ forest/ grassland/ hill/ mountain, visit to a local polluted site-Urban/Rural/Industrial/Agricultural, study of common plants, insects, birds and study of simple ecosystems-pond, river, hill slopes, etc.

AU.Stat.231 Statistical Methods

Credit hours: 2(1+1) Sem. III

Theory

Unit I

Introduction to Statistics and its Applications in Agriculture, Graphical Representation of Data, Measures of Central Tendency & Dispersion, Definition of Probability, Addition and Multiplication Theorem (without proof).

Unit II

Simple Problems Based on Probability. Binomial & Poisson Distributions, Definition of Correlation, Scatter Diagram. Karl Pearson's Coefficient of Correlation. Linear Regression Equations.

Unit III

Introduction to Test of Significance, One sample & two sample test t for Means, Chi-Square Test of Independence of Attributes in 2 ×2 Contingency Table. Introduction to Analysis of Variance, Analysis of One Way Classification.

Unit IV

Introduction to Sampling Methods, Sampling versus Complete Enumeration, Simple Random Sampling with and without replacement, Use of Random Number Tables for selection of Simple Random Sample.

Practical

Graphical Representation of Data. Measures of Central Tendency (Ungrouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Central Tendency (Grouped data) with Calculation of Quartiles, Deciles & Percentiles. Measures of Dispersion (Ungrouped Data). Measures of Dispersion (Grouped Data). Moments, Measures of Skewness & Kurtosis (Ungrouped Data). Moments, Measures of Skewness & Kurtosis (Grouped Data). Correlation & Regression Analysis. Application of One Sample t-test. Application of Two Sample Fisher's t-test. Chi-Square test of Goodness of Fit. Chi-Square test of Independence of Attributes for 2 ×2 contingency table. Analysis of Variance One Way Classification. Analysis of Variance Two Way Classification. Selection of random sample using Simple Random Sampling.

AU.LPM.231 Livestock & Poultry Management

Credit hours: 4(3+1) Sem. III

Theory

Unit I

Role of livestock in the national economy. Reproduction in farm animals and poultry. Housing principles, space requirements for different species of livestock and poultry. Management of calves, growing heifers and milch animals. Management of sheep, goat and swine. Incubation, hatching and brooding. Management of growers and layers.

Unit II

Important Indian and exotic breeds of cattle, buffalo, sheep, goat, swine and poultry. Improvement of farm animals and poultry.

Unit III

Digestion in livestock and poultry. Classification of feedstuffs. Proximate principles of feed. Nutrients and their functions. Feed ingredients for ration for livestock and poultry. Feed supplements and feed additives. Feeding of livestock and poultry.

Unit IV

Introduction of livestock and poultry diseases. Prevention (including vaccination schedule) and control of important diseases of livestock and poultry.

Practical

External body parts of cattle, buffalo, sheep, goat, swine and poultry. Handling and restraining of livestock. Identification methods of farm animals and poultry. Visit to IDF and IPF to study breeds of livestock and poultry and daily routine farm operations and farm records. Judging of cattle, buffalo and poultry. Culling of livestock and poultry. Planning and layout of housing for different types of livestock. Computation of rations for livestock. Formulation of concentrate mixtures. Clean milk production, milking methods. Hatchery operations, incubation and hatching equipments. Management of chicks, growers and layers. Debeaking, dusting and vaccination. Economics of cattle, buffalo, sheep, goat, swine and poultry production.

AU. NSS/Physical Education & Yoga Practices

Credit hours: 2 (0+2) Sem. III

Course Title: National Service Scheme III

Vocational skill development

To enhance the employment potential and to set up small business enterprises skills of volunteers, a list of 12 to 15 vocational skills will be drawn up based on the local conditions and opportunities. Each volunteer will have the option to select two skill-areas out of this list.

Issues related environment

Environmental conservation, enrichment and sustainability, climatic change, natural resource management (rain water harvesting, energy conservation, forestation, waste land development and soil conservations) and waste management.

Disaster management

Introduction and classification of disaster, rehabilitation and management after disaster; role of NSS volunteers in disaster management.

Entrepreneurship development

Definition, meaning and quality of entrepreneur; steps in opening of an enterprise and role of financial and support service institution.

Formulation of production oriented project

Planning, implementation, management and impact assessment of project.

Documentation and data reporting

Collection and analysis of data, documentation and dissemination of project reports.

SEMESTER IV

AU.Agron.245 Crop Production Technology-II (*Rabi* crops)

Credit hours: 2(1+1) Sem. IV

Theory

UNIT I

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of *Rabi* crops; cereals – wheat and barley, sugar crops-sugarcane and sugar beet.

UNIT II

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of pulses- chickpea, lentil, peas, oilseeds- rapeseed, mustard, sunflower, safflower and linseed.

UNIT III

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of medicinal and aromatic crops- mentha, lemon grass, citronella, isabgol, saffron and kalazira.

UNIT IV

Origin, geographical distribution, economic importance, soil and climatic requirements, varieties, cultural practices and yield of commercial crops- potato and tobacco; forage crops- berseem, lucerne and oat.

Practical

Sowing methods of wheat and sugarcane, identification of weeds in *rabi* season crops, study of morphological characteristics of *rabi* crops, study of yield contributing characters of *rabi* season crops, yield and juice quality analysis of sugarcane, study of important agronomic experiments of *rabi* crops at experimental farms. Study of *rabi* forage experiments, oil extraction of medicinal crops, visit to research stations of related crops.

AU. Hort. 244 Production Technology for Ornamental Crops, MAPs and Landscaping

Credit hours: 2(1+1) Sem. IV

Theory

UNIT I

Importance and scope of ornamental crops, medicinal and aromatic plants and landscaping. Principles of landscaping. Landscape uses of trees, shrubs and climbers.

UNIT II

Production technology of important cut flowers like rose, gerbera, carnation, lilium and orchids under protected conditions and gladiolus, tuberose, chrysanthemum under open conditions.

UNIT III

Package of practices for loose flowers like marigold and jasmine under open conditions. Production technology of important medicinal plants like asparagus, aloe, costus, Cinnamomum, periwinkle, isabgol and aromatic plants like mint, lemongrass, citronella, palmarosa, ocimum, rose, geranium, vetiver.

UNIT IV

Processing and value addition in ornamental crops and MAPs produce.

Practical

Identification of Ornamental plants. Identification of Medicinal and Aromatic Plants. Nursery bed preparation and seed sowing. Training and pruning of Ornamental plants. Planning and layout of garden. Bed preparation and planting of MAP. Protected structures – care and maintenance. Intercultural operations in flowers and MAP. Harvesting and post-harvest handling of cut and loose flowers. Processing of MAP. Visit to commercial flower/MAP unit.

AU.Ag.Engg.243 Renewable Energy and Green Technology

Credit hours: 2(1+1) Sem. IV

Theory

Unit I

Classification of energy sources, contribution of these of sources in agricultural sector, Familiarization with biomass utilization for biofuel production and their application.

Unit II

Familiarization with types of biogas plants and gasifiers, biogas, bioalcohol, biodiesel and biooil production and their utilization as bioenergy resource, introduction of solar energy, collection and their application.

Unit III

Familiarization with solar energy gadgets: solar cooker, solar water heater, application of solar energy: solar drying, solar pond, solar distillation.

Unit IV

Familiarization with solar energy gadgets: solar photovoltaic system and their application, introduction of wind energy and their application.

Practical

Familiarization with renewable energy gadgets. To study biogas plants, To study gasifier, To study the production process of biodiesel, To study briquetting machine, To study the production process of bio-fuels. Familiarization with different solar energy gadgets. To study solar photovoltaic system: solar light, solar pumping, solar fencing. To study solar cooker, To study solar drying system. To study solar distillation and solar pond.

AU.Soils.242 Problematic Soils and their Management

Credit Hours: 2(2+0) Sem. IV

Theory

Unit I

Soil quality and health, Distribution of Waste land and problem soils in India. Their categorization based on properties.

Unit II

Reclamation and management of Saline and sodic soils, Acid soils, Acid Sulphate soils, Eroded and Compacted soils, Flooded soils, Polluted soils.

Unit III

Irrigation water – quality and standards, utilization of saline water in agriculture. Remote sensing and GIS in diagnosis and management of problem soils.

Unit IV

Multipurpose tree species, bio remediation through MPTs of soils, land capability and classification, land suitability classification. Problematic soils under different Agroeco systems.

AU.Hort.243 Production Technology for Fruit and Plantation Crops

Credit hours: 2(1+1) Sem. IV

Theory

Unit I

Importance and scope of fruit and plantation crop industry in India; High density planting; Use of rootstocks.

Unit II

Production technologies for the cultivation of major fruits- mango, banana, citrus, grape, guava, litchi, papaya, apple, pear, peach.

Unit III

Production technologies for the cultivation of minor fruits pineapple, pomegranate, jackfruit, strawberry.

Unit IV

Production technologies for the cultivation of nut crops; plantation crops-coconut, arecanut, cashew, tea, coffee & rubber.

Practical

Seed propagation. Scarification and stratification of seeds. Propagation methods for fruit and plantation crops including Micro-propagation. Description and identification of fruit. Preparation of plant bio regulators and their uses, Pests, diseases and physiological disorders of above fruit and plantation crops, Visit to commercial orchard.

AU.PBG.243 Principles of Seed Technology

Credit hours: 3(1+2) Sem. IV

Theory

Unit I

Seed and seed technology: introduction, definition and importance. Deterioration causes of crop varieties and their control; Maintenance of genetic purity during seed production, seed quality; Definition, Characters of good quality seed, different classes of seed. Foundation and certified seed production of important cereals, pulses, oilseeds, fodder and vegetables.

Unit II

Seed certification, phases of certification, procedure for seed certification, field inspection. Seed Act and Seed Act enforcement. Duty and powers of seed inspector, offences and penalties. Seeds Control Order 1983, Varietal Identification through Grow Out Test and Electrophoresis, Molecular and Biochemical test. Detection of genetically modified crops, Transgene contamination in non-GM crops, GM crops and organic seed production.

Unit III

Seed drying, processing and their steps, seed testing for quality assessment, seed treatment, its importance, method of application and seed packing. Seed storage; general principles, stages and factors affecting seed longevity during storage.

Unit IV

Measures for pest and disease control during storage. Seed marketing: structure and organization, sales generation activities, promotional media. Factors affecting seed marketing, Role of WTO and OECD in seed marketing. Private and public sectors and their production and marketing strategies.

Practical

Seed production in major cereals: Wheat, Rice, Maize, Sorghum and Bajra. Seed production in major pulses: Urd, Mung, Pigeonpea, Lentil, Gram, Fieldpea. Seed production in major oilseeds: Soybean, Rapeseed and Mustard. Seed production in vegetable crops. Seed sampling and testing: Physical purity, germination, viability, etc. Seed and seedling vigour test. Genetic purity test: Grow out test and electrophoresis. Seed certification: Procedure, Field inspection, Preparation of field inspection report. Visit to seed production farms, seed testing laboratories and seed processing plant.

AU.Agron.246 Farming System and Sustainable Agriculture

Credit hours: 1(1+0) Sem. IV

Theory

UNIT I

Farming System-scope, importance, and concept, Types and systems of farming system and factors affecting types of farming, Farming system components and their maintenance.

UNIT II

Cropping system and pattern, multiple cropping system, Efficient cropping system and their evaluation, Allied enterprises and their importance, Tools for determining production and efficiencies in cropping and farming system.

UNIT III

Sustainable agriculture-problems and its impact on agriculture, indicators of sustainability, adaptation and mitigation, conservation agriculture strategies in agriculture, HEIA, LEIA and LEISA and its techniques for sustainability.

UNIT IV

Integrated farming system-historical background, objectives and characteristics, components of IFS and its advantages, Site specific development of IFS model for different agro-climatic zones, resource use efficiency and optimization techniques, Resource cycling and flow of energy in different farming system, farming system and environment, Visit of IFS model in different agro-climatic zones of nearby states University/ institutes and farmers field.

AU. Ag. Econ. 243 Agricultural Marketing, Trade and Prices

Credit hours: 3(2+1) Sem. IV

Theory

Unit I

Agricultural Marketing: Concepts and definitions of market, marketing, agricultural marketing, market structure, marketing mix and market segmentation, classification and characteristics of agricultural markets**;** demand, supply and producer's surplus of agri-commodities: nature and determinants of demand and supply of farm products, producer's surplus – meaning and its types, marketable and marketed surplus, factors affecting marketable surplus of agri-commodities; product life cycle (PLC) and competitive strategies.

Unit II

Meaning and stages in PLC; characteristics of PLC; strategies in different stages of PLC; pricing and promotion strategies: pricing considerations and approaches – cost based and competition based pricing; market promotion – advertising, personal selling, sales promotion and publicity – their meaning and merits & demerits; marketing process and functions: Marketing process-concentration, dispersion and equalization; exchange functions – buying and selling; physical functions – storage, transport and processing; facilitating functions – packaging, branding, grading, quality control and labeling (Agmark);Market functionaries and marketing channels.

Unit III

Types and importance of agencies involved in agricultural marketing; meaning and definition of marketing channel;number of channel levels; marketing channels for different farm products; Integration, efficiency, costs and price spread: Meaning, definition and types of market integration; marketing efficiency; marketing costs, margins and price spread; factors affecting cost of marketing; reasons for higher marketing costs of farm commodities; ways of reducing marketing costs.

Unit IV

Role of Govt. in agricultural marketing: Public sector institutions- CWC, SWC, FCI, CACP & DMI – their objectives and functions; cooperative marketing in India; Risk in marketing: Types of risk in marketing; speculation & hedging; an overview of futures trading; Agricultural prices and policy: Meaning and functions of price; administered prices; need for agricultural price policy; Trade: Concept of International Trade and its need, theories of absolute and comparative advantage. Present status and prospects of international trade in agri-commodities; GATT and WTO; Agreement on Agriculture (AoA) and its implications on Indian agriculture; IPR.

Practicals:

1 Plotting and study of demand and supply curves and calculation of elasticities**;** 2 Study of relationship between market arrivals and prices of some selected commodities; 3 Computation of marketable and marketed surplus of important commodities; Study of price behaviour over time for some selected commodities; 4 Construction of index numbers; Visit to a local market to study various marketing functions performed by different agencies, 5 Identification of marketing channels for selected commodity, collection of data regarding marketing costs, margins and price spread and presentation of report in the class; 6 Visit to market institutions – NAFED, SWC, CWC, cooperative marketing society, etc. to study their organization and functioning; 7 Application of principles of comparative advantage of international trade.

AU.Agron.244 Introductory Agro-meteorology & Climate Change

Credit hours: 2(1+1) Sem. IV

Theory

UNIT I

Meaning and scope of agricultural meteorology; Earth atmosphere- its composition, extent and structure; Atmospheric weather variables; Atmospheric pressure, its variation with height; Wind, types of wind, daily and seasonal variation of wind speed, cyclone, anticyclone, land breeze and sea breeze.

UNIT II

Nature and properties of solar radiation, solar constant, depletion of solar radiation, short wave, long wave and thermal radiation, net radiation, albedo; Atmospheric temperature, temperature inversion, lapse rate, daily and seasonal variations of temperature, vertical profile of temperature, Energy balance of earth.

UNIT III

Atmospheric humidity, concept of saturation, vapor pressure, process of condensation, formation of dew, fog, mist, frost, cloud; Precipitation, process of precipitation, types of precipitation such as rain, snow, sleet, and hail, cloud formation and classification; Artificial rainmaking. Monsoon-mechanism and importance in Indian agriculture, Weather hazards - drought, floods, frost, tropical cyclones and extreme weather conditions such as heat-wave and cold-wave.

UNIT IV

Agriculture and weather relations; Modifications of crop microclimate, climatic normals for crop and livestock production. Weather forecasting- types of weather forecast and their uses. Climate change, climatic variability, global warming, causes of climate change and its impact on regional and national Agriculture.

Practical

Visit of Agro-meteorological Observatory, site selection of observatory, exposure of instruments and weather data recording. Measurement of total, shortwave and longwave radiation, and its estimation using Planck's intensity law. Measurement of albedo and sunshine duration, computation of Radiation Intensity using BSS. Measurement of maximum and minimum air temperatures, its tabulation, trend and variation analysis. Measurement of soil temperature and computation of soil heat flux. Determination of vapor pressure and relative humidity. Determination of dew point temperature. Measurement of atmospheric pressure and analysis of atmospheric conditions. Measurement of wind speed and wind direction, preparation of wind rose. Measurement, tabulation and analysis of rain. Measurement of open pan evaporation and evapotranspiration. Computation of PET and AET.

Course Title: National Service Scheme IV

Credit hours: 2(0+2) Sem. IV

Youth and crime

Sociological and psychological factors influencing youth crime, cyber crime, pear mentoring in preventing crime and awareness for juvenile justice.

Civil/self defence

Civil defence services, aims and objectives of civil defence; needs and training of self defence.

Resource mobilisation

Writing a project proposal of self fund units (SFUs) and its establishment.

Additional life skills

Positive thinking, self confidence and esteem, setting life goals and working to achieve them, management of stress including time management.

SEMESTER V

AU.Pl.Patho.354 Principles of Integrated Pest and Disease Management

Credit hours: 3(2+1) Sem. V

Theory

Unit I

Categories of insect pests and diseases, IPM: Introduction, history, importance, concepts, principles and tools of IPM. Economic importance of insect pests, diseases and pest risk analysis.

Unit II

Methods of detection and diagnosis of insect pest and diseases.Calculation and dynamics of economic injury level and importance of Economic threshold level.

Unit III

Methods of control: Host plant resistance, cultural, mechanical, physical, legislative, biological and chemical control. Ecological management of crop environment.Introduction to conventional pesticides for the insect pests and disease management.Surveysurveillance and forecasting of Insect pestand diseases.

Unit IV

Development and validation of IPM module.Implementation and impact of IPM (IPM module for Insect pest and disease. Safety issues in pesticide uses. Political, social and legal implication of IPM.Case histories of important IPM programmes.

Practical

Methods of diagnosis and detection of various insect pests, and plant diseases, Methods of insect pests and plant disease measurement, Assessment of crop yield losses, calculations based on economics of IPM,Identification of biocontrol agents, different predators and natural enemies. Mass multiplication of *Trichoderma, Pseudomona*s, *Trichogramma,* NPV etc.Identification and nature of damage of important insect pests and diseases and their management.Crop (agro-ecosystem) dynamics of a selected insect pest and diseases.Plan & assess preventive strategies (IPM module) and decision making. crop monitoring attacked by insect, pestand diseases . Awareness campaign at farmers fields.

AU. Soils.353 Manures, Fertilizers and Soil Fertility Management

Credit Hours: 3(2+1) Sem. V

Theory

Unit I

Introduction and importance of organic manures, properties and methods of preparation of bulky and concentrated manures. Green/leaf manuring. Fertilizer recommendation approaches. Integrated nutrient management.

Unit II

Chemical fertilizers: classification, composition and properties of major nitrogenous, phosphatic, potassic fertilizers, secondary & micronutrient fertilizers, Complex fertilizers, nano fertilizers Soil amendments, Fertilizer Storage, Fertilizer Control Order.

Unit III

History of soil fertility and plant nutrition. criteria of essentiality. role, deficiency and toxicity symptoms of essential plant nutrients, Mechanisms of nutrient transport to plants, factors affecting nutrient availability to plants. Chemistry of soil nitrogen, phosphorus, potassium, calcium, magnesium, sulphur and micronutrients.

Unit IV

Soil fertility evaluation, Soil testing. Critical levels of different nutrients in soil. Forms of nutrients in soil, plant analysis, rapid plant tissue tests. Indicator plants. Methods of fertilizer recommendations to crops. Factor influencing nutrient use efficiency (NUE), methods of application under rainfed and irrigated conditions.

Practical

Introduction of analytical instruments and their principles, calibration and applications, Colorimetry and flame photometry. Estimation of soil organic carbon, Estimation of hydrolysable N in soils. Estimation of soil extractable P in soils. Estimation of exchangeable K, Ca and Mg in soils. Estimation of extractble S in soils. Estimation of DTPA extractable Zn in soils. Estimation of N in plants. Estimation of P in plants. Estimation of K in plants. Estimation of S in plants.

AU.Ento.352 Pests of Crops and Stored Grains and their Management

Credit hours: 3(2+1) Sem. V

Theory

Unit I

General account on nature and type of damage by different arthropods pests. Scientific name, order, family, host range, distribution, biology and bionomics, nature of damage, and management of major pests.

Unit II

Scientific name, order, family, host range, distribution, nature of damage and control practice other important arthropod pests of various field crop, vegetable crop, fruit crop, plantation crops, ornamental crops, narcotics, spices and condiments.

Unit III

Factors affecting losses of stored grain and role of physical, biological, mechanical and chemical factors in deterioration of grain.

Unit IV

Insect pests, mites, rodents, birds and microorganisms associated with stored grain and their management. Storage structure and methods of grain storage and fundamental principles of grain store management.

Practical

Identification of different types of damage. Identification and study of life cycle and seasonal history of various insect pests attacking crops and their produce: (a) Field Crops; (b) Vegetable Crops; (c) Fruit Crops; (d) Plantation, gardens, Narcotics, spices & condiments. Identification of insect pests and Mites associated with stored grain. Determination of insect infestation by different methods. Assessment of losses due to insects. Calculations on the doses of insecticides application technique. Fumigation of grain store / godown. Identification of rodents and rodent control operations in godowns. Identification of birds and bird control operations in godowns. Determination of moisture content of grain. Methods of grain sampling under storage condition. Visit to Indian Storage Management and Research Institute, Hapur and Quality Laboratory, Department of Food., Delhi. Visit to nearest FCI godowns.

AU.Pl.Patho.352 Diseases of Field & Horticultural Crops & their Management-I

Credit hours: 3 (2+1) Sem. V

Theory

Unit I

Symptoms, etiology, disease cycle and management of major diseases of following crops:

Field Crops:**Rice**: blast, brown spot, bacterial blight, sheath blight, false smut, khaira and tungro; **Maize**: stalk rots, downy mildew, leaf spots; **Sorghum**: smuts, grain mold and anthracnose, **Bajra** :downy mildew and ergot; **Groundnut**: early and late leaf spots, wilt

Unit II

Symptoms, etiology, disease cycle and management of major diseases of following crops:

Soybean: Rhizoctonia blight, bacterial spot, seed and seedling rot and mosaic; **Pigeonpea**: Phytophthora blight, wilt and sterility mosaic; **Finger millet**: Blast and leaf spot; black & green gram: Cercospora leaf spot and anthracnose, web blight and yellow mosaic; **Castor**: Phytophthora blight; **Tobacco**: black shank, black root rot and mosaic.

Unit IIII

Symptoms, etiology, disease cycle and management of major diseases of following crops:

Horticultural Crops: Guava: wilt and anthracnose; **Banana**: Panama wilt, bacterial wilt, Sigatoka and bunchy top; **Papaya**: foot rot, leaf curl and mosaic, **Pomegranate**: bacterial blight; **Cruciferous vegetables**: Alternaria leaf spot and black rot; **Brinjal**: Phomopsis blight and fruit rot and Sclerotinia blight;

Unit IV

Symptoms, etiology, disease cycle and management of major diseases of following crops:

Tomato: damping off, wilt, early and late blight, buck eye rot and leaf curl and mosaic; Okra:Yellow Vein Mosaic; **Beans**: anthracnose and bacterial blight; **Ginger**: soft rot; **Colocasia**: Phytophthora blight; **Coconut**: wilt and bud rot; **Tea**: blister blight; **Coffee**: rust

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems. Collection and preservation of plant diseased specimens for Herbarium; Note: Students should submit 50 pressed and well-mounted specimens.

AU.PBG.354 Crop Improvement – I (*Kharif Crops*) resign

Credit hours: 2(1+1) Sem. V

Theory

Unit I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fibres; fodders and cash crops; vegetable and horticultural crops.

Unit II

Plant genetic resources, its utilization and conservation, study of genetics of qualitative and quantitative characters. Important concepts of breeding self-pollinated, cross pollinated and vegetatively propagated crops.

Unit III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

Unit IV

Hybrid seed production technology of in Maize, Rice, Sorghum, Pearl millet, and Pigeonpea, etc. Ideotype concept and climate resilient crop varieties for future.

Practical

loral biology, emasculation and hybridization techniques in different crop species; viz., Rice, Jute, Maize, Sorghum, Pearl millet, Ragi, Pigeonpea, Urdbean, Mungbean, Soybean, Groundnut, Seasame, Caster, Cotton, Cowpea, Tobacco, Brinjal, Okra and Cucurbitaceous crops. Maintenance breeding of different kharifcrops. Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Kharifcrops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

AU.Ag.Extn.354 Entrepreneurship Development and Business Communication

Credit hours: 2(1+1) Sem. V

Theory

Unit I

Concept of Entrepreneur, Entrepreneurship Development, Characteristics of entrepreneurs; Assessment of entrepreneurship skills, SWOT Analysis & achievement motivation.

Unit II

Government policy and programs and institutions for entrepreneurship development, impact of economic reforms on Agribusiness on Agribusiness/ Agrienterprises, Entrepreneurial Development Process.

Unit III

Business Leadership Skills; Developing organizational skill (Controlling, supervising, problem solving, monitoring & evaluation), Developing Managerial skills, business leadership skinlls (Communication, direction and motivation skills), Problem solving skill, Supply chain management and Total quality management.

Unit IV

Project Planning Formulation and report preparation; Financing of enterprise, Opportunities for Agri- entrepreneurship and rural enterprise.

Practical

Assessing entrepreneurial traits, problem solving ability, managerial skills and achievement motivation, exercise in creativity, time audit through planning, monitoring and supervision, identification and selection of business idea, preparation of business plan and proposal writing, visit to entrepreneurship development institute and entrepreneurs.

AU.Agron.359 Geoinformatics and Nano-technology for Precision Farming

Credit hours: 2(1+1) Sem. V

Theory

UNIT I

Precision agriculture: concepts and techniques; their issues and concerns for Indian agriculture; Geo-informatics- definition, concepts, tool and techniques; their use in Precision Agriculture.

UNIT II

Crop discrimination and Yield monitoring, soil mapping; fertilizer recommendation using geospatial technologies; Spatial data and their management in GIS.

UNIT III

Remote sensing concepts and application in agriculture; Image processing and interpretation; Global positioning system (GPS), components and its functions; Introduction to crop Simulation

Models and their uses for optimization of Agricultural Inputs; STCR approach for precision agriculture.

UNIT IV

Nanotechnology, definition, concepts and techniques, brief introduction about nanoscale effects, nano-particles, nano-pesticides, nano-fertilizers, nano-sensors, Use of nanotechnology in seed, water, fertilizer, plant protection for scaling-up farm productivity.

Practical

Introduction to GIS software, spatial data creation and editing. Introduction to image processing software. Visual and digital interpretation of remote sensing images. Generation of spectral profiles of different objects. Supervised and unsupervised classification and acreage estimation. Multispectral remote sensing for soil mapping. Creation of thematic layers of soil fertility based on GIS. Creation of productivity and management zones. Fertilizers recommendations based of VRT and STCR techniques. Crop stress (biotic/abiotic) monitoring using geospatial technology. Use of GPS for agricultural survey. Formulation, characterization and applications of nanoparticles in agriculture. Projects formulation and execution related to precision farming.

AU.Agron.358 Practical Crop Production-I *(Kharif Crops)*

Credit hours: 2(0+2) Sem. V

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

AU.IPR.351 Intellectual Property Rights

Credit hours: 1(1+0) Sem. V

Theory

Unit I

Introduction and meaning of intellectual property, brief introduction to GATT, WTO, TRIPs and WIPO, Treaties for IPR protection: Madrid protocol, Berne Convention, Budapest treaty, etc.

Unit II

Types of Intellectual Property and legislations covering IPR in India:-Patents, Copyrights, Trademark, Industrial design, Geographical indications, Integrated circuits, Trade secrets. Patents Act 1970 and Patent system in India, patentability, process and product patent, filing of patent, patent specification, patent claims, Patent opposition and revocation, infringement, Compulsory licensing, Patent Cooperation Treaty, Patent search and patent database.

Unit III

Origin and history including a brief introduction to UPOV for protection of plant varieties, Protection of plant varieties under UPOV and PPV&FR Act of India, Plant breeders rights, Registration of plant varieties under PPV&FR Act 2001, breeders, researcher and farmers rights. Traditional knowledge-meaning and rights of TK holders.

Unit IV

Convention on Biological Diversity, International treaty on plant genetic resources for food and agriculture (ITPGRFA). Indian Biological Diversity Act, 2002 and its salient features, access and benefit sharing.

SEMESTER VI

AU.Agron. 3613 Rainfed Agriculture and Watershed Management

Credit hours: 2(1+1) Sem. VI

Theory

UNIT I

Rainfed agriculture: Introduction, types, History of rainfed agriculture and watershed in India; Problems and prospects of rainfed agriculture in India; Soil and climatic conditions prevalent in rainfed areas; Soil and water conservation techniques.

UNIT II

Drought: types, effect of water deficit on physio-morphological characteristics of the plants, Crop adaptation and mitigation to drought.

UNIT III

Water harvesting: importance, its techniques, Efficient utilization of water through soil and crop management practices, Management of crops in rainfed areas.

UNIT IV

Contingent crop planning for aberrant weather conditions, Concept, objective, principles and components of watershed management, factors affecting watershed management.

Practical

Studies on climate classification, studies on rainfall pattern in rainfed areas of the country and pattern of onset and withdrawal of monsoons. Studies on cropping pattern of different rainfed areas in the country and demarcation of rainfed area on map of India. Interpretation of meteorological data and scheduling of supplemental irrigation on the basis of evapo-transpiration demand of crops. Critical analysis of rainfall and possible drought period in the country, effective rainfall and its calculation. Studies on cultural practices for mitigating moisture stress. Characterization and delineation of model watershed. Field demonstration on soil & moisture conservation measures. Field demonstration on construction of water harvesting structures. Visit to rainfed research station/watershed.

AU.Ag.Engg.365 Protected Cultivation and Secondary Agriculture

Credit hours: 2(1+1) Sem. VI

Theory

Unit I

Green house technology: Introduction, Types of Green Houses; Plant response to Green house environment, Planning and design of greenhouses, Design criteria of green house for cooling and heating purposes.

Unit II

Green house equipments, materials of construction for traditional and low cost green houses. Irrigation systems used in greenhouses, typical applications, passive solar green house, hot air green house heating systems, green house drying. Cost estimation and economic analysis.

Important Engineering properties such as physical, thermal and aero & hydrodynamic properties of cereals, pulses and oilseed, their application in PHT equipment design and operation.

Unit II

Drying and dehydration; moisture measurement, EMC, drying theory, various drying method, commercial grain dryer (deep bed dryer, flat bed dryer, tray dryer, fluidized bed dryer, recirculatory dryer and solar dryer).

Unit IV

Material handling equipment; conveyer and elevators, their principle, working and selection.

Practical

Study of different type of green houses based on shape. Determine the rate of air exchange in an active summer winter cooling system. Determination of drying rate of agricultural products inside green house. Study of green house equipments. Visit to various Post-Harvest Laboratories. Determination of Moisture content of various grains by oven drying & infrared moisture methods. Determination of engineering properties (shape and size, bulk density and porosity of biomaterials). Determination of Moisture content of various grains by moisture meter. Field visit to seed processing plant.

AU.Pl.Patho.364 Diseases of Field & Horticultural Crops & their Management-II

Credit hours: 3(2+1) Sem. VI

Theory

Unit I

Symptoms, etiology, disease cycle and management of following diseases:

Wheat: rusts, loose smut, karnal bunt, powdery mildew, alternaria blight, and ear cockle;

Sugarcane: red rot, smut, wilt, grassy shoot, ratoon stunting and PokkahBoeng;

Unit II

Symptoms, etiology, disease cycle and management of following diseases:

Sunflower: Sclerotinia stem rot and Alternaria blight; Mustard: Alternaria blight, white rust, downy mildew and Sclerotinia stem rot;Gram: wilt, grey mould and Ascochyta blight; Lentil: rust and wilt;Cotton: anthracnose, vascular wilt, and black arm;Pea: downy mildew, powdery mildew and rustHorticultural Crops: Mango: anthracnose, malformation, bacterial blight and powdery mildew;Citrus: canker and gummosis;Grape vine: downy mildew, Powdery mildew and anthracnose;Apple: scab, powdery mildew, fire blight and crown gall;Peach: leaf curl

Unit III

Symptoms, etiology, disease cycle and management of following diseases:

Strawberry: leaf spot Potato: early and late blight, black scurf, leaf roll, and mosaic;

Unit IV

Symptoms, etiology, disease cycle and management of following diseases:

Cucurbits: downy mildew, powdery mildew, wilt;Onion and garlic: purple blotch, and Stemphyliumblight;Chillies: anthracnose and fruit rot, wilt and leaf curl;Turmeric: leaf spot Coriander: stem gallMarigold: Botrytis blight; Rose: dieback, powdery mildew and black leaf spot.

Practical

Identification and histopathological studies of selected diseases of field and horticultural crops covered in theory. Field visit for the diagnosis of field problems.Collection and preservation of plant diseased specimens for herbarium.

Note: Students should submit 50 pressed and well-mounted specimens.

AU.Hort.365 Post-harvest Management and Value Addition of Fruits and Vegetables

Credit hours: 2(1+1) Sem. VI

Theory

UNIT I

Importance of fruits and vegetables, extent and possible causes of post-harvest losses; Pre-harvest factors affecting postharvest quality, maturity, ripening and changes occurring during ripening; Respiration and factors affecting respiration rate.

UNIT II

Harvesting and field handling; Storage (ZECC, cold storage, CA, MA, and hypobaric).

UNIT III

Value addition concept; Principles and methods of preservation; Intermediate moisture food-Jam, jelly, marmalade, preserve, candy – Concepts and Standards.

UNIT IV

Fermented and non-fermented beverages. Tomato products- Concepts and Standards; Drying/ Dehydration of fruits and vegetables – Concept and methods, osmotic drying. Canning -– Concepts and Standards, packaging of products.

Practical

Applications of different types of packaging containers for shelf life extension. Effect of temperature on shelf life and quality of produce. Demonstration of chilling and freezing injury in vegetables and fruits. Extraction and preservation of pulps and juices. Preparation of jam, jelly, RTS, nectar, squash, osmotically dried products, fruit bar and candy and tomato products, canned

products. Quality evaluation of products -- physico-chemical and sensory. Visit to processing unit/ industry.

AU.Ento.363 Management of Beneficial Insects

Credit hours: 2(1+1) Sem. VI

Theory

Unit I

Importance of beneficial Insects, Beekeeping, pollinating plant and their cycle, bee biology, commercial methods of rearing, equipment used, seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Insect pests and diseases of honey bee. Role of pollinators in cross pollinated plants.

Unit II

Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Rearing, mounting and harvesting of cocoons. Pest and diseases of silkworm, management, rearing appliances of mulberry silkworm and methods of disinfection.

Unit III

Species of lac insect, morphology, biology, host plant, lac production – seed lac, button lac, shellac, lac- products. Identification of major parasitoids and predators commonly being used in biological control.

Unit IV

Insect orders bearing predators and parasitoids used in pest control and their mass multiplication techniques. Important species of pollinator, weed killers and scavengers with their importance.

Practical

Honey bee species, castes of bees. Beekeeping appliances and seasonal management, bee enemies and disease. Bee pasturage, bee foraging and communication. Types of silkworm, voltinism and biology of silkworm. Mulberry cultivation, mulberry varieties and methods of harvesting and preservation of leaves. Species of lac insect, host plant identification. Identification of other important pollinators, weed killers and scavengers. Visit to research and training institutions devoted to beekeeping, sericulture, lac culture and natural enemies.

AU.PBG.366 Crop Improvement – II (*Rabi crops*)

Credit hours: 2(1+1) Sem. VI

Theory

Unit I

Centers of origin, distribution of species, wild relatives in different cereals; pulses; oilseeds; fodder crops and cash crops; vegetable and horticultural crops.

Unit II

Plant genetic resources, its utilization and conservation; study of genetics of qualitative and quantitative characters.

Unit III

Major breeding objectives and procedures including conventional and modern innovative approaches for development of hybrids and varieties for yield, adaptability, stability, abiotic and biotic stress tolerance and quality (physical, chemical, nutritional).

Unit IV

Hybrid seed production technology *rabi* crops. Ideotype concept and climate resilient crop varieties for future.

Practical

Floral biology, emasculation and hybridization techniques in different crop species namely Wheat, Oat, Barley, Chickpea, Lentil, Field pea, Rajma, Horse gram, Rapeseed Mustard, Sunflower, Safflower, Potato, Berseem. Sugarcane, Tomato, Chilli, Onion; Handling of germplasm and segregating populations by different methods like pedigree, bulk and single seed decent methods; Study of field techniques for seed production and hybrid seeds production in Rabicrops; Estimation of heterosis, inbreeding depression and heritability; Layout of field experiments; Study of quality characters, study of donor parents for different characters; Visit to seed production plots; Visit to AICRP plots of different field crops.

AU.Agron.3611 Practical Crop Production-II *(Rabi Crops)*

Credit hours: 2(0+2) Sem. VI

Practical

Crop planning, raising field crops in multiple cropping systems: Field preparation, seed, treatment, nursery raising, sowing, nutrient, water and weed management and management of insect-pests diseases of crops, harvesting, threshing, drying winnowing, storage and marketing of produce. The emphasis will be given to seed production, mechanization, resource conservation and integrated nutrient, insect-pest and disease management technologies. Preparation of balance sheet including cost of cultivation, net returns per student as well as per team of a group of students.

AU.Agron.3612 Principles of Organic Farming

Credit hours: 2(1+1) Sem. VI

Theory

UNIT I

Organic farming, principles and its scope in India; Initiatives taken by Government (central/ state), NGOs and other organizations for promotion of organic agriculture.

UNIT II

Organic ecosystem and their concepts; Organic nutrient resources and its fortification; Restrictions to nutrient use in organic farming.

UNIT III

Choice of crops and varieties in organic farming; Fundamentals of insect, pest, disease and weed management under organic mode of production; Operational structure of NPOP.

UNIT IV

Certification process and standards of organic farming; Processing, leveling, economic considerations and viability, marketing and export potential of organic products.

Practical

Visit of organic farms to study the various components and their utilization; Preparation of enrich compost, vermicompost, bio-fertilizers/bio-inoculants and their quality analysis; Indigenous technology knowledge (ITK) for nutrient, insect, pest disease and weed management; Cost of organic production system; Post-harvest management; Quality aspect, grading, packaging and handling.

AU. Ag. Econ. 365 Farm Management, Production and Resource Economics

Credit hours: 2(1+1) Sem. VI

Theory

Unit I

Meaning and concept of farm management, objectives and relationship with other sciences. Meaning and definition of farms, its types and characteristics, factor determining types and size of farms.Principles of farm management: concept of production function and its type, use of production function in decision-making on a farm.

Unit II

Factor-product, factor-factor and product-product relationship, law of equi-marginal/or principles of opportunity cost and law of comparative advantage. Meaning and concept of cost, types of costs and their interrelationship, importance of cost in managing farm business and estimation of gross farm income, net farm income, family labor income and farm business income.

Unit III

Farm business analysis: meaning and concept of farm income and profitability, technical and economic efficiency measures in crop and livestock enterprises. Importance of farm records and accounts in managing a farm, various types of farm records needed to maintain on farm, farm inventory, balance sheet, profit and loss accounts. Meaning and importance of farm planning and budgeting, partial and complete budgeting, steps in farm planning and budgeting-linear programming, appraisal of farm resources, selection of crops and livestock's enterprises.

Unit IV

Concept of risk and uncertainty occurs in agriculture production, nature and sources of risks and its management strategies**,** Crop/livestock/machinery insurance – weather based crop insurance, features, determinants of compensation. Concepts of resource economics, differences between NRE and agricultural economics, unique properties of natural resources. Positive and negative

externalities in agriculture, Inefficiency and welfare loss, solutions, Important issues in economics and management of common property resources of land, water, pasture and forest resources etc.

Practicals

Preparation of farm layout. Determination of cost of fencing of a farm. 2 Computation of depreciation cost of farm assets. Application of equi-marginal returns/opportunity cost principle in allocation of farm resources. 3 Determination of most profitable level of inputs use in a farm production process. Determination of least cost combination of inputs. Selection of most profitable enterprise combination. 4 Application of cost principles including CACP concepts in the estimation of cost of crop and livestock enterprises. Preparation of farm plan and budget, farm records and accounts and profit & loss accounts. Collection and analysis of data on various resources in India.

AU.FSN. 362 Principles of Food Science and Nutrition

Credit hours: 2(2+0) Sem. VI

Theory

UNIT I

Concepts of Food Science (definitions, measurements, density, phase change, pH, osmosis, surface tension, colloidal systems etc.)

UNITE II

Food composition and chemistry (water, carbohydrates, proteins, fats, vitamins, minerals, flavours, colours, miscellaneous bioactives, important reactions).

UNIT III

Food microbiology (bacteria, yeast, moulds, spoilage of fresh & processed foods, Production of fermented foods); Principles and methods of food processing and preservation (use of heat, low temperature, chemicals, radiation, drying etc.).

UNIT IV

Food and nutrition, Malnutrition (over and under nutrition), nutritional disorders; Energy metabolism (carbohydrate, fat, proteins); Balanced/ modified diets, Menu planning, New trends in food science and nutrition.

ELECTIVE COURSES

AU. FSN 241 Food Safety and Standards

Credit hours: 3(2+1) Sem. IV

Theory

UNIT I

Food Safety – Definition, Importance, Scope and Factors affecting Food Safety. Hazards and Risks, Types of hazards - Biological, Chemical, Physical hazards. Management of hazards - Need. Control of parameters. Temperature control. Food storage. Product design.

UNIT II

Hygiene and Sanitation in Food Service Establishments- Introduction. Sources of contamination and their control. Waste Disposal. Pest and Rodent Control. Personnel Hygiene. Food Safety Measures.

UNIT III

Food Safety Management Tools- Basic concepts. PRPs, GHPs, GMPs, SSOPs etc. HACCP. ISO series. TQM - concept and need for quality, components of TQM, Kaizen. Risk Analysis. Accreditation and Auditing, Water Analysis, Surface Sanitation and Personal Hygiene. Food laws and Standards- Indian Food Regulatory Regime, FSSA. Global Scenario CAC. Other laws and standards related to food.

UNIT IV

Recent concerns- New and Emerging Pathogens. Packaging, Product labeling and Nutritional labeling. Genetically modified foods\ transgenics. Organic foods. Newer approaches to food safety. Recent Outbreaks. Indian and International Standards for food products.

Practical

Water quality analysis physico-chemical and microbiological. Preparation of different types of media. Microbiological Examination of different food samples. Assessment of surface sanitation by swab/rinse method. Assessment of personal hygiene. Biochemical tests for identification of bacteria. Scheme for the detection of food borne pathogens. Preparation of plans for Implementation of FSMS - HACCP, ISO: 22000

AU. Hort. 245 Landscaping

Credit hours: 3(2+1) Sem. IV

Theory

UNIT I

Importance and scope of landscaping. Principles of landscaping, garden styles and types, terrace gardening, vertical gardening, garden components, adornments, lawn making, rockery, water garden, walk-paths, bridges, other constructed features etc. gardens for special purposes.

UNIT II

Trees: selection, propagation, planting schemes, canopy management, shrubs and herbaceous perennials: selection, propagation, planting schemes, architecture.

UNIT III

Climber and creepers: importance, selection, propagation, planting, Annuals: selection, propagation, planting scheme, Other garden plants: palms, ferns, grasses and cacti succulents. Pot plants: selection, arrangement, management.

UNIT IV

Bio-aesthetic planning: definition, need, planning; landscaping of urban and rural areas, Peri-urban landscaping, Landscaping of schools, public places like bus station, railway station, townships, river banks, hospitals, play grounds, airports, industries, institutions. Bonsai: principles and management, lawn: establishment and maintenance. CAD application.

Practical

Identification of trees, shrubs, annuals, pot plants; Propagation of trees, shrubs and annuals, care and maintenance of plants, potting and repotting, identification of tools and implements used in landscape design, training and pruning of plants for special effects, lawn establishment and maintenance, layout of formal gardens, informal gardens, special type of gardens (sunken garden, terrace garden, rock garden) and designing of conservatory and lathe house. Use of computer software, visit to important gardens/ parks/ institutes.

AU. Ag. Ext. 245 Agricultural Journalism

Credit hours: 3(2+1) Sem. IV

Theory

UNIT I

Agricultural Journalism: The nature and scope of agricultural journalism characteristics and training of the agricultural journalist, how agricultural journalism is similar to and different from other types of journalism.

UNIT II

Newspapers and magazines as communication media: Characteristics; kinds and functions of newspapers and magazines, characteristics of newspaper and magazine readers. Form and

content of newspapers and magazines: Style and language of newspapers and magazines, parts of newspapers and magazines.

UNIT III

The agricultural story: Types of agricultural stories, subject matter of the agricultural story, structure of the agricultural story. Gathering agricultural information: Sources of agricultural information, interviews, coverage of events, abstracting from research and scientific materials, wire services, other agricultural news sources.

UNIT IV

Writing the story: Organizing the material, treatment of the story, writing the news lead and the body, readability measures. Illustrating agricultural stories: Use of photographs, use of artwork (graphs, charts, maps, etc.), writing the captions. Editorial mechanics: Copy reading, headline and title writing, proofreading, lay outing.

Practical

Practice in interviewing. Covering agricultural events. Abstracting stories from research and scientific materials and from wire services. Writing different types of agricultural stories. Selecting pictures and artwork for the agricultural story. Practice in editing, copy reading, headline and title writing, proofreading, layouting. Testing copy with a readability formula. Visit to a publishing office.

AU. Agron./ Soils 247 Agrochemicals

Credit hours: 3(2+1) Sem. IV

Theory

UNIT I

An introduction to agrochemicals, their type and role in agriculture, effect on environment, soil, human and animal health, merits and demerits of their uses in agriculture, management of agrochemicals for sustainable agriculture. Herbicides-Major classes, properties and important herbicides. Fate of herbicides.

UNIT II

Fungicides - Classification – Inorganic fungicides - characteristics, preparation and use of sulfur and copper, Mode of action-Bordeaux mixture and copper oxychloride. Organic fungicides-Mode of action- Dithiocarbamates-characteristics, preparation and use of Zineb and maneb. Systemic fungicides- Benomyl, carboxin, oxycarboxin, Metalaxyl, Carbendazim, characteristics and use.

UNIT III

Introduction and classification of insecticides: inorganic and organic insecticides Organochlorine, Organophosphates, Carbamates, Synthetic pyrethroids, Neonicotinoids, Biorationals, Insecticide Act and rules, Insecticides banned, withdrawn and restricted use, Fate of

insecticides in soil & plant. IGRs Biopesticides, Reduced risk insecticides, Botanicals, plant and animal systemic insecticides their characteristics and uses.

UNIT IV

Fertilizers and their importance. Nitrogenous fertilizers: Feedstocks and Manufacturing of ammonium sulphate, ammonium nitrate, ammonium chloride, urea. Slow release N-fertilizers. Phosphatic fertilizers: feedstock and manufacturing of single superphosphate. Preparation of bone meal and basic slag. Potassic fertilizers: Natural sources of potash, manufacturing of potassiumchloride, potassium sulphate and potassium nitrate. Mixed and complex fertilizers: Sources and compatibility–preparation of major, secondary and micronutrient mixtures. Complex fertilizers: Manufacturing of ammonium phosphates, nitrophosphates and NPK complexes. Fertilizer control order. Fertilizer logistics and marketing. Plant bio-pesticides for ecological agriculture, Bio-insect repellent.

Practical

Sampling of fertilizers and pesticides. Pesticides application technology to study about various pesticides appliances. Quick tests for identification of common fertilizers. Identification of anion and cation in fertilizer. Calculation of doses of insecticides to be used. To study and identify various formulations of insecticide available kin market. Estimation of nitrogen in Urea. Estimation of 120 Report of the ICAR Fifth Deans' Committee water soluble P_2O_5 and citrate soluble P_2O_5 in single super phosphate. Estimation of potassium in Muraite of Potash/ Sulphate of Potash by flame photometer. Determination of copper content in copper oxychloride. Determination of sulphur content in sulphur fungicide. Determination of thiram. Determination of ziram content.

AU.Ag. Econ. 354 Agri-business Management

Credit hours: 3(2+1) Sem. IV

Theory

Unit I

Transformation of agriculture into agribusiness, various stakeholders and components of agribusiness systems. Importance of agribusiness in the Indian economy and New Agricultural Policy. Distinctive features of Agribusiness Management: Importance and needs of agro-based industries, Classification of industries and types of agro based industries. Institutional arrangement, procedures to set up agro based industries. Constraints in establishing agro-based industries.

Unit II

Agri-value chain: Understanding primary and support activities and their linkages. Business environment: PEST & SWOT analysis. Management functions: Roles & activities, Organization culture. Planning, meaning, definition, types of plans. Purpose or mission, goals or objectives, Strategies, polices procedures, rules, programs and budget.

Unit III

Components of a business plan, Steps in planning and implementation. Organization staffing, directing and motivation. Ordering, leading, supervision, communications, control. Capital Management and Financial management of Agribusiness. Financial statements and their importance.

Unit IV

Marketing Management: Segmentation, targeting & positioning. Marketing mix and marketing strategies. Consumer behaviour analysis, Product Life Cycle (PLC). Sales & Distribution Management. Pricing policy, various pricing methods. Project Management definition, project cycle, identification, formulation, appraisal, implementation, monitoring and evaluation. Project Appraisal and evaluation techniques.

Practical

Study of agri-input markets: Seed, fertilizers, pesticides. Study of output markets: grains, fruits, vegetables, flowers. Study of product markets, retails trade commodity trading, and value added products. Study of financing institutions- Cooperative, Commercial banks, RRBs, Agribusiness Finance Limited, NABARD. Preparations of projects and Feasibility reports for agribusiness entrepreneur. Appraisal/evaluation techniques of identifying viable project- Non-discounting techniques. Case study of agro-based industries. Trend and growth rate of prices of agricultural commodities. Net present worth technique for selection of viable project. Internal rate of return.

AU. Ag. Engg. 354 Protected Cultivation

Credit hours: 3(2+1) Sem. V

Theory

UNIT I

Protected cultivation- importance and scope, Status of protected cultivation in India and World types of protected structure based on site and climate. Cladding material involved in greenhouse/ poly house.

UNIT II

Greenhouse design, environment control, artificial lights, Automation. Soil preparation and management, Substrate management. Types of benches and containers. Irrigation and fertigation management. Propagation and production of quality planting material of horticultural crops.

UNIT III

Greenhouse cultivation of important horticultural crops – rose, carnation, chrysanthemum, gerbera, orchid, anthurium, lilium, tulip, tomato, bell pepper, cucumber, strawberry, pot plants, etc.

UNIT IV

Cultivation of economically important medicinal and aromatic plants. Off-season production of flowers and vegetables. Insect pest and disease management.

Practical

Raising of seedlings and saplings under protected conditions, use of protrays in quality planting material production, Bed preparation and planting of crop for production, Inter cultural operations, Soil EC and pH measurement, Regulation of irrigation and fertilizers through drip, fogging ad misting.

AU. PBG 355 Commercial Plant Breeding

Credit hours: 3(1+2) Sem. V

Theory

UNIT I

Types of crops and modes of plant reproduction. Line development and maintenance breeding in self and cross pollinated crops (A/B/R and two line system) for development of hybrids and seed production.

UNIT II

Genetic purity test of commercial hybrids. Advances in hybrid seed production of maize, rice, sorghum, pearl millet, castor, sunflower, cotton pigeon pea, Brassica etc. Quality seed production of vegetable crops under open and protected environment.

UNIT III

Alternative strategies for the development of the line and cultivars: haploid inducer, tissue culture techniques and biotechnological tools.

UNIT IV

IPR issues in commercial plant breeding: DUS testing and registration of varieties under PPV & FR Act. Variety testing, release and notification systems in India. Principles and techniques of seed production, types of seeds, quality testing in self and cross pollinated crops.

Practical

Floral biology in self and cross pollinated species, selfing and crossing techniques. Techniques of seed production in self and cross pollinated crops using A/B/R and two line system. Learning techniques in hybrid seed production using male-sterility in field crops. Understanding the difficulties in hybrid seed production, Tools and techniques for optimizing hybrid seed production. Concept of rouging in seed production plot. Concept of line its multiplication and purification in hybrid seed production. Role of pollinators in hybrid seed production. Hybrid seed production techniques in sorghum, pearl millet, maize, rice, rapeseed-mustard, sunflower, castor, pigeon pea, cotton and vegetable crops. Sampling and analytical procedures for purity testing and detection of spurious seed. Seed drying and storage structure in quality seed management. Screening techniques during seed processing viz., grading and packaging. Visit to public private seed production and processing plants.

AU. Agron. 3510 Weed Management

Credit hours: 3(2+1) Sem. V

Theory

UNIT I

Introduction to weeds, characteristics of weeds their harmful and beneficial effects on ecosystem. Classification, reproduction and dissemination of weeds.

UNIT II

Herbicide classification, concept of adjuvant, surfactant, herbicide formulation and their use. Introduction to mode of action of herbicides and selectivity.

UNIT III

Allelopathy and its application for weed management. Bio-herbicides and their application in agriculture. Concept of herbicide mixture and utility in agriculture.

UNIT IV

Herbicide compatibility with agro-chemicals and their application. Integration of herbicides with non chemical methods of weed management. Herbicide Resistance and its management.

Practical

Techniques of weed preservation. Weed identification and their losses study. Biology of important weeds. Study of herbicide formulations and mixture of herbicide. Herbicide and agrochemicals study. Shift of weed flora study in long term experiments. Study of methods of herbicide application, spraying equipments. Calculations of herbicide doses and weed control efficiency and weed index.

AU. Pl.Path. 365 Biopesticides & Biofertilizers

Credit hours: 3(2+1) Sem. VI

Theory

UNIT I

History and concept of biopesticides. Importance, scope and potential of biopesticide. Definitions, concepts and classification of biopesticides viz. pathogen, botanical pesticides, and biorationales. Botanicals and their uses. Mass production technology of bio-pesticides.

UNIT II

Virulence, pathogenicity and symptoms of entomopathogenic pathogens and nematodes. Methods of application of biopesticides. Methods of quality control and Techniques of biopesticides. Impediments and limitation in production and use of biopesticide.

UNIT III

Biofertilizers - Introduction, status and scope. Structure and characteristic features of bacterial biofertilizers- Azospirillum, Azotobacter, Bacillus, Pseudomonas, Rhizobiumand Frankia;Cynobacterial biofertilizers- Anabaena, Nostoc, Hapalosiphon and fungal biofertilizers- AM mycorrhiza and ectomycorhiza. Nitrogen fixation -Free living and symbiotic nitrogen fixation. Mechanism of phosphate solubilization and phosphate mobilization, K solubilization.

UNIT IV

Production technology: Strain selection, sterilization, growth and fermentation, mass production of carrier based and liquid biofertiizers. FCO specifications and quality control of biofertilizers. Application technology for seeds, seedlings, tubers, sets etc. Biofertilizers -Storage, shelf life, quality control and marketing. Factors influencing the efficacy of biofertilizers.

Practical

Isolation and purification of important biopesticides: Trichoderma Pseudomonas, Bacillus, Metarhyziumetc. and its production. Identification of important botanicals. Visit to biopesticide laboratory in nearby area. Field visit to explore naturally infected cadavers. Identification of entomopathogenic entities in field condition. Quality control of biopesticides. Isolation and purification of Azospirillum , Azotobacter, Rhizobium, P-solubilizers and cyanobacteria. Mass multiplication and inoculums production of biofertilizers. Isolation of AM fungi -Wet sieving method and sucrose gradient method. Mass production of AM inoculants.

AU. Hort. 366 Micro propagation Technologies

Credit hours: 3(1+2) Sem. VI

Theory

UNIT I

Introduction, History, Advantages and limitations.

UNIT II

Types of cultures (seed, embryo, organ, callus, cell), Stages of micropropagation, Axillary bud proliferation (Shoot tip and meristem culture, bud culture),

UNIT III

Organogenesis (callus and direct organ formation), Somatic embryogenesis, cell suspension cultures, Production of secondary metabolites

UNIT IV

Somaclonal variation, Cryopreservation.

Practical

Identification and use of equipments in tissue culture Laboratory, Nutrition media composition, sterilization techniques for media, containers and small instruments, sterilization techniques for explants, Preparation of stocks and working solution, Preparation of working medium, Culturing of explants: Seeds, shoot tip and single node, Callus induction, Induction of somatic embryos regeneration of whole plants from different explants, Hardening procedures.

AU. Hort. 367 Hi-tech. Horticulture

Credit hours: 3(2+1) Sem. VI

Theory

UNIT I

Introduction & importance; Nursery management and mechanization; micro propagation of horticultural crops; Modern field preparation and planting methods

UNIT II

Protected cultivation: advantages, controlled conditions, method and techniques, Micro irrigation systems and its components; EC, pH based fertilizer scheduling, canopy management, high density orcharding

UNIT II

Components of precision farming: Remote sensing, Geographical Information System (GIS), Differential Geo-positioning System (DGPS), Variable Rate applicator (VRA),

UNIT II

Application of precision farming in horticultural crops (fruits, vegetables and ornamental crops); mechanized harvesting of produce.

Practical

Types of polyhouses and shade net houses, Intercultural operations, tools and equipments identification and application, Micro propagation, Nursery-protrays, micro-irrigation, EC, pH based fertilizer scheduling, canopy management, visit to hi-tech orchard/nursery.

AU. Agron. 3614 System Simulation and Agroadvisory

Credit hours: 3(2+1) Sem. VI

Theory

UNIT I

System Approach for representing soil-plant-atmospheric continuum, system boundaries, Crop models, concepts & techniques, types of crop models, data requirements, relational diagrams.

UNIT II

Evaluation of crop responses to weather elements; Elementary crop growth models; calibration, validation, verification and sensitivity analysis. Potential and achievable crop production-concept and modelling techniques for their estimation.

UNIT III

Crop production in moisture and nutrients limited conditions; components of soil water and nutrients balance. Weather forecasting, types, methods, tools & techniques, forecast verification; Value added weather forecast, ITK for weather forecast and its validity.

UNIT IV

Crop-Weather Calendars; Preparation of agro-advisory bulletin based on weather forecast. Use of crop simulation model for preparation of Agro-advisory and its effective dissemination.

Practical

Preparation of crop weather calendars. Preparation of agro-advisories based on weather forecast using various approaches and synoptic charts. Working with statistical and simulation models for crop growth. Potential & achievable production; yield forecasting, insect & disease forecasting models. Simulation with limitations of water and nutrient management options. Sensitivity analysis of varying weather and crop management practices. Use of statistical approaches in data analysis and preparation of historical, past and present meteorological data for medium range weather forecast. Feedback from farmers about the agroadvisory.

SEMESTER - II

Course No.	Subject	Teaching Scheme				Evaluation Scheme		
		L	T	P/D	Credits	Internal Assessment	External Theory	Total
AUBT-108	Business Communication	2	0	0	2	40	60	100
AUBT-109	Engineering Mathematics-II	3	1	0	4	40	60	100
AUBT-110	Engineering Chemistry	3	1	0	4	40	60	100
AUBT-111	Principles of Electrical Engineering	2	2	0	3	40	60	100
AUBT-112	Fundamental of Electronics Engineering	2	2	0	3	40	60	100
AUBT-113	Workshop Technology	2	0	3	3	40	60	100
AUBT-114	Disaster Management	2	0	0	2	40	60	100

Course No. (Lab No.)	Subject (Lab Name)	Teaching Scheme				Evaluation Scheme		
		L	T	P/D	Credits	Internal Assessment	External Practical	Total
AUBT-110 (L)	Engineering Chemistry Lab	0	0	2	1	30	20	50
AUBT-111 (L)	Electrical Engineering Lab	0	0	2	1	30	20	50
AUBT-112 (L)	Electronics Engineering Lab	0	0	2	1	30	20	50

Abhilashi University

Faculty of Humanities, Education and Basic Sciences

Scheme for M.A. Education

1st Year (Annual Examination)

Sr.No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Theory Marks	Internal Assess.	Total Marks
1	AUMAEDU101	Philosophical Foundation of Education	5	-	-	5	80	20	100
2	AUMAEDU102	Sociological Foundation of Education	5	-	-	5	80	20	100
3	AUMAEDU103	Psychological Foundation of Education	5	-	-	5	80	20	100
4	AUMAEDU104	Contemporary Issues in Indian Education	5	-	-	5	80	20	100
5	AUMAEDU105	Educational Technology	5	-	-	5	80	20	100
		Total	25	-		25	400	100	**500**

2nd Year (Annual Examination)

Sr.No.	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Theory Marks	Internal Assess.	Total Marks
1	AUMAEDU201	Curriculum Development and Comparative Education	5	-	-	5	80	20	100
2	AUMAEDU202	Special Education	5	-	-	5	80	20	100
3	AUMAEDU203	Methods of Data Analysis of Education	5	-	-	5	80	20	100
4	AUMAEDU204	Research Methods in Education	5	-	-	5	80	20	100
5	AUMAEDU205	Practicum Viva	Grades (A to E)						
		Total	20	-		20	320	80	**400**

Legend: ***L-lecture, T-Tutorial, P-Practical***

INSTRUCTIONS:

For Paper Setters: The questions are to be fairly distributed within the Syllabus for Maximum Marks of 80. The question paper shall comprise five sections A, B, C, D and E. Section A shall contain eight short compulsory questions selected from the entire syllabus carrying 2 marks each. Section B, C, D and E shall contain two questions carrying 16 marks each. These questions shall be selected from the respective units of the syllabus.

For Candidates:

Section A includes eight Short answer type questions and is compulsory. Attempt one question each from Section B, C, D and E.

FIRST YEAR

PHILOSOPHICAL FOUNDATION OF EDUCATION

(AUMAEDU101)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

Unit-1

* Relationship between Education and philosophy.
* Indian Schools of Philosophy:- Samkhya, Vedanta, Nyaya, Buddhism and Jainsim with special reference to their educational implications.

Units-2

* Western Philosophies: Major Schools:- Naturalism Idealism Pragmatism Logical Positivisin Existentialism Marxism Their Educational implications with special reference to epistemology, axiology and the process of education.

Unit - 3

* Contributions of following Indians Philosophers to Education Thought: Vivekananda, Tagore, Gandhi, Aurobindo, and J. Krishananmurthy

Unit-4

Education, National Values and the constitution of India Nature of knowledge and the knowledge getting process Social Philosophy of Education Freedom, equality, Democracy and Responsibility.

Reference Readings:

1. Baskin, Wade: Class in Education, Vision press London, 1966.
2. Brubacher, John's: Modern Philosophies of Education, Tata McGraw, Hill, New Delhi, 1969.
3. Broudy, H.S: Building a Philosophy of Education, Krieger, New York, 1977
4. Butler, J.D.: "Idealism in Education" Harper and Row, New York, 1966
5. Dewey, John: "Democracy and Education", Macmillan, New York, 1966
6. Dupuis, A.M.: "Philosophy of Education in Historical perspective", Thomson Press, New Delhi, 1972.
7. Kneller, George F: "Foundations of Education" John Wiley and Sons, 1978.
8. Morris, Van C.: "Existentialism in Education what It means", Harper & Row, New York, 1966.
9. Pand y, RS.: "An Introduction to Major Philosophies of Education", Vinod Pustak Mandir, Agra. 1982.
10. Narvana, V.S.: "Modern Indian Thought", Orient Longmans Ltd., New York, 1978, 11. Mukerjee, RK.: "Ancient Indian Education". Motilal Banarsidas, Varanasi, 1969.

Sociological Foundation of Education
(AUMAEDU102)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

Unit-1

* Concept of Educational sociology of Education Social organization and its concepts Factors influencing social organization-folk ways, more: institution; vales. Dynamic characteristics of Social organization and its educational implication.
* Social interactions and their education implication Social Group inter- group relationship group dynamic.

Social stratification-concepts of social stratification and its education implication.

* Culture: Meaning and Nature of Culture.

Role of Education in cultural context. Cultural determinants of education. Education and cultural change.

Units-2

* Social change: its meaning and concept with special reference of India. Concept of urbanization modernization, westernization and sankritisation with special reference to Indian society ands its education implications.
* Social principles in education social and economic relevance to education.
* Socio-economic factors and their impact on education. Unit - 3
* Education in relation to democracy, freedom nationalism, national integration, international understanding.
* Education and Society Education: As a process in social system. As a process in socialization, and As a process of social progress

Unit-4

* Education opportunity and inequality:

Inequality of education opportunities and their impact on social growth and Development

* Social theories:

Functionalist-Emile Durkheim, Talcott Parsons, and R.K. Metron. Marxism Integral Humanism (based on ' swadeshi') with special reference to social change.

Selected Readings:

1. Pandey, K.P.: "Perspectives in Social Foundations of Education", Amitash Prakashan, Ghaziabad, 1983.
2. Havighurst, Robert et AI: "Society and Education", Allyns and Boston, 1995.
3. Gore, M.S.: "Education and Modernization in India", Rawat Publishers, Jaipur, 1984
4. Kamat, A.R: "Education and Social Change in India", Samaiya Publishing Co., Bombay 1985.
5. Maunheim, K. Et. AI: "An Introduction to Sociology of Education", Routledge and Kegan Paul, London, 1962.
6. M.H.R.D.: "Towards an Englightened and Human Society", Department of Education, New Delhi 1990.
7. Inkeles, Alix: What is Sociology? Prentice Hall of India, New Delhi, 1987.
8. Maslow, A.H. (Ed): "New Knowledge in Human Values", Harpe and Row New York, 1959.
9. Mossish. Loor: "Sociology of Education: An Introduction" George Allen and Unwin, London 1972.

Psychological Foundation of Education
(AUMAEDU103)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

Unit-1

* Meaning of education and psychology: Relationship of education and psychology Scope of educational psychology
* Methods of Educational psychology: Experimental Clinical Differential
* Growth and Development: Physical development during childhood and adolescence. Social development during childhood and adolescence Emotional development during childhood and adolescence. Mental development during childhood and adolescence.

Units-2

* Individual Differences Concept and areas Determinates: Roles of heredity and environment in developing individual differences Implications of individual difference for organizing educational programme
* Gifted Mentally Retarded Children Meaning and Characteristics Needs and problems
* Creativity: Concept Characteristics Development of Creativity Importance of Creativity in Education

Unit - 3

* Intelligence: Definition and nature of intelligence;Theories: Two factors theory (spearman) Mutlifactor theory Group factor theory, Guildford model of intellectHierarchical of intelligence (Two verbal and two non-verbal tests).
* Personality: Meaning and Determinants, Type and train Theories Assessment of personality by subjective and projective methods.

Unit-4

* Learning: Meaning Theories and their educational implications Pavlov's classical conditions Skinner's operant conditioning Learning by insight
* Hull's reinforcement theory Lawin's field theory Gagne's hierarchy of learning theory Factors influencing learning
* Motivation: Concept of motivation Theories of motivation Physiological Theory Murray's Need Theory Psycho-analytical Theory Maslow's theory of hierarchy of needs Factors affecting motivation

Selected Readings:

1. Abramson, Paul, R.: "Personality", New York: Holt Rinehart and Wiston, 1980.
2. Allport G.W.: "Personality", New York: Holt, 1954
3. Allport, G.W.: "Pattern and Growth in Personality", New York: Rinehart and Winston, 1961.
4. Andrews, T.W. (Ed.): "Methods in Psychology", New York John Wiley and Sons, Inc: 1961.
5. Baller, Warren, R. Charles, Don and C.: "The Psychology of Human Growth and Development", New York: Holt, Rinehm 1 and Winston, Inc.1962.
6. Baum, A, Newman, S., West, R. & McManus, C.Cambridge: Handbook of Psychology, Health and Medicine, Cambridge University Press, 1997.
7. Coleman, C.: "Abnomtal Psychology and Modern Life", Bombay D.B. Taraporewala sons & co. 1976.
8. Dicapro, N.S.: "Personality Theories", New York, Harper, 1974.
9. Douglas, O.B., Holl, and B.P.: "Foundations of Education Psychology", New York; The Macmillan Co., 1948
10. Gangne, R.M.: "The Conditions of Learning", New York, Chicago: Holt, Rinehart and Winston. 1977.
11. Gates. AT. ET. AI: "Educational Psychology", New York Macmillan, 1963.
12. Hillgard, E.R.: "Theories of Learning", New York: Appleton Century Crafts.
13. Kundu, c.L.: "Educational Psychology", Delhi, Sterling Publisher, 1984.
14. Kundu, c.L.: "Personality Development", A Critique of Indian Studies, Vishal Publishers, 1976.
15. Kundu, c.L. & Tutoo, D.N.: "Educational Psychology", New Delhi: Sterling Publisher, Private Limited: 1988.

CONTEMPORARY ISSUES IN INDIAN EDUCATION
(AUMAEDU104)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

UNIT-1

Education in India during Vedic Buddhist, and Medieval period Macaulay's minutes and Bentick resolution of 1835 Adam' report and its recommendations Wood's Dispatch of 1854 Lord Cruzen's educational policy, Growth of nation consciousness, National education movement

UNIT-2

Recommendations of Indian Education Commission-1882, its influence on the Subsequent development of education Essential features of Sadler Commission Report-1917 Wardha Scheme of Education-1937

UNIT-3

University Education Commission (1948-49) Secondary Education Commission (1952-53) Indian Education Commission (1964-66) National Policy of Education (1986) Revised National Policy (1992)

UNIT-4

Contemporary issues in Indian Education in a Global perspective highlighting the UNESCO's current concerns in respects of the following: Universalization of Educational and related issues such as retention completion of rates in elementary schools Vocationalization of Education Education of girls in various age groups Education of socially disadvantaged segments such as SC/ST/OBC Issues relating to providing equally of educational opportunities Issues relating to quality in education and excellence Issues pertaining to open learning and distance education system Education for human values and life skills Issues relating to medium of instruction-three language formula Issues in respect of emotional integration and international understanding in the context of Globlisation

Selected Readings:

1. Nurullash S. Naik J.P. and Oad L.K.A. Student History of Education India. MeMillan and Co. Bombay, 1970
2. M.H.R.D.: Report of the University Education Commission (1948), Ministry of Education, Govt. of India, New Delhi, 1949
3. M.H.R.D. Report of the Secondary Education Commission (1952-53), Ministry of Education, Govt. of India, New Delhi, 1953
4. M.H.R.D. Report of the Education Commission Education and National Development (1964-66), Ministry of Education, Govt. of India, New Delhi, 1966
5. M.H.R.D. Challenges of Education-A Policy of Perspective, Ministry ofEducation, Govt. of India, New Delhi, 1985
6. M.H.R.D. National Policy of Education (1986), Ministry of Education, Govt.of India, New Delhi, 1986
7. M.H.R.D. Programme of Action (1992), Ministry of Education, Govt. of India, New Delhi, 1992
8. M.H.R.D. Towards and Enlightened and Humane Society-A Review (NEPRC) , Ministry of Education, Govt. of India, New Delhi, 1990
9. M.H.R.D. Education for All: The Indian Scene, Ministry of Education, Govt.of India, New Delhi, 1993
10. M.H.R.D. Selected Education Studies, Ministry of Education, Govt. of India, New Delhi, 1993
11. World Year Book of Education, Youth, Education and Work, Kogan Page, Londan, 1995

EDUCATIONAL TECHNOLOGY

(AUMAEDU105)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

UNIT-1

Meaning and Scope of educational technology: System approach to education and its characteristics, Component of Educational Technology-Hardware and Software Multimedia approach in Educational Technology

UNIT-2

Modalities of teaching-Teaching as different from indoctrination, instruction conditioning and training Stages of teaching pre-active, interactive and post active Teaching at different levels memory, understanding and reflective levels of organizing teaching and learning Programmed instruction: Origin, Principles and Characteristics Types: Linear, Branching and mathetics Development of programme: Preparation, Writing, Tryout and Evaluation

UNIT-3

Modification of teaching behaviour-Micro teaching, Flanders interaction analysis simulation Communication process: Concept of communication, Principles, Modes and Barriers to communication, Class-room communication (interaction, verbal and non verbal) Models of teaching: Concept, Different families of Teaching Models

UNIT-4

Designing instructional system: Formulation of instructional objective, Task analysis Designing of instructional strategies: Lecture, Team teaching, Discussion Seminars, Tutorials and Brainstorming sessions Development of Evaluation tools: Norm referenced tests and Criterion referenced tests Application of Educational Technology in Distance Education: Concept of Distance Education: Distance and Open learning system. Student Supports Service, Evaluation strategies in Distance Education; Counselling in Distance Education

Suggested Readings:

1. Davies, I.K.: “The management of learning”, London MC Graw Hill, 1971
2. Dececco, J.P.: “The psychology or learning and instruction”, New Delhi, Prentice Hall, 1988
3. Kulkarni, S.S.: “Introduction to Educational Technology”, New Delhi Oxford & IBH Publishing Company, 1986
4. Kumar, K.L.: “Educational Technology”, New Delhi New age International Publishers, 1996
5. Locates, C.N. and Atkinson, F.D. : “Median and Technology for Education and Training” London Charles E: Publishing Co., 1984
6. Mavi, N.S.: “Programmed Learning-An Empirical Approach”, Kurukshetra Publishers, 1984
7. Joyee, B & Wield, M: “Models of Teaching”, New Delhi, Prentice Hall, 1922
8. Merritt, M.D. (ed): “Instructional Design” , New York, 1971
9. Mukhopadhyay, M.Ed. “Educational Technology”, New Delhi Sterling, 1990
10. Pandey, K.P.: “A first Course in Instructional Technology”, Ghaziabad, Amitash Parkashan, 1983
11. Pandey, K.P.: “Dynamics of Teaching Behaviour, Ghaziabad, Amitash Parkashan, 1983
12. Pandey, S.K.: “Teaching Communication”, New Delhi Commonwealth Publishers, 1997
13. Pereival F. and Ellington, H: “A Handbook of Educational a Technology”, New York Kogan page, 1988
14. Skinner, B.F.: “The Technology of Teaching”, New York: Appleton Century Crofts, 1968
15. Vendanayagam E.G.: “Teaching Technology for College Teachers”, New Delhi, Sterling Publishers, 1988

SECOND YEAR

CURRICULUM DEVELOPMENT AND COMPARATIVE EDUCATION

(AUMAEDU201)

Max. Marks: 80 (Ext.) 20 (Int.) Time Allowed: 3 Hrs.

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

UNIT-1

Concept aims and scope of comparative education Factors influencing education system Approaches to comparative Education: Historical, Philosophical, Sociological and Problem Approach

UNIT-2

Elementary Education: Concept of Universalization, it's implication for Indian education, Primary education in U.S.A., U.K. and India (aims, content, methods of instruction and evaluation system). Secondary Education in U.K., U.S.A. and India Vocationalization of secondary education in U.K., U.S.A., Russia and India

UNIT-3

Higher Education in U.S.A., U.K. and India Distance Education: its needs and various concepts with reference to U.K., Australia and India Education Administration in U.K., U.S.A. and India

UNIT-4

Curriculum: Concept, factor affecting curriculum development Philosophical, Psychological, Sociological and Discipline Oriented Consideration Curriculum development different Models: Administrative. Grass Root Demonstration and System Analysis. Curriculum evaluation in terms of learning outcome: Concept, Formative and Summative evaluation. System of according marks, ratings and grades. Interpretation of evaluation result.

Selected Readings:

1. Andrey & Howard Nicholls: Developing Curriculum-A Practical Guide. George Allen and Unwin, London, 1978
2. Bexday, G.Z.L.: Comparative Methods in Education, Oxford and IBH Publishing Co. New Delhi, 1964
3. Cramer, I.F. & Brown, and G.S. Contemporary Education A Comparative Studies of National System, Harcourt Brace & Company, New York, 1965
4. Denis Law ten: School Curriculum Planning Hodder and Stoughton, London, 1986
5. Dent, H.C.: Education System of England, George Allen and Unwin, London, 1981
6. Edward, Akron: The Secondary School Curriculum, Harper and Row Publishers, New York, 1980.
7. Hans, Nicholas: Comparative Education Routledge and Kegan Paul, London, 1961
8. Harold B. Alberty & Ejisie, J. Alberty: Reorganizing the High School Curriculum, Macmillan Company, New York, 1957
9. Harold B.Alberty & Ejisie, J.Alberty: The Curriculum, The Macmillan Company, New York, 1963
10. Hugh Sockelt: Designing the Curriculum, Open Books, London, 1976
11. Ivor. K.Davies: Objectives in Curriculum Design, MC Graw Hill, London, 1976
12. John.D.Mcneil: Curriculum, Little Brown and Company, Boston, 1977
13. Joseph. Leese: The Teacher in Curriculum making, Harper and Brother Publishers, New York, 1961
14. Kendel I.L.: Studies in Comparative Education, George Harrup, New York 1963
15. King, F.J.: Other School and Ours, Holt, Rinehart and Winston, New York, 1959
16. William.M. Alexander: Planning Curriculum for School Holt, Rinehart and Winston, New York, 1966

SPECIAL EDUCATION
(AUMAEDU202)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

UNIT-1

Concept of Exceptionality Positive, Negative and Multiple Deviations Needs and Problems of Exceptional Children Nature of Special Education Objectives Historical Perspective Continuum of Special Education alternatives/programmes Integrated/Inclusive Education

UNIT-2

Education of Orthopaedically Handicapped Concept Types of Handicap Characteristics Educational Programmes for orthopaedically Handicapped Education of Mentally Retarded Concept Classification Etiology Educational Programmes for Trainable Mentally Retarded Educational Programmes for Educable Mentally Retarded

UNIT-3

Educational of Visually Impaired Characteristics Degree of Impairment Etiology and Intervention Educational Programme Education of Hearing Impaired Characteristics Degree of Impairment Etiology Education and Intervention Programme Education of Learning Disabled Characteristics Types Identification Education and Intervention Programmes

UNIT-4

Education of Gifted, Creative & Juvenile Delinquents Characteristics Identification Problem Educational Programmes Guidance and Counselling for Exceptional Children Meaning and Need Role of Teachers and Other Specialties

Selected Readings:

1. Bender, W.N.: Learning Disability, Allyn & Bacon, Bacon, Simon and Schuster, 1995, Boston, London
2. Serdine W.H. & Blank Hurst, AE. (eds): An Introduction to Special Education, Harper Collins Publishers, Boston 1980
3. Dutn, L & Bay, D.M. (Ed.): Exceptional Children in the Schools, New York: Holt, Rinchart, Winston
4. Hallahar, D.P. & Kauffiman, J.M.: Exceptional Children: Introduction to Speical Education Shally & Bacon, Massachusetts, 1991
5. Hewett Frank M. & Fore ness Steven R: Educational of Exceptional Learners, Allyn & Bacon, Mitssachusetts, 1984
6. Jordern, Thomas E: The Exceptional Child, Ohio: MerriIL
7. Kirk S.A." & Gallagher J.J.: Education of Exceptional Children; Houghton Mifflin Co., Boston 1989
8. Magnifico, Lx.: Education of the Exceptional Child, New York, Longman
9. Shankar, Udey: Exceptional Children, Hullender: Sterling Publication
10. Singh, N.N. and Beale, LL (Eds.): Learning Disabilities Nature, Theory and Treatment, spring-Verlag, New York, Inc: 1992
11. Smith, CR: Learning Disabilities-The Interaction of Learner, Task and Setting, Allyn & Bacon Massachusetts, 1991
12. Strange, Ruth: Exceptional Children & Youth, N.J.: Prentice Hall

METHODS OF DATA ANALYSIS IN EDUCATION

(AUMAEDU203)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

UNIT-1

* Nature of educational Data Quantitative and qualititative Scales of measurement Descriptive and inferential statistics. Organization and graphical respresentative data frequency distribution. Frequency polygon histogram, ogive, smoothed, frequency polygon.
* Measures of central tendency: Concept, characteristics computation and uses of mean, median, mode.
* Measures of dispersion: Concept, characteristics computation and uses of Range, Quartile Deviation, Average Deviation, Standard Deviation and Variance.
* Measure of relative position: Percentiles and percentile ranks.

UNITS-2

* Correlations: Meaning, Characteristics, assumptions, computation and uses of: Product moment correlation. Rank difference correlation.
* Partial and Multiple Correlations: Meaning, assumptions computation and uses.
* Regression and prediction: Concept, assumptions and computation of linear Regression equations, standard error of measurement.

UNIT - 3

* Tests of significance: Null hypothesis Standard error, confidence limits Type I and Type II errors One tailed and two tailed tests.
* The t-test: Difference between means Difference between percentages and proportions Difference between correlations.
* The F-Test: One way ANOVA: Meaning assumptions, computation and uses.

UNIT-4

* None Parametric Tests: Meaning assumptions and use of: Chi-square tests of equality and independence, setting up cross bread for contingency table. Sign test.

Selected Readings:

1. Aggarwal, YP. (1988): Statistical Methods", Sterling, New Delhi.
2. Edward, Allen L (1968): "Experimental Designs in Psychological Research", Holt, Rinehart and Winston, New York.
3. Ferguson, George A. (1976): "Statistical Analysis in Psychology and Education", McGraw Hill, New York.
4. Garrett, H.E. (1973): "Static's in Psychology and Education", Vakils Feffer and simon, Bomboy.
5. Guilford, J.P and Benjamin Fruchter (1973): "Fundamental Statistics in Psychology and Education"," McGraw Hill, New York.
6. Kaul, Lokesh (1988): "Methodology of Educational Research", Viaks, New York ,
7. Kurds, A.K. And Mayo, S.T. (1980): Statistical Methods: "In Education and Psychology" Narola, New Delhi.
8. Newman, W.L. (1997): Social Research Methods: "Qualitative and Quantitative Approaches", Allyn and Bacon, Boston.
9. Siegel's (1986): "Non-Parametric Statistic", McGraw Hill, New York, to Van Dalen, Trang Web nay coi cung hay, vao coi thu di http://nhatquanglan.xlphp.net/TrangWeb nay coi cung hay, vao coi thu di http:/nhatquanglan..xlphp.net/ FC:/WINDOWS\hinhem.scrD.B.(1962): "Understanding Educational Research", McGraw Hill, New York.

Research Methods in Education

(AUMAEDU204)

Max. Marks: 80 (Ext.) 20 (Int.)

Note: There will be nine questions in the question paper. Students are required to attempt five questions in all. All questions shall carry equal marks. Question no. I shall be compulsory which will comprise of eight short answers type questions parts and students are expected to answer any five parts. There will be eight other questions comprising of two questions from each of the four units. Students are expected to attempt one question from each unit.

Course Contents:

UNIT-1

* Methods of acquiring scientific knowledge: Tradition, Experience, reasoning - inductive and deductive.
* Nature and scope of Educational research: Meaning, Nature and Limitation Need and Purpose Scientific enquiry and theory development Fundamental, applied and action research. Quantitative and qualitative research.
* Some emerging trends in educational research.
* Formulation of research problem: Criteria and sources for identifying the problem. Delineating and operationlizing variables. Review of related literature: Importance and various sources including internet. Development hypothesis in various types of research.

UNITS-2

* Collection of Data: Types of data: Quantity and qualitative Tools and techniques: Characteristics of a good research tool: Questionnaire Observation Projective and Sociometric techniques.
* Sampling: Concept of population and sample: Steps and characteristics of a good sample: Various methods of sampling: Probability and non-probability. Sampling errors and how to reduce them.

UNIT - 3

* Major Approaches to Research Descriptive Research Ex-post facto Research Laboratory Experiments Field studies Historical Research
* Research Designs

UNIT-4

* Qualitative Research: Ethnographic, Development, documentary analysis.
* Validity and limitations of findings, factors influencing Validity of research findings.
* Research Report: Developing a research proposal (synopsis). Writing research report and evaluation of research report.

Selected Readings:

1. Aggarwal, YP. (1988): "The Science Educational Research": A Sourcebook, Nirmal and Kurukshetra.
2. Bets, John W. and Kahn James V (1995): "Research in Education", Prentice Hall, New Delhi.
3. Bums, R.B. (1991): "Introduction to Research in Education", Prentice Hall, New Delhi.
4. Edward, AllenL (1968): "Experimental Designs in Psychological Research", Holt, Rinehar and Wiston, New York.
5. Good; C.V. and Douglas, E. Scates (1954): "Methods in Social Research", McGraw Hill, New York.
6. Koul, Lokesh (1988): "Methodology of Educational Research",Vikas, New Delhi.
7. McMillan, James H. and Schumacher's (1989): "Research in Education": A Conceptual Introduction, Harper and Collins, New York's.
8. Mouly, AJ. (1963): "The Science of Educational Research", Eurasia, New Delhi.
9. Neuman, W.L. (1997): "Social Research Methods Qualitative and Quantitative Approaches", Allyn and Bacon, Boston.
10. Kerliner, F.V. (1973): "Foundation of Behavioural Research", Holt, Rinehan and Winston, New York.
11. Travers, R.M.W. (1978): "An Introduction to Educational Research", Macmillan, New York.
12. Van Dalen, D.B. (1962): "Understanding Educational Research", McGraw Hill, New York.
13. Young, P.V. (1960): "Scientific Social Surveys and Research", Prentice Hall, New York.

Dissertation/Viva-voce

(AUMAEDU205)

M.Sc. Zoology

Duration: **4** Semesters.

Eligibility: B.Sc. or equivalent degree with Zoology as one of the subjects and having 50% marks (45% for SC/ST) in Graduation.

Semester – I

Course Code	Name of Course	Internal Assessment Marks	End Semester Marks	Total marks	Credits
AUZOO 101	Structure and Function of Animals – I	40	60	100	4
AUZoo 102	Biostatistics and Computer Applications	40	60	100	4
AUZoo 103	Biodiversity and Wildlife	40	60	100	4
AUZoo 104	Environmental Biology and Toxicology	40	60	100	4
AUZoo 105	Practical based on Zoo 101 and Zoo 102	40	60	100	4
AUZoo 106	Practical based on Zoo 103 and Zoo 104	40	60	100	4

Semester – II

Course Code	Name of Course	Internal Assessment Marks	End Semester Marks	Total marks	Credits
AUZoo 201	Animal Physiology and Endocrinology	40	60	100	4
AUZoo 202	Biochemistry	40	60	100	4
iochrmistry					
AUZoo 203	Structure and Function of Animals-II	40	60	100	4
AUZoo 204	Medical Zoology	40	60	100	4
AUZoo 205	Practical	40	60	100	4

	based on Zoo 201 and Zoo 202				
AUZoo 206	Practical based on Zoo 203 and Zoo 204	40	60	100	4

Semester – III

Course Code	Name of Course	Internal Assessment Marks	End Semester Marks	Total marks	Credits
AUZoo 301	Biotechnology	40	60	100	4
AUZoo 302	Immunology	40	60	100	4
AUZoo 303	Molecular Biology and Genetics	40	60	100	4
AUZoo 304	Developmental Biology	40	60	100	4
AUZoo 305	Practical based on Zoo 301 and Zoo 302	40	60	100	4
AUZoo 306	Practical based on Zoo 303 and Zoo 304	40	60	100	4

Semester – IV

Course Code	Name of Course	Internal Assessment Marks	End Semester Marks	Total marks	Credits
AUZoo 401	Techniques in Biology	40	60	100	4
AUZoo 402	Specialization Paper : Entomology/Molecular Parasitology/ Animal Behavior/Genomics/Fish Biology	40	60	100	4
Project Work		--	250	250	10
Seminar		--	50	50	2
Total Marks				**2300**	**92**

Note: End Semester Theory Examination

Attempt FIVE questions in all. Question No.1 is compulsory of 20 marks with short - type answers covering the whole syllabus. For others two questions will be set from each unit, one to be attempted. Maximum marks for each theory paper will be 60 and time 3 hours.

SEMESTER – I

AUZoo 101: Structure and Function of Animals – I

Unit-I

Cytoskeleton: Basic characteristics and its role in locomotion. Flagella and cilliary movement in protozoa; Skeleton, its role and types: an overview. Hydrostatic skeleton in Cnidaria and Flatworms Exoskeleton in arthropods and molluscs Evolution of Coelom, Bilateral symmetry and Metamerism and their significance in locomotion

Unit –II

Ingestion of food Mechanism and regulation of digestion Symbiotic nutrition Intracellular transport in Protozoa. Circulation of external medium of transport within the body of sponges and cnidarians Filter feeding in Polychaeta, Mollusca, Echinodermata.

Unit-III

Open and closed circulatory systems. Chambered, tubular and ampullary hearts, neurogenic and myogenic hearts Blood and Evolution of Heart

Unit – IV

Organs of Respiration: Gills, Lungs and Trachea. Respiratory pigments and their functions Mechanism of Respiration and transport of gases

Suggested Reading Materials:

- Barrington, E. J. W. (1967), Invertebrates Structure and Functions. Houghton Mifflin Co. Boston.
- Gardiner, M. S. (1972), The Biology of Invertebrates, McGraw Hill, New York
- Hyman, L. H. The Invertebrates. Vol I– Protozoa through Ctenophora (1940), Vol. II – Platyhelminthes and Rhynchocoela (1951), Vol. III- Acanthocephala, Aschelminthes and Entoprocta (1951), Mc Graw Hill, New York
- Kent, G. C. and Carr, R. K. (2001), Comparative Anatomy of the Vertebrates 9th edition, McGraw Hill Higher Education, New York.
- Prosser, C.L. (1984), Comparative Animal Physiology. Satish Book Enterprise Books seller & Publishers, Agra.
- Smith, H.S. Evolutin of chordate structure, Hold Rinehart and Winston Inc. New York.

AUZoo 102: Biostatistics and Computer Applications

Unit-1

Data analysis and database – Brief description and tabulation of data, Measure of central. Measures of central value Arithmetic mean, mode and median Definition, calculation and its properties Measures of Dispersion Range, Interquartile range, Quartile deviation Mean deviation and standard deviation Correlation: Methods studying correlation. Regression analysis (Regression lines and regression equation).

Unit-II

Concept of sampling and sampling methods Definition and law of sampling, judgment sampling, Random sampling, stratified sampling, systematic sampling, multi-stages sampling and quota sampling. Test of significance for large samples and small samples. Chi-square analysis. Analysis of variance Probability and law of probability, Bioinformatics

UNIT-III

Introduction to computer capability, history and classification of computers Computer architecture, organization, its components, hardware and software concepts, operating systems, peripherals, I/O devices Introduction to programming Languages, Internet

Unit – IV

MS-Windows basics, MS-Word – Meaning of Word–Processing, Creating, Saving, Printing documents, Formatting, Spell-Check, Adding page numbers, Header and Footer, Macros, Creating tables, Converting table to text and vice–versa. MS-Excel – Spreadsheets, Using different types of formulae, Creating graphs and charts, Exporting charts to MS-Word, MS-PowerPoint – Creating presentations, Formatting, Adding effects and timings.

Suggested Reading Materials:

- Sinha, P.K. (1992). Computer Fundamentals.
- Peter Norton's Introduction to Computers, 6th Ed.
- Windows Based Computer Courses, Sumit Kumar, and JBD Publishers.
- Gupta, S.C. (2004). Fundamentals of Statistics. Himalaya Publishing House.

AUZoo 103: Biodiversity and Wildlife

Unit-I

Biological diversity, concept and level, role of biodiversity in ecosystem, function and stability.Biodiversity as a resource and causes of its depletion Ecological sub regions and distribution of wildlife in India. Basic knowledge of National and international organization: ZSI, WII, BNHS. The animal welfare board of India, TRAFFIC, CITIES, WWE, UNEP World heritage and biodiversity convention (Ramsar convention)

Unit-II

Need for conservation of biodiversity. Benefits from biodiversity Threats to biodiversity IUCN Categories of threat, distribution and global pattern, terrestrial biodiversity hot spots. Red Data Book & Conservation status (endangered, vulnerable, rare, threatened and near threatened species) – definitions

Unit-III

Wildlife, History Cause of depletion Wildlife of India- wildlife schedules, ecozones, national parks, sanctuaries, reserves. National & State mammals and birds of India Policies and Laws in Wildlife Management (National) Endangered species management and biodiversity protection Important projects for the conservation of endangered species in Himachal Pradesh and other parts of India

Unit-IV

Environmental awareness and education regarding consevation of wildlife Restoration of wildlife populations by reintroduction and captive breeding *In situ* and *ex situ* conservation. Conservation of invertebrates with special reference to corals and butterflies Wildlife and its status in India – Important ecological sites and their status Zoo Geographical regions

Suggested Reading Materials:

- Aggarwal, (2000). Wildlife of India.
- Brewer: Principal of Ecology.
- Burton, L. D. (2003). Fish and Wildlife: Principles of Zoology and Ecology. Delmar.
- Fulbright, Timothy, E. and Hewitt, D. G. (2008). Wildlife Science: Linking Ecological Theory and Management Applications. CRC Press, Taylor and Francis: BocaRaton, F L.
- Gopal, R. (1992). Fundamental of Wildlife management Justice Home Allahabad. Thompson Learning Pb.
- Dasmann, R. F. (1982).Wildlife Biology, Wiley Eastern, New Delhi.
- Giles, R. H. (1984). Wildlife Management Techniques, Natraj Publishers, Dehradun.
- Hosetti, B. B. (1997). Concepts in Wildlife Management, Chawla Press, Delhi.
- Odum, E. P. (1983). Basic Ecology.

AUZoo 104: Environmental Biology and Toxicology

Unit-I

Environmental pollution: Definition, primary and secondary pollutants. Types of pollution: their causes, sources, effect and control management/method. Green House effect: Definition, global warming, consequences and significance. Ozone layer: Ozone as a friend and a foe; reasons of ozone depletion and its possible effects on plants, animals and man; Measures to check depletion of ozone layer.

Unit-II

Concepts of sustainable development, its utility and significance Environment Impact Assessment: Definition, Introduction, Different phases and significance. Environmental Policy: Economic environmental policy, social environmental policy, legal environmental policy at global and national level. Environmental Audit

Unit-III

Environmental Toxicology: Historical background, Classical toxicology, ecotoxicology and environmental toxicology. Classification of toxicants Toxic agents: Pesticides, metals, solvents Radiation, carcinogens, poisons, Bio-toxins, petrochemicals. Toxicant uptake: Route of toxicant uptake/Absorption of toxicant uptake at tissue and cellular level. Distribution and storage of toxicant Biotransformation and elimination of toxicant Xenobiotics: Definition, types and significance.

Unit-IV

Effect of pollutant on ecosystem Solid waste management: Primary waste products- Solid waste, toxic biological and hospital landfills, incineration, source reduction and recycling. Bioremediation, its role and significance Applications of toxicology, anthropogenic activities and environment Human toxicology and medicinal ethics

Suggested Reading Materials:

- Principles of Environmental Toxicology by I. C. Shaw and J. Chadwick; Taylor & Introduction to Toxicology, 3rd Ed. Taylor & Francis, London by Timbrell, J.
- Applied Ecology and Environmental Management by Edward I. Newman Francis ltd.
- Fundamentals of Ecology by W.B. Odum, E.P. Saunders, Toppan Co. Ltd., Tokyo, Japan
- Handbook of Environmental Health and Safety – principle and practices by H. Koren; Lewis Publishers
- Textbook: A Textbook of Modern Toxicology. Third Edition by E. Hodgson (Ed.). John Wiley & Sons, Inc. (Posted on the D2L content page).

AUZoo 105: Practical based on AUZoo 101 and AUZoo 102

- Study of permanent slides.
- Salivary glands.
- Blood of animals.
- Radula of Pila and jaws of Leech.
- Using slides/charts/models/videos study of following:-
  Anatomy of gut in relation to food and feeding habits of detritivores, carnivores Herbivores, omnivores and sanguivores
- Different kinds of Heart and blood vascular system in animals.
- Respiratory structures: Gills (Crustaceans, Bivalves, Cephalopods, and Fish) Book Lungs (Scorpion); Trachea and spiracles (Cockroach).
- To study the digestive system.
- To study the circulatory system.
- To study the respiratory system and respiratory pigments.
- To study the Hydrostatic skeleton.
- To study the Locomotory mechanisms.
- MS-Windows basics, MS-Word – Meaning of Word–Processing, Creating, Saving, Printing documents, Formatting, Spell-Check, Adding page numbers, Header and Footer, Macros, Creating tables, Converting table to text and vice–versa.
- MS-Excel – Spreadsheets, Using different types of formulae, Creating graphs and charts.
- Exporting charts to MS-Word, MS-PowerPoint – Creating presentations, Formatting, Adding effects and timings.
- Concept of sampling and sampling methods. Definition and law of sampling, Test of significance for large samples and small samples.
- Chi-square analysis.
- Analysis of variance.
- Probability.

AUZoo 106: Practical based on AUZoo 103 and AUZoo 104

- Study of Indian Wild life Sanctuaries/ National Parks and their fauna with the help of Maps/charts
- Study of different types of forests in India with the help of maps/charts.
- National & State mammals and birds of India.
- IUCN Categories of threat.
- Important projects for the conservation of endangered species in India.
- *In situ* and *ex situ* conservation.
- List of different environmental policies.
- Classification of toxicants and Toxic agents.
- Bioremediation
- Types of pollution
- Green house effect
- Biotransformation and elimination of toxicant.
- Toxicant uptake: Route of toxicant uptake/Absorption of toxicant uptake at tissue and cellular level
- Visit to an industry for waste water and solid waste management

Minor changes in practical syllabus can be there as per the availability of materials. As per the latest UGC guidelines (D.O. No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website

SEMESTER – II

AUZoo 201 Animal Physiology and Endocrinology

UNIT – I

Nutrition: Chemistry, metabolic role, sources and deficiency diseases.
Blood and Circulation: Blood corpuscles, Haemopoiesis and formed elements, plasma function, blood volume regulation, blood groups, haemoglobin, haemostasis.
Heart structure, myogenic heart, specialised tissue.
ECG- its principle and significance, heart as a pump, blood pressure.
Respiration: exchange of gases, transport of gases, waste elimination.
Respiratory pigment through different polygenic group

UNIT – II

Physiology of Muscles: Types of muscles and their components, molecular organization of myosin, role of heavy and light meromyosin.
Molecular organization of actin: interaction of actin and myosin, role of actin (microfilaments) and myosin in eukaryotic cells.
Excretion: kidney, urine formation, urine concentration, waste eliminition and micturition.

UNIT – III

Nervous system: Neurons, chemotaxis and chemotactic signals of the plasma membrane, Na+ and K+ permeability and channels and neurotransmitters.
Physiology of impulse transmission through nerves and synapsis
Sense organs: Sensing the Environment- photoreception, chemoreception, mechanoreception, echolocation endogenous and exogenous biological rhythms.
Chromatophores and bioluminescence
Reproductive Physiology: Structure and functions of vertebrate testis and ovary, spermatogenesis, folliculogenesis and ovogenesis and their hormonal control.

UNIT – IV

Endocrinology: Chemical nature and classes of hormones, steroid hormones, and amino acid derived hormones, mechanism of hormone action. Hormones and diseases
Phylogeny of endocrine system: Evolution of pituitary gland, Physiological actions of pituitary hormones. renin-angiotensin system. Importance of adrenocortical and adrenomedullary interaction
Evolution of thyroid gland: thyroid hormones, parathyroid gland, hormonal regulation of calcium and phosphate homeostasis.

Suggested Reading Materials:

- Benjamin Lewin, Genes VII, Oxford University Press
- Hoar, W.S. General and comparative animal physiology

- Prosser, C.L. Comparative animal physiology. W.B. Saunders and Co.
- Hall, J. E., Guyton and Hall Text Book of Medical Physiology, 12th edition, Saunders Company (2010)
- Bentley, P.J., Comparative Vertebrate Endocrinology, Cambridge Univ. Press (1998).
- Vander, A.J., Sherman, J.H. and Luciana, D.S., Human Physiology, McGraw Hill Publ. Co. (1990).
- Animal Physiology: Adaptation and Environmental, Nelson K. S. (ed.) Cambridge University Press, Cambridge, UK
- Comparative Vertebrate Endocrinology, Bentley, P. J., Cambridge University Press, UK
- Vertebrate Endocrinology, Norris D. O., Elsevier Academic Press

AUZoo 202 Biochemistry

UNIT – I

Carbohydrates: General structure, classification and chemical properties of carbohydrates.

Homo and heteropolysaccharide: Structure of starch, pectins, dextrins, glycogen, cellulose and chitin. Bacterial polysaccharides, Mucopolysaccharides, Blood group substances, Biological functions of important polysaccharides

Lipids: Simple lipids, general structure and chemical properties of simple lipids.

Compound lipids: Structure of phospholipids like lecithins, lysolecithins, cephalins, phosphatidyl serine, phosphatidyl inositol, plasmalogens, cardiolipids, sphingomyelins, glycolipids, cerebrosides, gangliosides, properties and functions of phospholipids.

Derived lipids: Cholesterol and steroid hormones (chemistry), biological functions of lipids.

UNIT – II

Proteins: Amino acids as monomers of proteins and their properties, types of proteins and their classification, levels of protein structure and forces stabilizing protein structure and shape.

Conformation of proteins: subcellular assemblies of protein, functions and their denaturation.

Conjugated proteins: Lipoproteins, glycoproteins, nucleoproteins, metalloproteins and chromoproteins, biological functions of proteins.

Nucleic acids: Molecular structure and biological functions of DNA and RNA molecules, ZDNA and its biological significance.

Physical properties of nucleic acid - denaturation of DNA, hydrolysis of nucleic acid, nucleic acid and protein interaction

UNIT - III

Enzymes: Enzyme kinetics, mode of action of enzymes and biochemical role of coenzymes and isoenzymes.

Effect of enzyme concentration, substrate concentration and pH on enzyme activity

Mechanism of enzyme action - a brief description, allosteric enzymes, concentration of effector, feedback inhibition - various mechanisms, covalent modifications irreversible and reversible

Oxidation of fatty acids: Oxidation, biosynthesis of saturated and unsaturated fatty acids.

Energy rich bonds, compounds and biological energy tranducers

UNIT – IV

Metabolism: ATP - cycle, energy rich phosphate compounds, major pathways of catabolism of carbohydrates.

Glycolysis and tricarboxylic acid cycle

Phosphogluconate pathway and glycogenolysis

Mitochondrial -Electron Transport Chain, inhibitors of electron transport chain.

Mechanism of mitochondrial oxidative phosphorylation, inhibitors and uncouplers of mitochondrial oxidative phosphorylation

Suggested Reading Materials:

- Abeles, R.H., Fray, P.A. and Jencks, W.P. (1992) Biochemistry, Jones and Bartlett Publishers, London.
- Berg, J. M., Tymoczko, J.L. and Stryer (2002) Biochemistry (5th Ed.) W.H. Freeman andCo.NY.
- Cohn, E.E., Stump.P.K., Bruening , G. and Doi, R.H. (1987) Outlines of Biochemistry(5th

Ed)Johan Wiley & Sons, NY.
- Practical Biochemistry – Principles and Techniques, Wilson and Walker, Cambridge University Press, Cambridge, UK
- Nelson, D. L. and Cox, M. M., Lehninger Principles of Biochemistry, 5th ed., W.H. Freeman and Company, New York (2008).
- Satyanarayana, U. and Chakrapani, U., Biochemistry, 3rd ed., Books and Allied Pvt. Ltd. (2009).

AUZoo 203 Structure and Function of Animals-II

Unit-I

Integumentary System: Embryonic origin, General features of the Integument**,** Specializations of integument. Evolution of Skin

Digestive system: comparative account of alimentary canal, digestive organs in vertebrates.

Unit–II

Skeletal System: Comparative account of skeleton system in vertebrates.

Evolution of the Appendicular system.

Nervous Systems: Chemical coordination of body functions through neuro-secretion

Evolution of functional anatomy of brain

Unit – III

Circulatory system: comparative account of heart structure in vertebrates.

Excretory system: organs**,** waste products, comparative physiology of vertebrates.

Unit – IV

Introduction to insects: Morphology of head-antennae, mouth parts; thorax – legs, wings; abdominal appendages, genitalia. Taxonomy- classification of insects, basis of insect classification; classification of insects up to orders and in economical important groups

Metamorphosis in insects, Hormonal control of moulting, Social life in insects

Suggested Reading Materials:

- Barrington, E. U. W. (1967), Invertebrates Structure and Functions. Houghton Mifflin Co. Boston
- Barth, R. H. and Broshears, R. E (1982), The Invertebrate world. Holt Saunder, JapanGardiner, M. S. (1972), the Biology of Invertebrates, McGraw Hill, New York.
- Kent, G. C. and Carr, R. K. (2001), Comparative Anatomy of the Vertebrates 9th edition,McGraw Hill Higher Education, New York.
- Prosser, C.L. (1984), Comparative Animal Physiology. Satish Book Enterprise Booksseller & Puhlishers, Agra.
- Goodrich, E. S. (1958), Structure and Development of Vertebrates, Vol. I and II. D. E.Publication , New York.

AUZoo 204 Medical Zoology

UNIT-I

Introduction to Parasitology (pertaining to various terminologies used) Brief introduction to pathogenic microbes: Viruses, Rickettsiae, Spirochaetes and Bacteria.

Brief accounts of life history, mode of infection and pathogenicity of the following pathogens with reference to man prophylaxis and treatment:

Pathogenic protozoans*: Entamoeba, Trypanosoma, ·Leishmania, Giardia Trichomonas, Plasmodium*.

Pathogenic helminths: *Fasciolopsis, Schistosoma, Echinococcus, Ancylostoma, Trichinella, Wuchereria, Dracunculus, Oxyuris.*

UNIT-II

Brief account of arthropods as direct agents of disease or discomfort; accidental injury to sense organs; blood loss; entomophobia; dermatosis; myiasis; allergy and venoms.

Arthropods as vectors of human diseases; Malaria (*Anopheles stephensi, A. culicifacies*); yellow fever and Dengue haemorrhagic (*Aedes aegypti*, *Ae albopictus*); Filariasis (*culex pipiens, C. fatigans, Mansonia* sp.); Japanese B. Encephalitis (*C. tritaenorhynchus*) Plague (*Ctenocophalides cheopie*) and Epidemic typhus (*Pediculus*).

UNIT-III

Distribution biology and control of the above mentioned vectors.

Histopathological changes in organs in relation to diseases such as liver cirrhosis, nephrosis; tumours, cancers

Epidemic diseases, such as typhoid, cholera, small pox; their occurrence and eradication programmes.

UNIT-IV

Brief introduction to human defense mechanisms, Antigens and antibodies

General account of drug therapy and drug resistance

Vaccination: Immunization, different types of vaccines

Current status of vaccines for different diseases

Suggested Reading Materials:

- Kettle, D.S: Medical Veterinary Entomology (CAB International).
- Cheng, T.C: General Parasitology, (Academic Press).

AUZoo 205 Practical based on Zoo 201 and Zoo 202

- To demonstrate that the optimum activity of salivary amylase is pH dependent.
- To study the effects of various osmolarities on erythrocytes.
- To study the effect of exercise on cardiovascular and respiratory system.
- To estimate the glucose level by glucometer.
- Demonstration of endocrine glands of rat through charts/models/video clippings.
- To study the histology of endocrine glands of mammals through prepared slides.
- Qualitative/Quantitative estimation of Carbohydrates.
- Qualitative/Quantitative estimation of Glucose.
- Qualitative/Quantitative estimation of proteins.
- Qualitative/Quantitative estimation of fats.

AUZoo 206 Practical based on Zoo 203 and Zoo 204

- Study of permanent slides: Skin of fish, frog, lizard, bird and mammal. Setae of earthworm, Spicules of Sponges and *Herdmania*. Internal ear of fish, Tentorium of grasshopper, Muscle fibers, cartilage and bone. Endocrine glands of vertebrates.
- Study the following with the help of charts/models/videos/permanent slides. Appendages of Prawn, Wing venation, coupling and types of wings of insects. Metamorphosis in insects, Comparative anatomy of nervous system in Earthworm, Cockroach, Pila, Sepia and Fishes. Modification of antenna in arthropods
- Examination of blood parasites: *Trypanosoma* and *Plasmodium*.
- Study of permanent slides and specimens of parasitic protozoans, helminths and arthropods mentioned in the theory syllabus.
- *Anopheles*: Study of female adult mosquitoes for sporozites and oocytes through charts/models/video clippings.
- Collection of helminthes parasites from vertebrates; their preservation and staining. Staining bacteria.
- Study of slides showing histopathological changes in liver and kidney in respect of cirrhosis and nephrosis respectively.
- Analysis of blood Groups: A, B, O and AB.
- Blood: Erythrocyte sedimentation rate (ESR); Haematocrit; bleeding time; coagulation time; prothrombin time.
- R.B.C., W.B.C. counts.

Minor changes in practical syllabus can be there as per the availability of materials. As per the latest UGC guidelines (D.O.No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website

SEMESTER – III

AUZoo 301 Biotechnology

UNIT-I

Biotechnology: Scope, significance, microbes and microbial system and their improvement for biotechnological use.
Principles and techniques of plant, animal cell culture.
Basic concepts in genetic engineering
Enzymology of genetic engineering: Restriction enzymes, DNA *ligase*, Polymerase etc.
Cloning Vehicles: Plasmids, Cosmids, Lambda phage, Charon phage, Shuttle vectors, 2 µDNA plasmids, yeast plasmids.

UNIT-II

Recombinant DNA technology: Introduction of cloned genes into the host cells: Transformation, transduction, Particle gun, electroporation, and liposome mediated cultivation etc.
Analysis and expression of cloned gene in host cells: Gene cloning and Sequencing. Restriction endonuclease.Vectors, cDNA cloning. Identification of Specific clone with a specific probe
Techniques: Southern, Northern, Western Blotting, PAGE, PCR, DNA finger printing, DNA foot printing
In situ hybridization, RFLP, RAPD, DNA finger printing, Ligase, polymerase chain reaction, Ribozymes, DNA probes, antisense RNA, Expression of cloned genes
Practical applications of gene cloning

UNIT-III

Gene libraries - Construction and analysis of cDNA, mRNA, isolation, cDNA synthesis
Cloning and amplification of gene libraries, Genomic DNA libraries, YACs, BACs
Measuring activity of fused genes and identifying the products of cDNA clones
Changing genes: Site - directed mutagenesis. Transferring genes into animal oocytes, eggs, embryos and specific animal tissues
Application and Impact of rDNA technology Ethical issues and bio-safety regulations

UNIT-IV

Fermentation technology, design process
Scale up and down stream processing, procedure and antibiotics,
Beverages, enzymes, ethanol and methanol from biomass
Bioremediation, biopesticides and biosensors
Single cell protein

Suggested Reading Materials:

- De Robertis and De Robertis. Cell and molecular biology. Lea and Febiger.
- P.K. Gupta. Molecular cell biology. Rastogi publications.
- Watson, Gilman, Witkowsky, Zoller. Recombinant DNA. Scientific American books.
- Gardner, Simmons, Snuskd. Principle of genetics. John Wiley and Sons Inc.
- T.A. Brown. Gene Cloning
- Daniel L. Hartl, Elizabeth W. Jones. Genetics-Principles and Analysis. Jones and Bartlett

AUZoo 302 Immunology

Unit-I

Overview of the immune system: components of the immune system.
Principles of innate and adaptive immunity
Recognition and effector mechanisms of the adaptive immunity- antigen and immunogenicity
Clonal selection theory
Antigen recognition by immune cells: Adaptive immunity- antibody structure, antigen recognition by B lymphocytes, TCR, antigen recognition by T- cells.

Unit-II

Structure and function of MHC complex, Structural variations in immunoglobulin constant regions: antigen processing and presentation to T lymphocytes- antigen presenting cells. Role of CD1 in antigen presentation, Innate Immunity- pattern recognition in the innate immune system Role of TLRs in innate immune response, complement and innate immunity, induced innate response to infection.

Unit-III

Effector mechanisms and regulation of immune responses NK and NKT cell functions, mucosal immunity, immunological memory, regulation of immune response: cytokines and chemokines. Complement system, leukocyte activation and migration, APC regulation of the immune response, T- cell mediated regulation of immune response, Immunological tolerance and allergy.

Unit-IV

Immunity in health and disease: introduction to infectious disease, innate immunity to infection, adaptive immunity to infection.
Evasion of the immune response by pathogens, autoimmunity, immunodeficiency diseases- inherited immunodeficiency diseases, acquired immune deficiency syndrome.
Allergy and hypersensitivity- IgE and allergic reactions, hypersensitivity diseases; autoimmunity- responses to self antigens, transplant rejection- responses to allo-antigens; manipulation of immune responses, Vaccines.

Suggested Reading Materials:

- Kuby Immunology, Richard, Thomas, Barbara, Janis, (5th Ed., 2003), W. H. Freeman and company, New York, USA.
- Benjamini, Immunology, 5th ed., Coico & Sunshine, Wiley-Liss Publication, New York (2003).
- Roitt, I.M., Brostoff, J. and Male, D., Immunology, 8th ed., Mosby Publications,Edinburgh,
  Mosby (2012)
- Paul, W.E., Fundamental Immunology, 7th ed., Lippincott Raven Publication, Philadelphia,New York (2012).

AUZoo 303 Molecular Biology and Genetics

Unit-I

Chromosome organization: structure of chromosome, heterochromatin and euchromatin. DNA replication, Prokaryotic and eukaryotic DNA replication, Mechanics of DNA replication, Enzymes and Accessory proteins involved in DNA replication.
Transcription: Prokaryotic transcription, Eukaryotic transcription, RNA polymerases, General and specific transcription factors and regulatory elements.
Mechanisms of transcription regulation, Transcription termination, 3'-end processing and polyadenylation, Splicing, Editing, Nuclear export of mRNA

Unit-II

Genetic code
Translation, Prokaryotic and eukaryotic translation, The translational machinery, Mechanisms of initiation, elongation and termination
Regulation of translation, Co- and post-translational modifications of proteins, Antisense and Ribozyme technology, Inhibition of splicing, polyadenylation and translation, Types of ribozymes, hammerhead, hairpin and other ribozymes, Application of antisense and ribozyme technologies.

Unit-III

Cell Division: Molecular basis of cell division; mitotic apparatus; forces of cell division (chromosome movement).
Molecular Mutations: Molecular basis of mutations; wobble's hypothesis;
Overlapping and split genes, Regulation of Gene Operon hypothesis, pro and eukaryotic operons, induction and repression, complex gene clusters.
Genes in Populations: Hardy Weinberg Law and calculation of gene frequencies. Human Genome Project and Gene Therapy

Unit-IV

Recombination and repair, Holiday junction, gene targeting, gene disruption, Cre/lox recombination, RecA and other recombinases
DNA repair mechanisms Molecular mapping of genome.
Pedigree, analysis, Animal trafficking and poaching; germplasm maintenance and taxonomy

Suggested Reading Materials:

- Molecular Biology of the Gene, J.D. Watson, N.H. Hopkins, J.W. Roberts, J.A Steitz andA.M. Weiner. The Benjamin/Cummings Pub. Co., Inc., California.
- Molecular Cell Biology, J. Darnell, H. Lodish and D. Baltimore Scientific American Books, Inc., USA
- Molecular Biology of the Cell, B. Alberts, D. Bray, J. Lewis, M. Raff, K. Roberts andJ,D. Watson. Garland Publishing Inc., New York.
- Gene VI, Benjamin Lewin, Oxford University Press, U.K.

- Molecular Biology and Biotechnology. A comprehensive desk reference, R.A Meyers (Ed.), VCH Publishers, Inc., New York.
- Molecular Cloning: a Laboratory Manual, J. Sambrook, E.F. Fritsch and T. Maniatis,Cold Spring Harbor Laboratory Press, New York.
- Introduction to Practical Molecular Biology, P.D. Dabre, John Wiley & Sons Ltd., New York.

AUZoo 304 Developmental Biology

Unit – I

Scope, science of developmental biology and its application Developmental pattern in metazoan
Gametogenesis and Fertilization: Spermatogenesis and oogenesis. Egg and sperm interaction, fertilization, vitellogenesis
Natural and artificial parthenogenesis, *In vitro* fertilization and embryo transplantation.
Biology of sex determination: Chromosomal sex determination - mammals and *Drosophila*, Testis determining genes, ovarian development, Environmental sex determination.

Unit – II

Cleavage: Cleavage and its patterns. Biochemical changes during cleavage. Influence of male and female pronuclei during early development.
Gastrulation and morphogenetic movements
Differentiation, Determination, transdetermination.

Unit – III

Induction and Maturation: Induction, competence and inductive response.
Principles of reciprocal action
Control of metamorphosis: Morphophysiology of metamorphosis in insects and frog.
Regeneration of tail in Reptiles Limb regeneration in amphibians
Vertebrate lens regeneration, Regeneration in Platyhelminthes and Coelenterates
Concept of growth

Unit – IV

Genetic Control of Development: Nuclear determination of developmental events.
Molecular basis of early embryonic development Nucleus and cytoplasmic interactions during development.Hemopoietic stem cells.

Suggested Reading Materials:

- Balinsky, B.I. (1981). An Introduction to Embryology, Saunders, Philadelphia.
- Bellairs, R. (1971). Development Processes in Higher Vertebrates, University of Miami Press, Miami
- Berrill. N.J. (1971): Developmental Biology. McGraw Hill, New Delhi.
  Dawnpart, Developmental Biology.
- Ebert, J.D. & Sussex, IM. (1970): Interacting Systems in Development, Holt, Rinehart and Winston, New York.
- Gilbert, F. (1985, 95 & 2000): Developmental Biology, Sinaur.
- Goel, S.C. (1984): Principles and Animal Developmental Biology, Himalaya, Bombay.
- Grant, P. (1978): Biology of Developing System.
- Karp. G. & Berrill, M.J. (1981): Development. McGraw Hill, New Delhi.

AUZoo 305 Practical based on Zoo 301 and Zoo 302

- Isolation of B-lymphocytes.
- Studies of different types of eggs with reference to their yolk contents.
- Studies of normal development with reference to normal tables of developmental stages of frog/toad chick.
- Preparation of whole mounts of embryo and larvae when present.
- Bioassay to demonstrate toxicological effect.
- Study of various components of pond ecosystem.
- Blood film preparation and identification of cells
- To perform agglutination reaction by using blood group typing kit.
- To perform antigen – antibody interaction by Ouchterlony method.
- To demonstrate antigen-antibody reaction by ELISA to students.
- To perform DOT- ELISA by using kit.
- Simple exercise to teach biotechnological principles.

AUZoo 306 Practical based on Zoo 303 and Zoo 304

- Study of mitosis, meiosis through permanent slides/charts.
- To prepare and study the karyotype
- To study the pedigree analysis of family.
- To study blood groups in human beings.
- Demonstration of Barr body in the oral epithelium of human beings.
- To study different stages of mitosis in root tips of A*llium cepa*.
- To study permanent slides of:-
- Mitosis in bone marrow cells of rat.
- Stages of meiosis in testis of rat.
- Meiotic stages in testis of grasshopper.
- Polytene chromosomes
- To study meiotic stages in buds of *Allium cepa*.
- To study dermatoglyphics with palms of hands and fingertips.
- To study some inherited morphogenetic human characters.
- Numericals on Mendelian laws of inheritance.
- Study of different larval forms across the animal Kingdom using charts/models/videos.
- Developmental stages of chick, frog through slides/charts.
- Metamorphosis through charts/audio video means in frog and insect.
- Study of Gametes through permanent slides:-
- Spermatogenesis in rat/frog/grasshopper.
- Study of testis (rat/frog/grasshopper).
- Study of Ovary (rat/frog/grasshopper).
- Study of permanent stained slides of different stages of chick embryo.
- Study of permanent stained slides of different embryonic stages of frog.
- Quantitative/Qualitative analysis of proteins.

Minor changes in practical syllabus can be there as per the availability of materials. As per the latest UGC guidelines (D.O.No. F. 14-6/2014(CPP-II) dated 01-08-2014) the dissections should not be conducted. The guidelines on this issue are available on the UGC website

SEMESTER – IV

AUZoo 401 Techniques in Biology

UNIT – I
Microscopy
Principle and applications of light microscope
Phase - contrast microscope and Fluorescence microscope

UNIT – II
Spectrophotometry
Principle of Colorimetry and its applications
Chromatography: Principles and types of chromatography

UNIT – III
Electrophoresis
Principle, types and applications of electrophoresis
Flow Cytometry: Principles and Applications of flow cytometry

UNIT – IV
Tissue culture: Design and functioning of tissue culture laboratory
Culture media, essential components and preparations
Serological assays like ELISA, IFA

Suggested Reading Materials:

- Freiflder, D. (1982), Physical Biochemistry: Applications to Biochemistry and Molecular Biology, WH Freeman and Company, San Francisco.
- Gupta, M. N. (2002), Methods for Affinity- Based separations of Enzymes and Proteins.
- Kelly, R. A. (1971), the use of English for technical students, second edition. ELBS, London.
- Skoog, D. A. (1985), Principles of Instrumental Analysis, 3rd Edition, Saunders College Publishing, New York.
- Smith, C. N. (1996), Insect colonization and Mass Production. Academic Press, New York.
- Wilson, K. And Walker, J (1994), Practical Biochemistry: Principles and Techniques. Cambridge University Press, Cambridge.
- Sumner, B.E.H. (1988), Basic Histochemistry. John Wiley and Sons Ltd. Chichester, London.. Wilson, K. And Walker, J (1994), Practical Biochemistry: Principles and Techniques.
- Wilson, K. and Goulding, K. H. (1992), A Biologist Guide to principles and techniques of practical Biochemistry. 3rd Edition, Foundation Brothers, New Delhi.

AUZoo 402 Specialization Paper: Entomology/Molecular Parasitology/ Animal Behaviour/Genomics/Fish Biology/ Endocrinology

AUZoo 402 Entomology

Unit-I

Introduction to Entomology, History of entomology in india, insect ecology: biotic and abiotic factors, Morphology: structure and function of insect cuticle, structure of head, thorax and abdomen, wing venation, modifications and wing coupling apparatus, structure of male and female genitalia, sensory organs, types of larvae and pupae.

Unit-II

Structure and function of digestive, circulatory, excretory, respiratory, nervous and reproductive systems in insects

Introduction to apiculture, sericulture and lac culture

UNIT – III

Systematic position, host plants, nature of damage and outlines of the life cycle of the following pests of cereals, legumes, fiber, fruits and vegetables.

Pests of stored food products with particular reference to their habits, nature of damage caused by them and outlines of their life cycles.

Insects of medical and veterinary importance with particular reference to their systematic position, mode of infection and diseases caused by them

UNIT - IV

Methods of pest control: mechanical, cultural, physical, chemical, biological and genetic.

Pest surveillance, categories of pest, concept of injury levels

IPM: introduction, importance, concepts, principles and tools. Constraints of IPM

Suggested Reading Materials:

- Atwal, A.S. and Dhaliwal G. S., Agricultural Pests of South Asia and Their Management, 5th ed., Kalyani Publishers, New Delhi (2005).
- Kumar and Nigam, Economic and Applied Entomology, Emkay Publications (1991).
- Matheson, R., Medical Entomology, Comstock Publishing Company, Inc. (1950).
- Mctcalf and Mctcalf, Destructive and Useful Insects McGraw Hill Book Company, Inc. New York, Toronto, London (1951).
- David D., Integrated Pest Management, Chapman & Hall, London, New York, Tokyo, Madras (1995).

- House,S. J., Insect Pheromones and Their Use in Pest Management Chapman & Hall, London, New York, Tokyo, Madras (1998).

AUZoo 402 Molecular Parasitology

UNIT - I

Different types of animal associations: definitions; phoresis, commensalism, parasitisim, mutualism, hyperparasitism. Evolution of parasites: Origin of parasitism, possible evolutionary pathways, adaptation to multiple hosts, some evolutionary patterns. Parasite host specificity: Kinds of parasite - host specificity, Diagnosis of parasitic infections: Protozoans parasites and helminthic parasites.

UNIT - II

Host parasite interactions: Immunity to protozoans and helminths Pathogenesis of parasitic infection Vectors: Brief account of various insect vectors of human parasitic infections. Parasite transmission: Introduction, mechanism for location of host, mechanism for penetrating the host, circadian rhythm associated with transmission. Ecology of parasites

UNIT - III

Morphology, life-cycle, mode of infection of *Plasmodium*, molecular biology of *Plasmodium* – drug targets, mechanism of drug resistance, vaccine strategies and proteomic approaches; morphology, life-cycle, mode of infection of *Leishmania*, Morphology, biology, life-cycle, mode of infection of *Entamoeba*, morphology, biology, life-cycles, mode of infection of *Giardia*; gastro-intestinal nematodes, morphology, biology, life-cycles, modes of entry of *Schistosoma, Wuchereria, Brugia, Ancylostoma, Trichinella* and *Dracanculus*.

UNIT – IV

Immune response and self-defense mechanisms, immune evasion and biochemical adaptations of parasites; parasites of veterinary importance Parasites of insects and their significance; nematode parasites of plants, morphology, biology, lifecycle and infection of crop plants by plant parasitic nematodes, plant parasitic nematodes, host parasite interactions.

Suggested Reading Materials:

- Foundations of Parasitology, Roberts L.S. and Janovy J., McGraw-Hill Publishers, New York, USA.
- Modern Parasitology: A Textbook of Parasitology, FEG Cox., Wiley-Blackwell, U. K
- Chandler A.C. And Read, C.P., Introduction to Parasitology, John Wiley, London (1961).
- Smyth, J.D., Introduction to Animal Parasitology, Hodder& Stoughton, London (1976).
- Chappell, L.H., Physiology of Parasites, Blackie, Glasgow&London (1979).
- Cheng, T.C., General Parasitology, 2nd ed. Academic Press, College Division, London (1986).
- Noble, E.R. and Noble, G.A., Parasitology: The Biology of Animal Parasites V-edition, Lea & Febiger, Philadelphia (1982).
- Chatterjee, K. D., Parasitology: Protozoology and Helminthlogy, 13th ed., CBS publishers and distributors Pvt Ltd (2009)
- James, M.T. and Harwood, R.F., Herins's Medical Entomology, 6th ed., Collier Macmillan Canada Ltd., Don Mills, Qutario, (1969).

AUZoo 402 Animal Behaviour

Unit-I

Introduction - definition, historical out line, patterns of behaviour, objectives of behaviour, mechanism of behaviour, asking questions. Reflexes- reflex action, types of reflexes, reflex arch, characteristics of reflexes and complex behaviour. Orientation primary and secondary orientation; kinesis – orthokinesis, klinokinesis; taxis – different kinds of taxis; sun-compass orientation, dorsal- light reaction

Unit-II

Eusociality, social organization in honey bee, polyphenism and its neural control, flower recognition, displacement and translocation experiment, various type of communications, production of new queen and hive, swarming, honey bee as super organism**.** Fixed action pattern: mechanism, deprivation experiment controversies\ FAP- characteristics and evolutionary features Learning and instincts: conditioning, habituation, sensitization, And reasoning.

Unit-III

Innate releasing mechanisms: key stimuli, stimulus filtering, and supernormal stimuli, open and closed IRM, mimetic releaser, code breakers. Homeostasis and behaviour: motivational system, physiological basis of motivation, control of hunger drive in blow fly and thirst drive in goat, role of hormone, motivational conflict and decision making, displacement activity, models of motivation, measuring motivation. Hormones and pheromones influencing behaviour of animals

Unit-IV

Altruism – reciprocal altruism, group selection, kin selection and inclusive fitness, cooperation, alarm call. Parental care, parental manipulation, evolutionarily stable strategy, cost benefit analysis of parental care with suitable case studies. Sexual selection: intra sexual selection (male rivalry), inter-sexual selection (female choice), infanticide, sperm competition, mate guarding, sexual selection in human, consequences of mate choice for female fitness, monogamous verses polygamous sexual conflict.

Suggested Reading Materials:

- Mechanism of Animal Behaviour, Peter Marler and J. Hamilton; John Wiley & Sons, USA
- Animal Behaviour, David McFarland, Pitman Publishing Limited, London, UK
- Animal Behaviour, John Alcock, Sinauer Associate Inc., USA
- Perspective on Animal Behaviour, Goodenough, McGuire and Wallace, John Wiley & Sons, USA
- Exploring Animal Behaviour, Paul W. Sherman & John Alcock, Sinauer Associate Inc. ,Massachusetts, USA
- An Introduction to Animal Behaviour, A. Manning and M.S Dawkins, Cambridge University Press, UK

AUZoo 402 Genomics

Unit-I
Organization and structure of genomes - size, complexity, gene-complexity, virus and bacterial genomes, organelle genome, architecture of mitochondrial genome, conserved chloroplast DNA; organization and nature of nuclear DNA in eukaryotes; transposable elements, retro-transposons, SINE, LINE, Alu and other repeat elements, pseudogenes, segmental duplications

Unit-II
Mapping genomes - physical maps, EST, SNPs as physical markers, radiation hybrids, FISH, optical mapping, gene maps, integration of physical and genetic maps; sequence genomes: high-throughput sequencing, strategies of sequencing, recognition of coding and non-coding regions and annotation of genes, quality of genome-sequence data, base calling and sequence accuracy.

Unit-III
Bioinformatics - datasets, sequence analysis based on alignment, de novo identification of genes, *in silico* methods. Comparative genomics - orthologs and paralogs, protein evolution by exon shuffling; human genome project, comparative genomics of bacteria, organelles, and eukaryotes

Unit-IV
Large scale mutagenesis and interference - genome wide gene targeting; systematic approach, random mutagenesis, insertional mutagenesis, libraries of knock-down phenocopies created by RNA interference; transcriptome analysis, DNA micro-array profiling, data processing and presentation, expression profiling, proteomics - expression analysis, protein structure analysis, protein-protein interaction.

Suggested Reading Materials:

- Principle of Genome Analysis and Genomics, Primrose, S. B. and Twyman R. M., (7th Ed., 2006), Blackwell Publishing Company, Malden, USA
- Genomes 3, Brown, T. A., Garland Science Publishing, London, UK
- Bioinformatics: Sequence and Genome Analysis, Mount, D. W., Cold Spring Harbor Laboratory Press, New York, USA

AUZoo 402 Fish Biology

Unit-I

Definition of Fish, Fisheries and aquaculture Classification of fishes with distinguishing characters and examples of each group Indian fisheries production, utilization and demand Estuarine, Marine, Riverine and wetland fisheries: characteristic species and their exploitation. Culture fisheries Cultivable organisms for aquaculture Criteria of selection of cultivable fishes Design, construction and maintenance of fish culture ponds. Ecology of fish pond ecosystem Physico chemical conditions of ponds water and soil Biological conditions of waters Weeds and their control Productivity of fish pond Classification of water bodies on the basis of productivity Water pollution its causes and remedy. Aquaculture Ranching and Rational fishery

Unit-II

Fish integument: Exoskeleton and colouration. Fins: origin types and functions. Food and feeding habits of fishes, Digestion in fishes Respiratory system Gill structure and functions, Accessory respiratory organs swim bladder and webberian ossicles Osmoregulation in fishes. Receptors in fishes Chemoreceptors Lateral line organs Eye, Ear. Pineal organ Hormones and reproduction: Induced breeding in carps and catfishes. Identification of different maturity stages of fishes. Migration in fishes Fish diseases and their control Age and growth studies

Unit-III

Introduction to fish biotechnology and methods of fish stock improvement Selection and hybridization Androgenesis and Gynogenesis – natural and induced Polyploidy induced. Sex reversal and sterility Transgenesis, transgenes and application Cryopreservation of gametes and embryo Fish-by products Fish preservation process Nutritive aspect of fish meat and oil

Unit-IV

Different systems for aquaculture: pond culture, cage culture, raceway culture. Culture of important fish species (Mayer carps, common carps, Chinese carps, cat fish
and Tilapia culture). Integrated Aquaculture and waste water aquaculture. Pearl Culture Frog culture Prawn culture-Fresh and brackish water Impact of Aquaculture on Environment Methods of Fishing: Crafts and gear technology. Nutrition in Aquaculture Nutrient and non-nutrient diet components Preparation and processing of feed, feed formulae, Natural and supplementary feed and their utilization

Suggested Reading Materials:

- Fishponds in Farming Systems, Zijpp, V. D., Verreth, J. A. J., Tri, L. Q., van Mensvoort, M. E. F., Bosma, R. H., and Beveridge, M. C. M., Wageningen Academic Publishers, Netherlands
- Aquaculture Principles and Practices, Pillay, T. V. R., Blackwell Publishing, USA
- Aquaculture and Fisheries Biotechnology Genetic Approaches, Dunham, R. A., CABI Publishing, USA

AUZoo 402 Endocrinology

UNIT-I

History and scope of endocrinology
Endocrine methodologies
Mechanism of hormone action
Hormones and environment

UNIT-II

Role of hypothalamus and neuroendocrine integration in mammals
Functional significance of Pineal hormones
Parathyroid hormones and gastrointestinal hormones and its significance
Renin and angiotensins and their functional significance

UNIT-III

Male Reproductive System: Differentiation of testes and male genital ducts
Ultrastructure of testes
Structure and ultrastructure of mammalian sperm
Structure and functional role of sertoli cell and Leydig cells

UNIT-IV

Female Reproductive system: Differentiation of Ovary and genital ducts
Histology of Ovary, Uterus, Cervix and Vagina
Ultrastructure of Ovum
Estrous Cycle in Mammals

Suggested Reading Materials:

- Hadley, M.E. Endocrinology
- Bentley, P.J. Comparative Vertebrates Endocrinology. Cambridge University Press, Cambridge, U.K.
- Greep, R.O. Handbook of Physiology Vol. 6: Male Reproduction. American Physiological Society, Washington.
- Greep, R.O. Handbook of Physiology Vol. 7: Female Reproduction. American Physiological Society, Washington.
- Turner, C.D. and J.T. Bagnara. General Endocrinology. W./B. Saunders.

M.Phil./ Ph. D Zoology

Duration: **2** Semesters.

Eligibility: M.Sc. in Zoology and having 55% marks (50% for SC/ST) in post Graduation.
Semester – I

Semester- I

Course Code	**Name of Course**	**Internal Assessment Marks**	**End Semester Marks**	**Total marks**	**Credits**
AUZooMP 101	Techniques in Biological Research	40	60	100	4
AUZooMP 102	Recent advances in Zoology	40	60	100	4
AUZooMP 103	Specialization paper	40	60	100	4
	Total Marks	120	180	300	12

Semester- II

Dissertation			150	12
Viva voce			50	2
Total Marks (Semester I & II)			**500**	**26**

Note: End Semester Theory Examination
Attempt FIVE questions in all. Question No.1 is compulsory of 20 marks with short - type answers covering the whole syllabus. For others two questions will be set from each unit, one to be attempted. Maximum marks for each theory paper will be 60 and time 3 hours. M.Phil. theory course is same for Ph. D students also who need to undertake theory course as per regulations.

AUZooMP 101- TECHNIQUES IN BIOLOGICAL RESEARCH

UNIT-I

Basic concepts of research: Method of writing Dissertation, Preparation of Abstract, Collecting information for Introduction and definition of the research problems- development and standardization of materials and methods. Defining and formulation of research problem- literature collection using internet and journals- way of interpretation of references cited in the Thesis/ dissertation. Data collection technique Selection of problem- stages in execution of research; preparation of Manuscript for journals

UNIT-II

Laws of photometry, Kinds of photometers-colorimeters, spectrophotometers, single/double beam instrument. Principle of electrophoresis, Agarose gel electrophoresis and its limitations, Polyacrylamide gel electrophoresis, Determination of molecular weights by electrophoresis, Isoelectric Focusing (IEF) and 2-D gel electrophoresis, Western blotting, Northern blotting and Southern blotting. Differences between light and Electron Microscope, Specimen block preparation for Transmission Electron Microscopy, Staining for ultrathin sections, Specimen preparation for scanning Electron Microscopy, Negative staining, Freeze – fracture Etching technique

UNIT-III

Principles of adsorptions, Partition, ion exchange and molecular sieve chromatography Paper chromatography, Thin layer chromatography, column chromatography, gas chromatography, high performance liquid chromatography, ion exchange chromatography, their analytical uses and applications. Principle of Centrifugation, Types of Centrifuges (low speed, high speed and ultracentrifuges) Types of centrifugations (Rate, Density gradient- Isopycnic centrifugation). Preparative and analytical ultracentrifugation

UNIT-IV

Radiotracers, isotopes and applications of tracer techniques Autoradiography: Principle, techniques and applications of autoradiography. Principles, methods and importance of histochemistry in Biological research Historical perspective, Principles of fixation, types of fixative and their application. Radial immunodiffusion, double diffusion, Immunoelectrophoresis, Radioimmunoassay, Haemagglutination, Enzyme Linked Immunosorbent assay (ELISA), Immunofluorescence, Western blotting and Migration inhibition factor assay.

Suggested Reading Materials:

- Wilson, K. And Walker, J (1994), Practical Biochemistry: Principles and Techniques. Cambridge University Press, Cambridge.
- Freiflder, D. (1982), Physical Biochemistry: Applications to Biochemistry and Molecular Biology, WH Freeman and Company, San Francisco.
- Gupta, M. N. (2002), Methods for Affinity- Based separations of Enzymes and Proteins.

- Kelly, R. A. (1971), the use of English for technical students, second edition. ELBS, London.
- Skoog, D. A. (1985), Principles of Instrumental Analysis, 3rd Edition, Saunders College Publishing, New York.
- Kuby, Immunology. W.H. Freeman, USA.
- Paul, W. Fundamentals of Immunology.
- Roitt, I.M. Essensial Immunology. ELBS edition

AUZooMP 102: RECENT ADVANCES IN ZOOLOGY

UNIT-I
Origin and evolution of life
Theories of evolution
Evolutionary time scale
Evolution of man

UNIT-II
Trends in global and Indian aquaculture
Culture of Pearl oyster and pearl production
Integrated Multi Tropic Aquaculture (IMTA)
Recirculation aquaculture system, Sewage fed farming

UNIT-III
Role of insects in Human society for development of Human culture Aspects include health, food production and storage.
Introduction of honey bee biology
Economic importance and control strategies for arthropod pests

UNIT-IV
Zoogeography: Introduction, Speciation and Dispersal
Island Biogeography
Diversity and Diversity gradients
Continental drift and Glaciation

Suggested Reading Materials:

- Origin of Species (1859) by Charles Darwin.
- What Evolution is (2002) by Ernst W. Mayr.
- Principles of Zoology by Hickmann and Hickmann.
- Evolution: The modern synthesis. Julian Huxley.
- H.D. Kumar: Sustanibility & Management of Aquaculture & Fisheries.
- Arugun & Natarajan: Fresh water Aquaculture.
- The Insect-Structure and Function. - by R.F. Chapman.
- Imm's General Text Book of Entomology –by O.W. Richards and R.G. Davies.
- The Insect an outline of Entomology- by P.G. Gullan and P.S. Cranston.
- Carter, G. A. (2004) Beekeeping, Biotech Books, New Delhi.
- Brewer, R. (1994), The science of Ecology, Saunders College of Publishing, New York.
- Beeby, A. (1992), Applying Ecology Chapman and Hall Madras.
- Putmann, R. J. and Wratten, S. D. (1984), Principles of Ecology, Crown Helm, London.

AUZooMP 103 - ADVANCED TOPICS IN PARASITOLOGY

UNIT-I

Pathogenesis due to protozoan and helminth parasites

In vitro culture

UNIT-II

Physiology of helminth parasites (a) feeding, nutrition (b) carbohydrate, lipid and protein metabolism (c) electron transport

Biology of egg and hatching mechanisms in helminth parasites

UNIT-III

Infective stages and variation in life cycles of helminths

Exsheathing mechanism in parasites

UNIT-IV

Identification of helminth parasites

(a) Characters of taxonomic importance
(b) Problems in speciation in dioecious parasites
(c) Rules of zoological nomenclature

Adaptations of parasitism

Suggested Reading Materials:

- Cheng, T.C., General Parasitology, 2nd ed. Academic Press, College Division, London (1986).
- Noble, E.R. and Noble, G.A., Parasitology : The Biology of Animal Parasites V-edition, Lea & Febiger, Philadelphia (1982).
- Chatterjee, K. D., Parasitology: Protozoology and Helminthlogy, 13th ed., CBS publishers and distributors Pvt Ltd (2009)
- James, M.T. and Harwood, R.F., Herins's Medical Entomology, 6th ed., Collier Macmillan Canada Ltd., Don Mills, Qutario, (1969).

AUZooMP 103 - ADVANCED TOPICS IN ENDOCRINOLOGY

UNIT-I
Hormonal control of feeding behaviour
Gastrointestinal tract functioning
Blood – testis barrier

UNIT-II
Steroid hormone receptor interactions
Signal transductions
Biological aspects of vasectomy

UNIT-III
Autocrine, paracrine and Juxtacrine regulations of hormones
Pineal-hypothalmo-hypophyseal-gonadial axis and Circadian rhythms
Placental hormones and their significance

UNIT-IV
Stress physiology and adaptation
Prostaglandin structure, type, synthesis and biological activities
Genetic basis of hormonal disorders

Suggested Reading Materials:

- Hadley, M.E. Endocrinology
- Greep, R.O. Handbook of Physiology Vol. 6: Male Reproduction. American Physiological Society, Washington.
- Greep, R.O. Handbook of Physiology Vol. 7: Female Reproduction. American Physiological Society, Washington.
- Hall, J. E., Guyton and Hall Text Book of Medical Physiology, 12th edition, Saunders Company (2010)
- Rhoades, R.A. and Tanner, G.A., Medical Physiology, 2nd edition, Lippincott Williams and Wilkins (2003).
- Hoar, W.S. General and Comparative Physiology, Adaptation and Environment, 3rd edition, Cambridge University, Press (1985).
- Turner, C.D. and Bagnars, W.B., General Endocrinology, Saunders Company (1976).
- Golds Worthy, G.J. Robinson, J. and Mordue, W., Endocrinology, John Wiley and Sons, New York (1981)
- Bentley, P.J., Comparative Vertebrate Endocrinology, Cambridge Univ. Press (1998).

AUZooMP 103-ADVANCED TOPICS IN ENTOMOLOGY

UNIT I

Insect sociobiology: Forms of social life, the organization of higher social communities of insects, mutual communication in search of food

UNIT II

Role of taxonomy, role of dichotomous keys, new frontiers in insect taxonomy
Insect toxicology: classification and mode of action of pesticides, Physiology of insecticidal resistance.

Unit III

Behavioural control: Principles of behavioural control, pheromones, allomones, kairomones. Pest management with pheromones. Hormonal control and chemosterilants.

UNIT IV

Diapause: Endocrine mediation of diapause, significance of diapause. Pests of stored products: internal feeders, external feeders, secondary pests and scavengers.

Suggested Reading Materials:

- Kapoor, V.C., Theory and Practice of Animal Taxonomy, 7th ed., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi (2012).
- Peterson P.G., Elements of Insect Ecology, 1st ed., MEDTECH (2018).
- Chapman R. F., The Insects: Structure and function, 5th ed. Cambridge University Press (2013).
- Gour T.B. and Sriramulu, M., Insect Physiology: Principles and Concepts. 3rd revised ed., kalyani publishers, New Delhi (2017).
- Prakash A., Laboratory Manual of Entomology, 1st ed. New Age International Publishers (2001).
- Bland R.G. and Jaques H.E., How to know the Insects, 3rd ed., MEDTECH (2018)
- Abral D.P., Bees and Beekeeping in India, 2nd revised ed., Kalyani Publishers, New Delhi (2009).
- Ambrose D.P., The Insects: Beneficial and Harmful Aspects, Kalyani Publishers (2007).
- Atwal, A.S. and Dhaliwal G. S., Agricultural Pests of South Asia and Their Management, 5th ed., Kalyani Publishers, New Delhi (2005).
- Kumar and Nigam, Economic and Applied Entomology, Emkay Publications (1991).
- Matheson, R., Medical Entomology, Comstock Publishing Company, Inc. (1950).
- Metcalf and Metcalf, Destructive and Useful Insects, McGraw Hill Book Company, Inc. New York, Toronto, London (1951).
- David D., Integrated Pest Management, Chapman & Hall, London, New York, Tokyo, Madras (1995).
- House,S. J., Insect Pheromones and Their Use in Pest Management, Chapman & Hall, London, New York, Tokyo, Madras (1998).

ABHILASHI UNIVERSITY
DEPARTMENT OF ZOOLOGY
LIST OF BOOKS

AUTHOR NAME	TITLE OF BOOKS	PUBLISHERS	COPIES	
1. Barrington, E.U.W. (1967)	Invertebrates structure and functions	Houghton Mifflin Co. Boston	2	
2. Hyman, L.H.	The Invertebrates. Vol. 1 – Protozoa through Ctenophora (1940), Vol II- Platyhelminthes and Rhynchocoela (1951), Vol. III- Acanthocephala, Aschelminthes and Entoprocta (1951)	Mc Graw Hill, New York	1	
3. Gardiner, M.S. (1972)	The Biology of Invertebrates	Mc Graw Hill, New York	5	
4. Prosser, C.L. (1984)	Comparative Animal Physiology	Satish Book Enterprise Books seller & publishers, Agra	1	
5. Smith, H.S.	Evolution of Chordate Structure	Hold Rinehart and Winston Inc. New York	5	
6. Sinha, P.K. (1992)	Computer Fundamentals			
7. Gupta, S.C. (2004)	Fundamentals Of Statistics	Himalaya Publishing House	2	
8. Aggarwal, (2000)	Wildlife of India		1	
9. Brewer	Principle of Ecology		2	
10. Burton, L.D. (2003)	Fish and Wildlife: Principles of Zoology and Ecology		1	
11. Fulbright, Timothy, E. and Hewitt, D.G. (2008)	Wildlife Science: Linking Ecological Theory and Management Applications	CRC Press, Taylor and Francis: BocaRaton, F.L.	2	
12. Gopal, R. (1992)	Fundamental of Wildlife management	Thompson learning Pb.	2	
13. Dasmann, R.F.	Wildlife Biology	Wiley Eastern,	1	

(1982)		New Delhi		
14. Giles, R.H. (1984)	Wildlife Management Technique	Natraj Publisher, Dehradun	5	
15. Edward I. Newman	Applied Ecology and Environmental Management		2	
16. I.C. Shaw and J. Chadwick	Principles of Environmental Toxicology	Taylor and Francis, London by Timbrell, J.	2	
17. Hall, J.E. Guyton	Text book of Medical Physiology	XI Edition, Hercourt asia PTE Ltd./ W.B. saunders Company	2	
18. Bentley, P.J.	Comparative Vertebrate Endocrinology		5	
19. Vander, A.J., Shermann, J.H. and Luciana, D.S.	Human Physiology		2	
20. Norris, D.O.	Vertebrate Endocrinology		2	
21. Wilson and Walker	Principles and Techniques	Cambridge 2000	5	
22. Nelson, D.L. and Cox, M.M.	Lehninger Principles of Biochemistry	IV Edition. W.H. Freemanand Co.	2	
23. Cheng, T.C.	General Parasitology		3	
24. Kuby	Immunology	W.H. Freeman and Company	2	
25. Benjamini	Immunology		2	
26. Paul, W.E.	Fundamental Immunology		2	
27. J. Darnell, H. Lodish and D. Baltimore	Molecular Cell Biology	W.H. Freeman and Company	2	
28. J. Sambrook, E.F. Fritisch and T. Maniatis	Molecular Cloning: a Laboratory Manual		1	
29. Alberts *et a*l.	Molecular Biology of Cell	Garland Publishing Inc.	2	
30. Gilbert, F.	Developmental Biology	VIII Edition, Sinauer associates, Inc.	2	

		Publishers, Sunderland		
31. Balinsky, B.I.	An Introduction to Embryology	Saunders, Philedelphia	2	
32. Freiflder, D. (1982)	Physical Biochemistry : Applications to Biochemistry and Molecular Biology	Freeman, 1982	2	
33. Chatterjee, K.D.	Parasitology: Protozoology and Helminthology		5	
34. Rhoades, R.a. and Tanner, G.A.	Medical Physiology		2	
35. Hoar, W.S.	General and Comparative Physiology, Adaptation and Environment	Academic press, New York	2	
36. Golds Worthy, G.J. Robinson, J. and Mordue, W.	Endocrinology		3	
37. Greep, R.O.	Handbook of Physiology Vol. 6: Male Reproduction		2	
38. Greep, R.O.	Handbook of Physiology Vol. 6: Female Reproduction		2	

SYLLABUS

Bachelor of Arts & Bachelor of Education

(B.A. B.Ed.)

Four Years Integrated Course

ASSESMENT BASED ON THE FOLLOWING CRITERIA

Sr.No	Assessment Criteria	Percentage To total 100 marks
1	Assignments	08
2	Attendance	05
3	Mid-Term Examination: 1st	08
4	Mid-Term Examination: 2nd	08
5	Class Test	05
6	Quizzes and Presentation	03
7	Attitude and Discussion	03
8	Sub-total (Total Marks of Assessment)	40
9	End- Term Theory Examination	60
10	Total Marks Allotted	100

Note: *End -Semester theory examination will be of sixty marks, while remaining forty marks pertains to internal assessment based on the above mentioned criteria. In theory paper, Candidates need to attempt five questions in all. Q.No.1 is compulsory with short-type answers containing twenty marks covering the whole syllabus. Further, two questions will be set from each unit where one question is compulsory (under each unit). In all, examination time will be of three hours.*

B.A.B.Ed. 4 years Integrated Course (Scheme) 2019-23

Semester -I									
Sr .NO	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Theory Marks	Internal Assess	Total Mark
1	AUBAED101	General Hindi	4	-	-	4	60	40	100
Elective (Choose any three)									
2	AUBAED102	Introduction of Political Theory	5	-	-	5	60	40	100
3	AUBAED103	Ancient History Earliest to 300C	5	-	-	5	60	40	100
4	AUBAED104	Introduction of Sociology	5	-	-	5	60	40	100
5	AUBAED105	Micro Economics and Indian Economy	5	-	-	5	60	40	100
6	AUBAED106	Physical Geography	4	-	-	1	60	40	100
		Total	19	-		19	240	160	400

Semester– II									
Sr. No	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Theory Marks	Internal Assess	Total Marks
1	AUBAED201 (Education)	Environmental Studies	3	-	-	3	60	40	100
2	AUBAED202	Computer Fundamentals, Internet, & MS-Office	3	-	1	4	60	40	100
Elective									
3	AUBAED203	Indian Government and Politics	5	-	-	5	60	40	100
4	AUBAED204	Medieval History From 300 to 1206AC	5	-	-	5	60	40	100
5	AUBAED205	Society in India	5	-	-	5	60	40	100
6	AUBAED206	Mathematical Methods for Economics & Economic Theory	5	-	-	5	60	40	100
7	AUBAED207	General Geography	4	-	1	5	60	40	100
		Total	21		1	22	300	200	500

Semester – III									
Sr. No	Course Code	Course Name	Periods			Credit	Theory Marks	Internal Assess.	Total Marks
			L	T	P				
Core Courses									
1	AUBAED301 (Education)	Childhood and Development Years	4	-	-	4	60	40	100
2	AUBAED302 (Education)	Understanding Discipline& Subjects	2	-	-	2	40	10	50
3	AUBAED303 (Education)	Language across the curriculum	2	-	-	2	40	10	50
4	AUBAED304	English	3	-	-	3	60	40	100
Elective									
5	AUBAED305	Comparative Governament and Politics Introduction to Internation relations	5	-	-	5	60	40	100
6	AUBAED306	History of India from 1206 to 1707AD	5	-	-	5	60	40	100
7	AUBAED307	Sociological Theories	5	-	-	5	60	40	100
8	AUBAED308	Macro Economics & International Trade	5	-	-	5	60	40	100
9	AUBAED309	Human Geography	4	-	1	5	60	40	100
		Total	26	-	0	26	380	220	600

Semester – IV									
Sr. No	Course Code	Course Name	Periods			Credit	Theory Marks	Internal Assess.	Total Marks
			L	T	P				
Core Courses									
1	AUBAED401	Learning and Teaching	4	-	-	4	60	40	100
2	AUBAED402	Drama & Art in education	2	-	-	2	40	10	50
3	AUBAED403	Text Reading &Reflections	2			2	40	10	50
4	AUBAED404	English	3	-	-	3	60	40	100
Elective									
4	AUBAED405	Legislative Support Public Opinion & Servay Search	5	-	-	5	60	40	100
5	AUBAED406	History of India 1707 to 1950 AD	5	-	-	5	60	40	100
6	AUBAED407	Sociology	5	-	-	5	60	40	100
7	AUBAED408	Statistical Method for Economists& Money and Financial system	5	-	-	5	60	40	100

8	AUBAED409	Environmental Geography	4	-	1	5	60	40	100
Total			26	-	-	26	380	220	600

Semester – V

Sr. No	Course Code	Course Name	Periods			Credit	Theory Marks	Internal Asses	Total Marks
			L	T	P				
Core Courses									
1	AUBAED501 (Education)	Assessment for learning	4	-	-	4	60	40	100
2	AUBAED502 (Education)	Teaching of Social Science	2	-	-	2	40	10	50
3	AUBAED503 Education	Teaching of English	2			2	40	10	50
4	AUBAED504	English	3	-	-	3	60	40	100
Elective									
5	AUBAED505	Political Science	5	-	-	5	60	40	100
6	AUBAED506	History	5	-	-	5	60	40	100
7	AUBAED507	Sociology	5	-	-	5	60	40	100
8	AUBAED508	Development Problems & Policies	5	-	-	5	60	40	100
9	AUBAED509	Geography of India	4	-	1	5	60	40	100
		Total	26	-	-	26	380	220	600

Semester – VI

Sr	Course Code	Course Name	Periods			Credit External	Theory Marks	Internal Assess	Total Marks
			L	T	P				
Core Courses									
1	AUBAED601(Edu)	Contemporary India &Education	4	-	-	4	60	40	100
2	AUBAED602(Edu)	Gender, School and Society	2			2	40	10	50
3	AUBAED603(Edu)	Inclusive School	2			2	40	10	50
4	AUBAED604	English	3	-	-	3	60	40	100
Elective									
5	AUBAED605	Political Science	5	-	-	5	60	40	100
6	AUBAED606	History	5	-	-	5	60	40	100
7	AUBAED607	Sociology	5	-	-	5	60	40	100
8	AUBAED608	Indian Economy Since Independence	5	-	-	5	60	40	100
9	AUBAED609	Sustainability & Development (Geo)	4	-	1	5	60	40	100

School Internship									
8	AUBAED608	Preliminary School Engagement (TP for 4 weeks)	Grading (on four points letter Grades) will be done on the basis of reports submitted by the students						
Total			26		-	26	380	220	600

Semester – VII					
S. No.	**Course Code**	**Course/Paper**	Theory Marks	Internal Assessment	Total Marks
School Internship/(Teaching Practice) 4 months					
1.	AUBAED701	Teaching of Social Science	40	10	50
2	AUBAED702	Teaching of English	**40**	10	50
3	AUBAED 703	Skill in Teaching (School	150		
4	AUBAED704	Skill in Teaching (School Subject-II)	150		
	Total		**80 + 20 + 300 = 400**		

	Semester – VIII								
Sr .No	Course Code	Course Name	Periods			Credit External	Theory Marks	Internal Assessment	Total Marks
			L	T	P				
	Core Courses								
1	AUBAED801	Knowledge and Curriculum	5	-	-	5	60	40	100
2	AUBAED802	Human Values And Ethics (Understanding the self)	5	-	-	5	40	10	50
3	AUBAED803	ICT in Teaching Learning Process	5	-	-	5	40	10	50
4	AUBAED804	Health & Physical Education	5	-	-	5	40	10	50
05	AUBAED805	Guidance& Counseling	5	-	-	5	40	10	50
Total			25	-	-	25	220	80	300

(All Semesters) Grand Total=	**4000**

B.A.B.Ed. 4 years Integrated Course (Scheme) 2020-24

Semester -I									
Sr.No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Evaluation Scheme**		
			L	**T**	**P**		**Internal**	**External**	**Total Marks**
1	AUBAED101	General Hindi	4	-	-	4	40	60	100
Elective (Choose any three)									
2	AUBAED102	Introduction of Political Theory (Pol. Science)	4	-	-	4	40	60	100
3	AUBAED103	Ancient History Earliest to 300 C (History)	4	-	-	4	40	60	100
4	AUBAED104	Introduction of Sociology (Sociology)	4	-	-	4	40	60	100
5	AUBAED105	Micro Economics and Indian Economy (Economics)	4	-	-	4	40	60	100
6	AUBAED106	Physical Geography (Geo)	4	-	-	4	40	60	100
		Total				16	160	240	**400**

Semester– II									
Sr. No	**Course Code**	**Course Name**	**Periods**			**Credit**	**Evaluation Scheme**		
			L	**T**	**P**		**Internal**	**External**	**Total Marks**
1	AUBAED201	Environmental Studies	4	-	-	4	40	60	100
2	AUBAED202	Computer Fundamentals, Internet, & MS-Office	3	-	1	4	40	60	100
Elective (Choose any three)									
3	AUBAED203	Indian Government and Politics (Pol. Science)	4	-	-	4	40	60	100
4	AUBAED204	Medieval History From 300 to 1206 A C (History)	4	-	-	4	40	60	100
5	AUBAED205	Society in India (Sociology)	4	-	-	4	40	60	100
6	AUBAED206	Mathematical Methods for Economics & Economic	4	-	-	4	40	60	100
7	AUBAED207	General Geography (Geo)	4	-	-	4	40	60	100
		Total				20	200	300	**500**

Semester – III									
Sr. No	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	**T**	**P**				
Core Courses									
1	AUBAED301 (Education)	Childhood and Development Years	4	-	-	4	40	60	100
2	AUBAED302 (Education)	Understanding Disciplines &Subjects	2	-	-	2	10	40	50
3	AUBAED303 (Education)	Language across the curriculum	2	-	-	2	10	40	50
4	AUBAED304	English	4	-	-	4	40	60	100
Elective (Choose any three)									
5	AUBAED305	(i) Comparative Government and Politics (ii) Introduction to International relations (Pol. Science)	4	-	-	4	40	60	100
6	AUBAED306	History of India from 1206 to 1707AD (History)	4	-	-	4	40	60	100
7	AUBAED307	Sociological Theories (Sociology)	4	-	-	4	40	60	100
8	AUBAED308	Macro Economics & International Trade (Eco.)	4	-	-	4	40	60	100
9	AUBAED309	Human Geography (Geo.)	4	-	-	4	40	60	100
Total						24	220	380	**600**

Semester – IV									
Sr.No	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	T	P				
Core Courses									
1	AUBAED401 (Education)	Learning and Teaching	4	-	-	4	40	60	100
2	AUBAED402 (Education)	Drama & Art in Education	2	-	-	2	10	40	50
3	AUBAED403 (Education)	Text Reading &Reflections	2	-	-	2	10	40	50
4	AUBAED404	English	4	-	-	4	40	60	100
Elective (Choose any three)									
4	AUBAED405	(i) Legislative Support (ii)Public Opinion & Survey Research (Political Science)	4	-	-	4	40	60	100
5	AUBAED406	History of India 1707 to 1950 AD (History)	4	-	-	4	40	60	100
6	AUBAED407	Methods of Sociological Enquiry (Sociology)	4	-	-	4	40	60	100
7	AUBAED408	Statistical Method for Economists& Money and Financial system (Eco.)	4	-	-	4	40	60	100
8	AUBAED409	Environmental Geography (Geo)	4	-	-	4	40	60	100
Total						24	220	380	**600**

Semester – V									
Sr.No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	T	P				
Core Courses									
1	AUBAED501 (Education)	Assessment for Learning	4	-	-	4	40	60	100
2	AUBAED502 (Education)	Gender, School and Society	2	-	-	2	10	40	50
3	AUBAED503 Education	Inclusive School	2	-	-	2	10	40	50
4	AUBAED504	English	4	-	-	4	40	60	100
Elective (Choose any three)									
5	AUBAED505	Democratic Awareness with Legal Literacy (Pol. Science)	4	-	-	4	40	60	100
6	AUBAED506	Modern and Contemporary World History 1: 1871-1919 (History)	4	-	-	4	40	60	100
7	AUBAED507	Marriage, Family and Kinship (Sociology)	4	-	-	4	40	60	100
8	AUBAED508	Development Problems & Policies (Eco.)	4	-	-	4	40	60	100
9	AUBAED509	Geography of India (Geo)	4	-	-	4	40	60	100
		Total				24	220	380	**600**

Semester – VI									
Sr No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	T	P				
Core Courses									
1	AUBAED601 (Education)	Contemporary India &Education	4	-	-	4	40	60	100
2	AUBAED602 (Education)	Teaching of Social Sciences	2	-	-	2	10	40	50
Candidates are required to choose any one of the following Subjects: 603 (i) or (ii)									
3	AUBAED603 (i) (Education)	Teaching of English	2	-	-	2	10	40	50
4	AUBAED603(ii)	Teaching of Hindi	2	-	-	2	10	40	50
5	AUBAED604	English	4	-	-	4	40	60	100
Elective (Choose any three)									
6	AUBAED605	Democracy and Governance (Political Science)	4	-	-	4	40	60	100
7	AUBAED606	Modern and Contemporary World History II: 1919-1992 (History)	4	-	-	4	40	60	100
8	AUBAED607	Social Stratification (Sociology)	4	-	-	4	40	60	100
9	AUBAED608	Indian Economy Since Independence (Eco.)	4	-	-	4	40	60	100
10	AUBAED609	Sustainability & Development (Geo)	4	-	-	4	40	60	100
School Internship									
11	AUBAED610	Preliminary School Engagement (TP for 4 weeks)	Grading (on four points letter Grades) will be done on the basis of reports submitted by the students						
Total						24	220	380	**600**

Semester – VII						
S.No.	**Course Code**	**Course Name**	**Credit**	**Internal**	**External**	**Total Marks**
Candidates will continue with same teaching subjects in VII Semester which they have opted in VI Semester:						
1.	AUBAED701	Teaching of Social Sciences	2	10	40	50
2	AUBAED702 (i)	Teaching of English	2	10	40	50
3	AUBAED702 (ii)	Teaching of Hindi	2	10	40	50
School Internship/(Teaching Practice) 4 months						
4	AUBAED 703 (A)	Skill in Teaching (School Subject-I)	150			
5	AUBAED703 (B)	Skill in Teaching (School Subject-II)	150			
	Total		**50+50 + 300 = 400**			

	Semester – VIII								
Sr. No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	T	P				
	Core Courses								
1	AUBAED801	Knowledge and Curriculum	4	-	-	4	40	60	100
2	AUBAED802	Understanding the self	2	-	-	2	10	40	50
3	AUBAED803	ICT in Teaching-Learning Process	2	-	-	2	10	40	50
4	AUBAED804	Health & Physical Education	2	-	-	2	10	40	50
5	AUBAED805	Guidance & Counseling	2	-	-	2	10	40	50
Total						12	80	220	300
All semesters Grand Total=									**4000**

FIRST SEMESTER

GENERAL HINDI

Course Code-AUBAED 101 **Marks: 100 (60+40)**

उदेश्य-

छात्रो में भाषा को समझने तथा मूल्यांकन करने की दृष्टि बढ़ाना

शब्द संरचना प्रक्रिया के प्रति छात्रों का ध्यानाकर्षण कराना

छात्रों को प्रयोजनमूलक हिन्दी की व्यापकता से अवगत करवाना

हिन्दी भाषा की व्यवहारिक उपयोगिता का परिचय देना

इकाई-1 हिंदी ध्वनियों का स्वरूप -

स्वर और व्यंजन

संज्ञा,सर्वनाम,क्रिया,विशेषण,क्रिया विशेषण

वाक्य संरचना

इकाई-2 हिंदी शब्द संरचना

पर्यायवाची,समानार्थक,विलोमार्थक,अनेकार्थक, अनेक शब्दों के स्थान पर एक शब्द, समुहार्थक शब्दों के प्रयोग, निकात्तार्थी शब्दों के सूक्ष्म अर्थ - भेद, समानार्थक शब्दों के भेद, उपसर्ग, प्रत्यय

इकाई-3 वर्तनी, विराम चिन्ह एवं संशोधन

वर्तनी सम्बन्धी अशुद्धियाँ, मात्राओ की अशुद्धियाँ

वर्तनी सम्बन्धी अशुद्धियों के कारण, वर्तनी सम्बन्धी अशुद्धियों के सुधारने के उपाय

विराम चिन्ह- पूर्णविराम, प्रश्नवाचक चिन्ह, सम्बोधन या आश्चर्य चिन्ह, निर्देशक चिन्ह, अवतरण चिन्ह

इकाई -4 लेखन सम्बन्धी कोशल
लिखित भाषा शिक्षण के उद्देश्य
लेखन की विभिन्न विधियों, लेखन के दोष
निबंध लेखन, कहानी लेखन
राष्ट्रीय - अंर्तराष्ट्रीय तात्कालिक घटनाक्रमों पर लेखन

इकाई- 5

ओपचारिक पत्राचार / अनोपचारिक पत्राचार
राष्ट्रीय - अंर्तराष्ट्रीय तात्कालिक घटनाक्रमों पर लेखन

Introduction of Political Theory

Course Code- AUBAED 102 Marks: 100 (60+40)

Course Content:

Unit I

What is politics and What is Political Theory, What is its relevance ?

Unit II

State, Civil Society, Liberty, Equality, Justice & Rights.

Unit III

Debates:
a. Democracy and Economic Growth,
b. Liberal and Socialist Perspective of Economic Growth.

Unit IV

Protective discrimination and principles of fairness. State intervention and the Institution of Family.

Suggested Readings:

- Bhargava, R. (2008) 'What is Political Theory', in Bhargava, R. and Acharya, A. (eds.) Political Theory: An Introduction. New Delhi: Pearson Longman, pp. 2-17.
- Bhargava, R. (2008) 'Why Do We Need Political Theory', in Bhargava, R. and Acharya, A. (eds.) Political Theory: An Introduction. New Delhi: Pearson Longman, pp. 18-37.
- Sriranjani, V. (2008) 'Liberty', in Bhargava, R. and Acharya, A. (eds.) Political Theory: An Introduction.New Delhi: Pearson Longman, pp. 40-57.
- Srinivasan, J. (2008) 'Democracy', in Bhargava, R. and Acharya, A. (eds.) Political Theory: An Introduction.New Delhi: Pearson Longman, pp. 106-128.
- Roy, A. 'Citizenship', in Bhargava, R. and Acharya, A. (eds.) Political Theory: An Introduction. New Delhi: Pearson Longman, pp. 130-147.
- Das, S. (2008) 'State', in Bhargava, R. and Acharya, A. (eds.) Political Theory: An Introduction. New Delhi:Pearson Longman, pp. 170-187.
- Frances E O. (1985) 'The Myth of State Intervention in the Family', University of Michigan Journal of Law Reform. 18 (4), pp. 835-64.
- Jha, M. (2001) 'Ramabai: Gender and Caste', in Singh, M.P. and Roy, H. (eds.) Indian Political Thought: Themes and Thinkers, New Delhi: Pearson

Ancient History Earliest to 300 C

Course Code- AUBAED-103 **Marks: 100 (60+40)**

UNIT – I

- History- Meaning, Definition, Scope and Importance of History.
- Sources and Interpretation.
- A broad survey of Paliolithic, Mesolithic and Neolithic cultures.

UNIT – II

- Harappan Civilization- Extent, Town Planning, Social, Economic and Cultural Life, Art, Script and Seals.
- The Vedic Period- Literature, Political, Social, Economic and Religious Life.
- Later Vedic Civilization- Political, Social, Economic and Religious Life.
- Difference between Rigvedic and Later Vedic Civilization.

UNIT – III

- Territorial Stats and The Rise of Magadha (Causes of Magadha's Success).
- Iranian and Macedonian Invasions – Rise of Alexander.
- Jainism and Buddhism – Mahavira & Buddha (Comparison between Jainism and Buddhism).
- The Satvahanas Phase – Main Rulers of the Satvahanas.

UNIT – IV

- Mauryan Empire- Main Sources of Mauryan Dynasty.
  *Chandragupta Maurya.
  *Bindusara.
  *Ashoka – Ashoka And Buddhism.
- The Sangam Age- The three early Kingdoms.
- The age of Shakas, Parthians and Kushanas.

Introduction of Sociology

Course Code- AUBAED 104 **Marks: 100 (60+40)**

UNIT – I Sociology:

Meaning, History of Sociology (Origin and Development), Nature and Significance.

UNIT – II Scope and Subject Matter:

Scope and subject matter of Sociology, Relationship of Sociology with Anthropology, History and Psychology.

UNIT – III Basic Concepts:

Society, Community, Institutions and Associations (Meaning and Characteristics). Status and Role (Meaning, Characteristics and Relationship).

UNIT – IV Sociological Concepts:

Socialization (Meaning and Agencies), Culture (Meaning, Characteristics and Types), Social Change (Meaning, Characteristics and Factors), Social Groups (Meaning, Characteristics and Types- Primary and Secondary groups)

SECOND SEMESTER
ENVIRONMENTAL STUDIES

Course Code– AUBAED/AUBSCED 201	L	T	P	C
	4	**-**	**-**	4

Objective: To create awareness among students about environment protection.

Course Content

Unit-I

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid & Ecological succession,

Unit II

Natural Resources: Renewable & Non-Renewable resources; Land resources and land use change; land degradation, Soil erosion & Deforestation.

Biodiversity: Definition: genetic, species and ecosystem diversity, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Bio-geographical Classification of India.

Unit III

Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

Climate change & Global Warming (Green house Effect),Ozone Layer-Its Depletion and Control Measures, Photochemical Smog, Acid Rain: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act,

Unit IV

Human Communities &Environment:

Human population growth; impacts on environment, human health & welfare, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Land slides, Environmental Ethics; Role of Indian & other religions & culture in environmental conservation, Environmental communication & public awareness; Case studies.

Text Books:

1. "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.
2. "Introduction to Environmental Engineering and Science", Masters, G. M. Prentice Hall India Pvt. Ltd.
3. "Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co.

Reference Books:

1. "Biodiversity and Conservation", Bryant, P. J. ,Hyper text Book
2. "Textbook of Environment Studies", Tewari, Khulbe & Tewari, I. K. Publication.

COMPUTER FUNDAMENTALS, INTERNET, & MS-OFFICE

Course Code-AUBAED/AUBSCED 202 **Marks 100 (60+40)**

L	T	P	C
3	0	1	4

Objective: To give the basic knowledge of computer hardware, internet and application software with DOS keys to the students.

Outcomes:

After studying this course, you should be able to:

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products.
- Be familiar with software application.
- Understand file management.

UNIT-I

Introduction and Definition of Computer: Computer generation, characteristics of computer, advantages and limitations of a computer, classification of computers, functional components of a computer system (Input, CPU, Storage and Output unit), types of memory (primary and secondary), memory hierarchy. Hardware: a) Input devices b) output devices. Software: Introduction, types of software with examples. Introduction to languages, compiler, interpreter and assembler.

Number system: Decimal, octal binary and hexadecimal conversions, BCD, ASCII and EBCDIC codes.

UNIT-II

MS-DOS: Getting started on DOS with Booting the system, internal commands: CHDIR (CD), CLS, COPY, DATE,DEL,DIR, CHARACTER, EXIT, MKDIR (MD), REM, RENAME (REN), RMDIR (RD), TIME, TYPE, VER, VOL. External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT, HELP, LABEL, MORE, REPLACE, RESTORE,SORT, TREE, UNDELETE, UNFORMAT, XCOPY.

Introduction of internet: History of internet, web browsers, searching and surfing, creating an email account, Sending and receiving emails.

UNIT-III

MS WORD: Starting MS WORD, creating and formatting a document, changing fonts and point size, table Creation Operations, autocorrect, auto text, spell check, word art, inserting objects, page setup, page preview, printing a document, mail merge.

MS EXCEL: Starting excel, worksheet, cell inserting data into rows/columns, alignment, text wrapping, sorting data, auto sum, use of functions, cell referencing form, generating graphs, worksheet data and charts with WORD, creating Hyperlink to a WORD document, page set up, print preview, printing worksheets.

UNIT-IV

MS POWERPOINT: Starting MS-Power point, creating a presentation using auto content wizard, blank presentation, Creating, saving and printing a presentation, adding a slide to presentation, navigation through a presentation, slide Sorter, slide show, editing slides, using clipart, word art gallery.

Text books:

1. Sinha P.K., Computer Fundamentals, BPB Publishing.
2. Bill Bruck., The Essentials office 2000 Books, BPB Publishing.
3. Leon A. & Leon M., Introductions to computer, Vikas publications.

Reference books:

1. Peter Nortons, Introduction to computers, Tata McGraw Hill.
2. Prince Michael, Office in Easy steps, TMH Publications.

**Latest editions of all the suggested books are recommended.*

INDIAN GOVERNMENT AND POLITICS

Course Code: AUBAED 203 **Marks: 100 (60+40)**

Course Content:

Unit I

Nature of Indian State, Liberal, Marxist and Gandhian Approaches to study Indian Politics.

Unit II

Indian Constitution: Features, Fundamental Rights and Directive Principles, Parliament, Office of Prime Minister and Judiciary. Power Structure in India: Caste, Class and Patriarchy.

Unit III

Religion and Politics, Secularism and Communalism; Parties and Party System in India.

Unit IV

Social Movements: Workers, Peasants, Environmental and Women's Movements. Strategies of Development: Planned Economy and Neo-liberalism.

Suggested Readings:

Chandra, B. Mukharjee, A & Mukharjee, M. (2010) New Delhi: Penguin.

Austin, G. (1999) Indian constitution: Corner Stone of a Nation. New Delhi Oxford University Press

Singh, M. P & Saxena, R. (2008) Indian Politics: Contemporary issues and Concerns. New Delhi. PHI Learning.

Chandhoke, N. & Priyadarshi, P. (eds) (2009) Contemporary India: economy, society, Politics. New Delhi: Pearson.

MEDIEVAL HISTORY FROM 300 TO 1206 A C

Course Code- AUBAED 204 **Marks: 100 (60+40)**

Credits-4(L-4, T-0)

Course Content:

Unit-1

a) The Gupta and Vakatakas : State and Administration.
b) Economy, Society, Religion, Art, Literature, Science and Technology during Gupta period.

Unit-2

a) Towards the Early Medieval : Changes in Society ,Polity ,Economy and Culture with special reference of Pallavas and Chalukyas.
b) Evolution of Political Structures of the Rastrakutas , Palas and Pratiharas ; Economy; Religious and Cultural Developments.

Unit-3

a) Harsha and His times; Harsha`s Kingdom, Administration, Buddhism & Nalanda.
b) The Cholas: State and Administration, Economy and Culture.

Unit-4

a) Emergence of Rajput states in Northern India ; socio-economic foundations
b) The Arabs;The Ghaznavids in the Northwest; establishment of the Delhi Sultanate; overland and maritime trade.

REFERENCE BOOKS –

1) Vakataka – Gupta Age (Circa 200-500 A.D.) by R.C.Majumdar & A.S. Altekar.
2) The Gupta Empire – by Radhakumud Mukerji.
3) Palas , Pratiharas and Rashtrakutas (750 AD -968 AD) by Jagran Josh .
4) The Harshavardhana Era (606 AD -647 AD) by Jagran Josh.
5) The Rajput Warrior by Harpreet Kaur.
6) The Royal Rajputs –Strange Tales and Stranger Truths by Manoshi Bhattacharya.
7) Dehli Saltanat (711 -1526) by A.L. Srivastavas

SOCIETY IN INDIA

Course Code- AUBAED 205 **Marks: 100 (60+40)**

Course content:

Unit-1

India as a Plural Society: Meaning and Characteristics of Plural Society, Traditional Basis of Indian Society,Unity and Diversity.

Unit -2

Social Institutions: Caste, Class, Tribal, Family, Marriage and Kinship (Meaning and Characteristics).

Unit -3

Identities and changes: Dalit's Movements ((Issues, Causes and Consequences), Women's Movement (Issues, Causes and Consequences) , Policies and Programmes for the upliftment of Dalits and Women.

Unit-4

Challenges to State and Society: Communalism, Secularism and Casteism (Meaning, Causes and Remedies).

Reference Books:

1) Democracy in Plural Societies by ArendLijphart
2) Politics in Plural Societies by Alvin Rabushka
3) Indian Society and Social Institutions by N. Jayapalan
4) The Dalit Movement in India by Eva-Maria Hardtmann
5) Communalism in Modern India by Bipan Chandra
6) Secularism in India by Uday Mehta & Ram Puniyani
7) Caste System in India – A Historical Perspective. By Ekta Singh

THIRD SEMESTER

CHILDHOOD AND DEVELOPMENT YEARS

Paper Code-AUBAED / AUBSCED- 301 **Marks: 100 (60 + 40)**

Course Objectives:

- Understand the meaning, nature and scope of educational psychology.
- Understand growth and development of the learner and its importance in the learning process.
- Understand the need and problems of adolescence.
- Identify educational needs of various types of children
- Understand concept of intelligence and personality, theories of intelligence and personality and their educational implications.

UNIT 1: Child Development

- Educational Psychology: Meaning, Nature, Scope and Role of Educational Psychology in Teaching-Learning Process.
- Concept of Growth, Maturation and Development.
- Principles of Growth and Development.
- Heredity and Environment: Concept, Importance of Heredity and Environment in Child's Development.

Unit 2: Managing Individual Differences

- Individual Differences: Meaning, Dimensions (Cognitive Abilities, Interest, Aptitude, Creativity, Personality, Emotions, Values, Attitudes, Study Habits Psycho-motor Skills, Self-concept and Gender).
- Causes of Individual Differences (Race, Sex, Heredity, Social, Economic Status, Culture, Rural-Urban Home, Language Spoken and Language of Instruction).
- Characteristics, Identification and Remedial Measures for diverse learners (Creative, Slow, Gifted Learners, Learners with Specific Learning Disabilities).
- Role of Teacher to minimize Individual Differences.

Unit 3: Social, Emotional and Moral Development

- Social Development: Meaning, Stages and Factors affecting Social Development, Characteristics of Social Development during Childhood and Adolescence.
- Emotional Development: Meaning, Factors affecting Emotional Development, Characteristics of Emotional Development during Childhood and Adolescence.
- Moral Development: Meaning, Stages (Kohlberg), Factors affecting Moral Development, Characteristics of Moral Development during Childhood and Adolescence.
- Childhood and Adolescence: Meaning, Characteristics, Problems of Adolescence Period.

UNIT 4: Cognitive and Personality Development

- Cognitive Development: Meaning, Factors affecting Cognitive Development, Characteristics of Cognitive Development during Childhood and Adolescence.
- Theories of Cognitive Development (Piaget and Bruner).
- Personality Development: Meaning, Factors affecting Personality, Developmental Stages of Personality (Views of Sigmund Freud and Allport).
- Adjustment: Meaning, Types and Factors affecting Adjustment, Symptoms of Maladjustment and Role of the Teacher.

Activities (Any one of the following)

1. Prepare a report of administration and interpretation of any one psychological test, selecting one from: Personality/Adjustment/Mental Health.
2. Visit to a school and write a report on problems being faced by the students.
3. Administration of an individual test and preparing a report.

Suggested Readings

1. Aggarwal, J.C (1994). Essentials of Educational Psychology. New House Delhi: Vikas Public House.
2. Berk, L.E (2012). Child Development (6th Ed.) New Delhi: Prentice Hall of India.
3. Bhatnagar, S. (1980). Psychological Foundations of Teaching Learning and Develop Meerut: Loyal Book Depot.

UNDERSTANDING DISCIPLINES AND SUBJECTS

Paper Code-AUBAED / AUBSCED- 302 **Marks: 50 (40 + 10)**

Course objectives:
The student teachers will be able to:

1. Understand the nature of discipline and school subjects.
2. Differentiate between school subjects and curriculum.
3. Integrate and apply concepts and theories in real classrooms

UNIT-1: Concept of Discipline

- Nature and role of Discipline knowledge in School Curriculum.
- Paradigm shift in the nature of discipline, Emergence of School subjects and disciplines from Philosophical, Social and Political Contexts.
- Needed changes in the Discipline Oriented Text Books.

UNIT-2: Quality in Classroom Learning

- Indicators of Quality Learning.
- Teaching and Learning as Interactive Process.
- Major issues in classroom learning: Catering individual differences, student-teacher interaction in the classroom.
- Learning beyond text books- other sources of learning.

Activity (Any one of the following)

1. Prepare a report mentioning the changes required in current school level text books prescribed by CBSE or HPBSE.
2. Prepare a report highlighting major issues and concerns in teaching of Mathematics or English at secondary school stage.

SUGGESTED READINGS

1. Apple, M. (1978): Ideology and Curriculum, New York: Routledge.
2. Fuller, B. (2007): Standardized Childhood, Stanford, CA: Stanford University Press.
3. Romero-Little, M.E. (2006). Honoring Our Own: Rethinking Indigenous Languages and Literary. Anthropology and Education quarterly, *37*(4), 399-402.

LANGUAGE ACROSS THE CURRICULUM

Paper Code-AUBAED / AUBSCED- 303 **Marks: 50 (40 + 10)**

Course Objectives:

The student teachers will be able to:

1. Understand the nature, importance and use of Language.
2. Acquaint with some latest methods and approaches for planning of successful language teaching.
3. Identify and be sensitive to the proficiency, interests and needs of learners.
4. Practice learner centered methods and techniques in the classroom.
5. Use technology to enrich language teaching,
6. Encourage continuous professional development.

UNIT 1 - LANGUAGE AND SOCIETY

- Meaning, Nature and Scope of Language, Role of Language in life: Intellectual, Emotional, Social, Literary and Cultural Development.
- Characteristics of Language Development.
- Factors affecting Language Learning: Physical, Psychological and Social.
- Theories of Language: Divine Gift Theory, the Pooh or the Interjectional Theory. The Ding-Dong Theory. The sing- song Theory, The Ta - Ta Theory, The Babble- Luck Theory. The Tongue-Tie Theory.

UNIT 2 - CURRICULAR PROVISIONS, POLICIES FOR LANGUAGE EDUCATION AND DEVELOPMENT OF LANGUAGE SKILLS

- Position of Languages in India; Article 343-351, 350A; of Constitution of India.
- Kothari Commission (1964-66): NPE-1986; POA-1992; National Curriculum of India. Framework-2005 (Language Education), NCFTE - 2009 (Language Education).
- Meaning, Importance and Need for development of Language Skills.
- Approaches to Language Learning: Traditional Method, Textbook Method, Communicative Method, Grammar-cum-Translation Method, Principles and Maxims of Language Learning.

Activities (Any One of the following):

1. Discuss 'Multilingualism as a Resource.
2. Analyze advertisements aired on Radio Television on the basis of language and gender,
3. Analyze few passages from Science, Social Science and Maths textbooks of Classes VI to VII and Write a Report based on Following Issues
    a) how the different registers of language have been introduced
    b) Does the language clearly convey the meaning of the topic being discussed?
    c) Is the language learner-friendly?
    d) Is the language too technical?
    e) Does it help in language learning?

SUGGESTED READINGS

1. Valdmen (1987) Trends in Language Teaching, New York, London: Mcgraw Hill.
2. Johnson, K (1983): Communicative Syllabus Design and Methodology. Oxford: Pergamon press
3. Sharma, KL.(2012): Methods of Teaching English in India, Agra, lakshmi Narain Agarwal Publisher
4. Kohli, A.L: Techniques of Teaching English, New Delhi: Dhanpat Rai Publisher.
5. Geéta Rai (2010): Teaching of English, Meerut: R. LAL book DEPOT.
6. Praveen Sharma (2008): Teaching of English language, Delhi: Shipra Publications.
7. Joseph Mukalel C. (2011). Teaching of English Language, New Delhi: DiscoveringPublishing House.
8. Sharma Yogendra K. Sharma Madhulika (2011): Teaching of English Language, New Delhi: Kanishka Publishers, Distributors.
9. Sharma R.A. (2007): Teaching of English Education, Meerut: A. Lall Book Depot.
10. Mangal, U. (2010) Teaching of Hindi, New Delhi: Arya Book Depot.
11. National Curriculum Frame Work (2005), New Delhi: NCERT.

English (Core)

PAPER CODE: AUBAED/AUBSCED-304 **Marks: 100 (60+40)**

UNIT-I Essays

i. The Power of Prayer by A. P. J. Abdul Kalam

ii. Vivekananda: The Great Journey to the West by Romain Rolland

iii. More Than 100 Million Women are Missing by Amartya Sen

iv. On the Ignorance of the Learned (Excerpts by William Hazlitt)

v. Simply Living (Excerpts by Ruskin Bond).

UNIT-II Poetry.

i Bacon 'Of Studies'

ii Richard Steele 'Recollections of Childhood'

iii Joseph Addison 'Sir Roger at Church'

iv Charles Lamb 'The Convalescent'

UNIT-III Applied Grammar

i One Word Substitution (5 Expressions)

ii Words Used as Nouns and Verbs (5 words)

(Students will be required to use the given words in sentences both as nouns and verbs)

iii Transformation Interchange of Degree

(5 Sentences in all) , Homonyms, Homographs and Homophones (5 words)

(Students will be required to use the given words in sentences so as to illustrate their meaning).

UNIT-IV Classroom Activity

i Reading, Speaking and Listening Exercises

ii Conversation

iii Etiquettes: Personality Development

Comparative Government and Politics

Course Code-AUBAED- 305 (i) **Marks: 100**
(60+40)

Course Content

UNIT I Comparative Politics

Nature, Scope and Methods, Authoritarian and Democratic Regimes.

Classification of Political Systems**:** Parliamentary and Presidential- UK and USA; Federal and Unitary- Canada and China.

UNIT II Electoral System

First Past the post; Proportional representation.

Party System**:** One party, Bi-Party and Multi-Party System. Notion of the Welfare State

Suggested Readings:

1. Bombwall K.R. Major Contemporary Constitutional syste.
2. A. C. Kapoor Comparative Government and Politics.
3. R.C. Aggarwal Comparative Government Politics.
4. L Sikri Comparative Constitution (Kalyani Publication).

INTRODUCTION TO INTERNATIONAL RELATIONS

Course Code-AUBAED- 305 (ii)

Unit III International Relations

Definition, Nature and Scope of International Relations

Approaches to study the International Relations;

(a) Classical Realism (Hans Morgenthau),

(b) World System Approach (Immanuel Wallerstein) and;

(c) Dependency model (Andre Gunder Frank)

Unit IV Cold War

Meaning, Nature, Causes, Development and Impact of Cold War.

Post Cold- War Era and Emerging Centers of Power (European Union, China, Russia and Japan)

India Foreign Policy (a) Basic Determinants (Historical, Geo-Political, Economic, Domestic and Strategic) Policy of Non-alignment.

Suggested Readings:-

1. M. Nicholson, (2002)
2. R. Jackson and G. Sorensen, (2007)
3. Brown and K. Ainely (2009)
4. S.Joshua Goldstein and J. Pevehouse (2007)

History of India from 1206 to 1707 AD

Paper Code- AUBAED-306 **Marks: 100 (60+40)**

Unit -1

(a) Foundation, Expansion and Consolidation of the Delhi Sultanate. C. 13th to 15th century: Expansion; Iqta System; Administration and Economic reforms.

(b) Regional political formation: Vijayanagara and Bahamani Kingdoms.

Unit-2

(a) Second Afghan State: Adminstration of Sher Shah and his revenue reforms.

(b) Socio-religious movement: Bhakti and Sufi

1) Nathpanthis, Papular Monotheism and Vaishnavism in north India.

2) Main Sufi Silsilahs in India: Chishti and Suhrawardi.

Unit -3

(a) Foundation, expansion and consolidation of the Mughal State. c. 16th to 17th century: expansion & consolidation; Mansabdari & Jagirdari; imperial ideology: assessment of Aurangzeb`s policies.

(b) Art and Architecture in Medieval India: Qutab Complex; Vijayanagara (Hampi); Fatehpur Sikri;

Mughal Miniature Painting.

Unit -4

(a) 17th century transitions; Marathas; Sikhs.

(b) Disintegration and decline of the Mughal Empire; different theories of Mughal decline (Hindu Reaction, Great Firm Theory, agrarian crisis, jagirdari crisis ,region – centric approach, cultural

Failure and others).

Reference Books:-

1) History of Delhi Sultanate by M.H. Syed.or by S. Ram & Shiv Gajrani.
2) Sher Shah Suri by Basheer Ahmad Khan Matta, 2005.
3) Bhakti and Sufi Movement by Mahesh Vikram Singh & Brij Bhushan Shrivastava.
4) The Great Mughals of India and their India by Dirk Collier.
5) The Mughal of India by HarbansMukhia.
6) History of the Marathas by R.S. Chaurasia.
7)Art & Architecture in Medieval India by Saktipada Datta.

Sociological Theories

Course Code-(AUBAED 307) **Marks: 100 (60+40)**

UNIT I

- AUGUST COMTE:
  - Law of three stages
  - Hierarchy of sciences

UNIT II

- KARL MARX:
  - Dialectical materialism; materialistic interpretation of history
  - Class and class struggle

UNIT III

- MAX WEBER:
  - Social action (meaning, characteristics and types)
  - Power and authority

UNIT IV

- EMILE DURKHEIM:
  - Theory of religion (meaning, beliefs, rituals, sacred, profane, totemism and function)
  - Social solidarity (meaning, characteristics and types)

❖ **REFERENCE BOOKS:**

- Introduction to positive philosophy-August Comte.
- Hierarchy in natural and social sciences- Denise Pumain.
- Dialectical materialism: an introduction- Maurice Cornforth.
- The communist Menifes to- Karl mark and Friedrich Engles.
- The structure of social action-Talcott Parsons
- Essays in sociology-Max Weber

FOURTH SEMESTER
Learning and Teaching

Paper Code (AUBAED/AUBSCED- 40l) **Marks: 100 (60 + 40)**

Course objectives:

The student teachers will be able to:

1. Understand the nature, characteristics of learner and principles to mako teaching-learning effective and productive.
2. Explain the concept, nature of learning as a process and conditions of learning.
3. Describe the Gagne's types of learning.
4. Explain the concept, types and strategies to develop memory.
5. Understand nature, causes, factors and strategies to minimize forgetting.
6. Apply the knowledge and understanding of the learning process, principles and theories of learning with their educational Implications.
7. Describe the concept, Importance and level of transfer of learning.

Unit 1 Learner and Learning

- Changing Nature of Learner, Characteristics of Effective Learner, Guiding Principles to make Teaching-Learning Effective and Productive.
- Concept and Nature of Learning as a Process, Learning Curve, Conditions of Learning - objective, subjective and methodological, Learning and Maturation.
- Gagne's Types of Learning, Events of Instruction, Learning Outcome.
- Memory - Concept, Types and Strategies to develop Memory; Forgetting - Nature, Factors and Strategies to Minimize Forgetting.

Unit 2 Understanding the Learning Process

- Learning: Meaning, Types and Levels of Concept Development, Strategies for Concept Learning.
- Learning through Association- Classical Conditioning, learning through Consequences - Operant Conditioning, learning through Trial and Error, learning through Observation Modeling/Observational Learning, Learning through Insight- Discovery Learning and their Educational implications.
- Social Constructivist Learning - Concept of Vygotsky, Educational Implications.
- Transfer of Learning: Concept, Types and Strategies to Maximize Transfer of Learning.

Unit 3 Teacher and Teaching

- Teacher: Qualities and Role in the Changing Scenario - Transmitter of Knowledge, Model, Facilitator.
- Concept of Teaching, Principles and Maxims of Teaching
- Teaching as a Profession: Meaning of Profession, Characteristics of a Profession, Professional Ethics for the Teachers, Role of Teacher Training in Developing Professionalism in Teachers Educators.

- Relationship between Teaching and Learning, Principles of effective Teaching and Learning.

Unit IV Phases and Models of Teaching

- Phases of Teaching: Pre-active, Interactive and Post Active. Operations involved in each.
- Models of Teaching: Meaning, Need, Types and Elements of Model of Teaching, Basic Teaching Models (Glaser).
- Concept Attainment Model (Bruner) and Advance Organiser Model (Ausbel).
- Strategies of Teaching: Brainstorming, Simulation. Role Play and Gaming,

Activities - (Any one of the following)

1. A study of educational, social & cultural functions of any informal agency of education.
2. Prepare a report of educational problems of learners in any school.
3. Prepare a report of problem of SC/ST/Backward/ Minority group of children in the rural & urban area of Himachal Pradesh.

Suggested Readings

1. Bower, G H and Hilgard E R (1981) Theories of learning, Englewood Cliffs, New Jersey: Prentice Hall Inc.
2. Chauhan S.S. (1995) Advanced Educational Psychology, New Delhi: Vikas Publishing House Pvt. Ltd.
3. Mangal S.K. 2005) Advanced Educational Psychology, New Delhi. Prentice Hall of India.
4. Dandapani S. (2005). Advanced Educational Psychology, New Delhi: Anmol Publications.
5. NCERT (2005) National Curriculum Framework, New Delhi.
6. NCTE (2009) National Curriculum Framework for Teacher Education, New Delhi.

DRAMA AND ART IN EDUCATION

Paper Code - (AUBAED/AUBSCED -402) **Marks: 50 (40 + 10)**

Course objectives:

The student teachers will be able to:

1. Understand the concept and importance of various arts in human life.
2. Understand aims, objectives and principles of performing and visual arts.
3. Appreciate Indian folk and visual and performing arts.
4. Understand various methods and techniques of teaching creative arts.
5. Understand the importance of visits in arts exhibitions and cultural festivals.

UNIT-I Origin and Development of Art in India.

- Meaning of Art: Concept and Scope of Art.
- Origin & development of Arts in India with special reference to the performing and visual arts.
- Importance of various Arts in Life and Education.
- Aims and objective of teaching performing and visual arts, Principles of Art.

UNIT-II Methods and Approaches of Teaching Creative Arts

- Understanding Indian folk and visual and performing arts.
- Methods of teaching creative arts: a. Lecture cum Demonstration method, b. Direct Observation method. c. Method of Imagination and Free Expression.
- Importance of visits in art exhibitions and cultural festivals.
- Process of preparing canvas, Types of Colours and Paints.

Activity (Any one of the following):

Practical work to be submitted by students during the session: Size- Imperial Size Sheet. One Canvas in size 18'X 22' to be submitted along with the sheets.

1. Landscapes –1
2. Still life – 1
3. Poster-1

Suggested Readings:

1. Brown, Percy (1953). Indian Painting, Calcutta.
2. Chawla, S.S. (1986). Teaching of Art. Patiala: Publication Bureau, Punjabi University.
3. Harriet, Goldstein (1964). Art in Everyday Life. Calcutta: Oxford and IBH Publishing Company
4. Jaswani, K.K., Teaching and Appreciation of Art in Schools. Lowenfeld Viktor.
5. Creative and Mental Growth. Margaret, Marie Deneck (1976)
6. Indian Art. London: The Himalaya Publication.
7. Sharma, L.C., History of Art, Meerut: Goel Publishing House.
8. Read.Herbert. Education through Art [paperback).
9. Shelar, Sanjay. Still Life. Jyotsna Prakashan.

TEXT READING AND REFLECTIONS

Paper Code - (AUBAED/AUBSCED-403) **Marks: 50 (40 + 10)**

Course objectives: The student teachers will be able to:

1. Learn to read Newspaper Follow Radio, TV & Internet media critically and with understanding.
2. Form and exchange viewpoints on political and social Issues.
3. Distinguish fact, fiction and opinion in Newspaper articles.
4. Develop teachers professionally and support their aspirations as teachers.

UNIT-1 Analytical and Critical Thinking

- Analytical and Critical Thinking: Meaning and Importance for Reading and Writing. Role of Critical Reading and Critical Thinking in Enhancing Writing Skills.
- Ways of Developing Reading Skills, Importance of Developing Reading Skills; Reading Aloud and Silent Reading; Extensive Reading, Study Skills including using Thesaurus, Dictionary, Encyclopedia.
- Ways of developing Writing Skills: Formal and Informal Writing (such as Poetry, Short Story, Letter, Diary, Notices, Articles, Reports, Dialogue, Speech and Advertisement.

UNIT-II Pedagogies of Reading and Writing

- Models for Assessing the components of Reading (Phonemic Awareness, Phonics, Fluency, Vocabulary, and Text Comprehension).
- Instructional Approaches for Developing Students' Concepts of Grammar, Punctuation, Spelling and Handwriting.
- Responding to the Texts: Approach to Response Based Study (The Core of the Text, Personal Connection. Reading Beyond the Text, Revisiting the Text).
- Responding to the Contexts: Sharing Responses (Purpose of Sharing. Role of the Teacher and Benefits of Sharing)

ACTIVITIES (Any one of the following):

1. Writing a review or a summary of the text with comments and opinion.
2. Student teacher will select news paper/magazine articles on topics of contemporary issues.
3. REFLECTION EXERCISES:
    a) Why did this particular (event, barrier, success, accident) happen?
    b) What was the best thing I did and Why?
    c) If I did this again tomorrow, what would I do differently?

SUGGESTED READINGS:

1. Alberta Learning (2003), Responding to Text and Context, Senior High School English Language Arts Guideto Implementation. Alberta, Canada. Retrieved from https://education.alberta.ca/media/883678/4_respond.pdf.
2. Cottrell Stella (2011) Critical Thinking Skills: Developing Effective Analysis and Argument (Palgrave study skills) Basingstoke: Palgrave Macmillan
3. Cox, Ailsa (2005) Writing Short Stories (English) London: Routledge.
4. Fisher Alec (2001) Critical Thinking:An Introduction, UK: Cambridge University press.
5. Fitkids T.J. (2011) Common Mistakes in English (With Exercises), New Delhi: Jain Book Agency.

English (Core)

PAPER CODE: AUBAED/AUBSCED-404 **Marks:100 (60+40)**

Unit -I

British Literature (Play and Novel)

Drama - William Shakespeare: Macbeth

Unit II

Non-Detailed Study:

Novel - Charles Dickens: *Oliver Twist*

Unit III

i Prem Chand, ―The Holy Panchayat

ii Vaikom Muhammad Basheer, ―The Card-Sharper's Daughter

iii Saadat Hasan Manto, ―Toba Tek Singh

iv Ambai, ―Squirrel‖

v. Ismat Chugtai, ―The Sacred Duty

UNIT IV

i. "Toys" by Roland Barthes
ii. "Indian Movie, New Jersey" by Chitra Banerjee Divakaruni
iii. "The Brand Expands" by Naomi Klein

Selections from Vinod Sood, et al, eds. The Individual and Society: Essays, Stories and Poems. Delhi: Pearson, 2005.

Legislative Support

Paper Code-AUBAED-405 (i) **Marks 100 (60+40)**

Course Content:

Unit I

Power and Function of peoples representatives
Local Government (Rural and Urban)
State Legislative and Parliament.
Supporting the Legislative Process: How a bill becomes a Law , Rule of the Standing Committee in the making of law.

Unit II

Legislative Committees: Nature, Role and Types of Committees.

Reading of Budget documents:
Role of Parliament in Passing the Urban Budget,
Raising the demands for grants.

Public Opinion and Survey Research

Paper Code-AUBAED-405 (ii)

Course Content:

Unit III

Public Opinion: Meaning and Features. Public Opinion and Democracy.
Representation and Sampling: (a) Sample- Meaning and Utility;
(b) Types: Random, Non-Random and Stratified sampling.

Unit IV

Understanding Survey research: (a) Interview techniques

(b) Questionnaire method.

Quantitative Data: Meaning, Analysis and interpretation.

Understanding the opinion and exit polls.

Suggested Readings:-

1. M.R Madhavan & N. Wahi(2008) Financing of election Campaings PRS, Centre for policy Research New Delhi.
2. S, vanka Primer on MPLADS Centre for Policy Research New Delhi, (2008)
3. Government of India (lok Sabha Secretariat) Parliamentary Procedures (abstract Series), 2009.
4 Bhanu Pratap Metha India's Unlikely Democracy: the rise of Judicial Sovereignty, Journal of Democracy vol.18

History of India 1707 to 1950 AD

Course code- AUBAED-406 **Marks: 100 (60+40)**

Credits-4 (L-4, T-0)

Unit -1

a) India in the 18th century; Society, Economy, Polity and Culture.

b) Expansion and consolidation of British power with special reference to Bangal, Mysore & Marathas.

Unit -2

a) Making of a colonial economy:-

1) Land Revenue Settlements: Parmanent ,Ryotwari & Mahalwari.

2) De- industrialization; commercialization of agriculture.

b) Socio-religious reform movement in the 19th century and after;

1) Raja Ram Mohan Roy and Brahmo Samaj: Dayanand and Arya Samaj; Ishwar Chandra Vidyasagar & Widow remarriage; Jyotiba Phule & Satya Shodhak Samaj; Syed Ahmad Khan &Aligarh movement.

2) Caste questions; Phule, Narayana Guru and Ambedkar.

Unit-3

a) Popular resistance:

1) The Uprising of 1857.

2) Peasant resistance to colonial rule; Santhal Uprising (1856);Indigo Rebellion (1860); Pabna Agrarian League (1873); Deccan Riots (1875).

b) Nationalist politics, 1885 -1947.

1) Foundation of the Indian National Congress.

2) Moderates and Radicals in the Indian National Movements.

3) Revolutionary movement for Indian Independence; ideas and contribution of Bhagat Singh and Veer Savarkar.

4) Mahatma Gandhi and mass nationalism; Gandhian thought, techniques and movements.

Unit-4

a) Growth of communal politics and the partition in India; resettlement of refugees and issue with Pakistan, Integration of the Indian States; Hyderabad, Junagarh and Kashmir.

b) Independence, Indian Constitution and its main features and the establishment of the republic.

Reference Books:-

1) The British in India by David Gilmour.
2) The Economic History of India 1857-1947 3rd Edition by Tirthankar Roy.
3) The New Cambridge History of India by Kenneth W. Jones.
4) Indian Nationalism by S. Irfan Habib.
5) History of Indian National Congress 1885-2002 by Deep Chand Bandhu.
6) The Indian War of Independence 1857, by Veer Savarkar.

Methods of Sociological Enquiry

Course Code- AUBAED 407 **Marks: 100 (60+40)**

- **UNIT I**
  - LOGIC OF SOCIAL RESEARCH:
    - Meaning, steps and types of social research.
    - Objectivity and subjectivity in social research.
- **UNIT II**
  - METHODOLOGICAL PERSPECTIVES:
    - Scientific method.
    - Comparative method: case study method
- **UNIT III**
  - MODES OF ENQUIRY:
    - Theory and research.
    - Theory and fact.
- **UNIT IV**
  - TOOLS OF DATA COLLECTION:
    - Observation and interview method.
    - Interview schedule and questionnaire.

- **REFERENCE BOOKS:**
  - Scientific method and social research- B.N. Ghosh
  - Social research methods- W. Lawrence Neuman
  - Themes and perspectives in Indian sociology- D.N. Dhanagore
  - Case study research and applications (design & methods)-Robert K.
  - Research design: Qualitative, Quantitative & mixed method approaches- John W. Creswell.
  - Statistical methods for research- K. Kalyanaraman.
  - Complete guide to writing questionnaires-David F. Harris
  - Research methodology-Deepak Chawla & Neena Sondhi

FIFTH SEMESTER

ASSESSMENT FOR LEARNING

Paper Code (AUBAED/AUBSCED-501) **Marks: 100 (60 + 40)**

Course Objectives:
The student-teachers will be able to;

1. Understand the nature of assessment and its role in teaching-learning process.
2. Understand the different perspectives of learning on assessment.
3. Realize the need for school-based assessment in schools.
4. Examine the contextual roles of different forms of assessment.
5. Understand the different dimensions of learning and the related assessment procedures, tools and techniques.

Unit-1 Perspectives on Assessment

- Concept of measurement, assessment, evaluation and their interrelationship.
- Purposes of Assessment: Prognostic, Monitoring of Learning. Providing Feedback, Selection, Promotion, Placement, Certification, Grading and Diagnostic.
- Classification of assessment: based on purpose (prognostic, formative, diagnostic and summative), nature of Interpretation (norm-referenced, criterion-referenced).
- Need for continuous and comprehensive school-based assessment: Grading: Concept, Types and Application Indicators for grading,

Unit 2 Assessment of Learning

- Dimensions of learning: cognitive, affective and performance.
- Assessment of cognitive learning: types and levels of cognitive learning: understanding and application. Thinking skills - convergent, divergent, critical, problem solving, decision making and procedures for their assessment.
- Assessment of affective learning: Attitudes, values, interests and procedures for their assessment.
- Assessment of Performance. Tools and techniques for assessment of skills.

Unit 3 Planning, Executing, Interpreting and Reporting of Assessment

- Construction/ Selection of test items: Guidelines for construction of test items.
- Guidelines for administration and scoring, Preparation of blueprint; Performing item analysis.
- Processing test performance: Calculation of percentages and central tendency measures: graphical representations; Analysis and interpretation of learners' performance; Reporting learners' performance - Progress report. Cumulative records, Portfolios.
- Means of providing remedial instruction for improving learning.

Unit 4 Issues, Concerns and Trends in Learning Assessment

- Existing Practices: Unit tests, half-yearly and annual examinations, semester system, Board examinations and Entrance tests, State and National achievement surveys, Use of question banks.
- Issues and Problems: Marking Vs. Grading. Non-detention policy, Objectivity Vs Subjectivity,

- Policy perspectives on examinations and assessment: Recommendations of NPE, 1986 and NCF, 2005.
- Trends in assessment and evaluation: Online examination, Peer assessment, Self-Assessment, Computer-based examinations and other technology-based assessment practices.

*** Activity (Any One of the Following):**

1. Construct an achievement test in any subject of your interest containing a minimum of 50 items with its marking scheme and scoring procedure, evaluation practices adopted by the school teachers.
2. Visit an elementary school and prepare a report on the assessment and prepare a report on the assessment and evaluation practices adopted by the school teachers.
3. Study the parameters / indicators followed in Continuous and Comprehensive Assessment System of CBSE and HP State Education Department. Prepare a critical report highlighting the similarities and differences in the two systems.
4. Visit a school and study how the progress reports and cumulative records of students are maintained by the teachers. Prepare a detailed report highlighting the content and format of students' progress reports and cumulative records.

***Suggested Readings:**

1. Bransford, J., Brown, AL, & Cocking. RR. (Eds.) (2000). How People Learn: Brain,
2. Mind, Experience, and School. Washington, DC: National Academy Press. Burke, K. (2005).
3. Nandra, Inder Dev Singh (2012). Learning Resources and Assessment of Leaming.Patiala: 21" Century Publications.
4. Natrajan and Kulshreshta S.P. (1983). Assessing Non-Scholastic Aspects-Learners Behaviour, New Delhi: Association of Indian Universities.
5. NCERT(1985) Curriculum and Evaluation, New Delhi.

GENDER, SCHOOL AND SOCIETY

Paper Code-(AUBAED/AUBSCED-502) **Marks: 50 (40+10)**

Course Objectives:

The student-teachers will be able to:

1. Develop basic understanding and familiarity with key concepts: Gender bias, gender stereotype, empowerment, equity and equality, patriarchy, matriarchy, masculinity and feminism.
2. Understand some important landmarks in connection with gender and education in the historical and contemporary perspective.
3. Learn about gender issues in school curriculum, textual materials across discipline, pedagogical processes and its interaction with class, caste, religion and region.

Unit-1 Gender Issues and Gender Studies

- Concept of Gender: Meaning of gender equality, need and importance, Gender bias, Gender stereotypes.
- Gender equity and equality in India in relation to caste, class, religion, ethnicity, disability and region.
- Historical backdrop: Some landmarks from social reform movements of the 19^{th} and 20^{th} centuries with focus on women education.
- Policy Initiatives for Gender equality and women empowerment in India.

Unit –2 Gender, Education and Empowerment

- Socialization theory of gender and educational implications.
- Gender identities and socialization practices in: family, school, other formal and informal organizations.
- Schooling of girls: Inequalities and resistances, issues of access, retention and exclusion (infrastructure and hidden curriculum).
- Role of education in dealing with social Issues: Domestic violence against women, female foeticide and infanticide and dowry.

Activity:

1. Development of a project on the organizational climate of two schools' single sex and co-educational school.

References:

1. Aaker's. (1994) Feminist Theory and The Study of Gender and Education In S. Acker, Gendered Education: Sociological Reflections on Women. Teaching and Feminism, Buckigham Open University Press.
2. Bars, O. (1971) Sociology of Education Ed. 2 London: Batsford.
3. Shokeshaft, Charol (1989), Women in Education Administration, New Bury Park:Sage Publication.
4. Devendra, K (1994). Changing Status of Woman in India, New Delhi: Vikas Publishing House.
5. Gupta, AK. (1986). Women and Society. New Delhi: Sterling Publication.

INCLUSIVE SCHOOL

Paper Code - (AUBAED/AUBSCED-503) **Marks: 50 (40+10)**

Course Objectives:

The student teachers will be able to:

1. Understand the concept, nature and types of disabilities.
2. Identify the characteristics and need, identification of different types of disabled children.
3. Understand the concept, nature and approaches of inclusion in education.
4. Understand and reflect on models of inclusion in education.
5. Acquire knowledge and understanding about the provisions made for disabled children under SSA and RTE Act, 20096.
6. Understand different pedagogical and assessment techniques for inclusion of CWSN.
7. Employ different pedagogical approaches for inclusion of CWSN in regular schools.

Unit-1 Disabilities and Inclusion in Education

- Disability: Concept and Nature; Disabled Children: Types, Characteristics and their identification.
- Inclusion in Education: Meaning, Need, Scope and Advantages.
- Constitutional Provisions for Inclusion in Education: Sarva Shiksha Abhiyan and Right to Education Act, 2009. Infrastructural Facilities required for Inclusion in Schools: Concept of Resource Room.
- Approaches to Inclusion: Full Inclusion and Partial Inclusion; Models of Inclusion: Consultant Model, 3-Dimensional (3D) Model of Inclusion: Ways of Ensuring Community/Parents' Participation in Creating Inclusive Schools.

Unit - 2 Pedagogical and Assessment Approaches for Creating Inclusive Schools

- Pedagogical Approaches for CWSN: Curriculum Adaptation, Activity-based Learning, Developing Specially Designed Resource Materials, Collaborative and Cooperative Learning, Team Teaching.
- Assessment Approaches for CWSN: Observation, Continuous and Comprehensive Assessment (Formative and Diagnostic Assessment).
- Identifying Barriers to Learning and Participation of CWSN.
- Means of Providing Remedial Instruction and Feedback; Role of School Head and Teachers in Evolving Inclusive Practices and Developing Inclusive Values.

Activity (Any one of the following):

1. Visit a primary school in your locality and identity the pedagogical practices employed by the teachers for inclusion of CWSN. Prepare a detailed report highlighting pedagogical practices, their relevance and difficulties faced by teachers.
2. Visit a School where resource room has been established by the State Govt. Interact with the in-charge of resource room and prepare a report highlighting its layout, types of equipment and their usage by the teachers for imparting education in inclusive settings.

Suggested Readings:

1. Alur, Mithu and Bach, Michael (2009). The Journey for Inclusive Education in the Indian Sub-Continent. New York: Routledge.)
2. Das, Shankar and Kattumuri, Ruth (2013). Inclusive Education: AContextual Working Model. New Delhi: Concept Publishing Company)
3. Friend, M. and Bursuck, W. D. (1999), Including Students with Special Needs: A Practical Guide for Classroom Teacher. Boston: Allyn and Bacon.)
4. Mangal, S. K. (2009) Educating Exceptional Children: An Introduction to Special Education. New Delhi: Prentice Hall

English (Core)

PAPER CODE AUBAED/AUBSCED-504 **Marks:100 (60+40)**

UNIT-I

Literary Terms: Plot, Characterization, Dialogue, Monologue, Soliloquy, Aside, Narrator, Persona, Irony, Metaphor, Simile, Metonymy, Alliteration, Rhyme, Onomatopoeia, Oxymoron, Point of View and Them

UNIT-II

i. Ozymandias

ii. Blow Blow thou Winter Wind

i. Good Morrow

iv. The Man he Killed

v. Lines Written in Early Spring

Poems from *The Blossoming Mind.* Ed. V. K. Khanna and Meenakshi F. Paul. New Delhi: Macmillan.

UNIT-III

i. "The Parrot in the Cage"

ii. "Dinner for the Boss"

iii. "The Reddening Tree"

iv. "At the Himalayas"

Stories and **Essays** from *Life Unfolded.* Ed. V. K. Khanna and Meenakshi F. Paul. New Delhi: Oxford University Press.

UNIT-IV

Applied Grammar:

The use of Articles, Prepositions, Verb Forms, Phrasal Verbs and Comprehension (The literary pieces incorporated in the course are to be used as tools to teach language through literature with emphasis on reading, listening, comprehension, summarizing, inference and discussion.)

Democratic Awareness with Legal Literacy

Course Code: AUBAED 505 **Marks: 100 (60+40)**

Course Content:

Unit I

Outlining the Legal system in India; criminal and civil courts; juvenile courts, Mahila courts, Role of tribunals.

Unit II

Understanding the application of law. Criminal jurisdiction, filing an FIR, arrest, bail search and seizure. Prevention of atrocities on Scheduled Castes and Scheduled Tribes.

Unit III

Dowry, sexual harassment and violence against women. Consumer rights and Cybercrimes.

Unit IV

Functioning of Legal System: Legal Services Authorities Act, Preventive detention Act and NSA.

Suggested Readings:

- Creating Legal Awareness, edited by Kamala Sankaran and Ujjwal Singh (Delhi: OUP, 2007)
- Legal literacy: available amongst interdisciplinary courses on Institute of Life Long Learning (Delhi University) Virtual Learning Portal namely vle.du.ac.in
- Sagade, Jaga, Law of Maintenance: An Empirical Study, ILS Law College, Pune 1996. 26
- Nomita Aggrawal, Women and Law in India, New Century, Delhi,2002.
- P. C. Rao and William Sheffiled Alternate Dispute Resolution: What it is and How it works, Universal Law Books and Publishers, Delhi, 2002.
- V. N. Shukla's Constitution of India by Mahendra P. Singh, Eastern Book Co. 10th edition 2001.

Modern and Contemporary World History 1: 1871-1919

Course Code: AUBAED-506 **Marks: 100 (60+40)**

Unit I Introductory;

- Modern & Contemporary History: Main characteristics.
- Emergence of Italy and Germany as unified nations.
- European hegemony and inter-imperialist rivalries, conflicts with Europe.
- Alliance formation, social tension and socialist movements.

Unit II The Emergence of USA after the Civil War

- The emergence of the USA after the Civil War.
- Japan's Emergence as a World Power: Modernization and economic progress under restoration. Sino-Japanese War.
- Nationalist movements in Asia: Rise of Kuomintang and the fall of the Manchus and its aftermath.
- Ottoman Empire and the Arab World: Accession of Sultan Abdul Hamid and the Young Ottoman Movement, Young Turk revolution of 1905.

Unit III The End of the Christ Regime in Russia

- Russo Japanese War of 1904-S and its consequences.
- Revolution of 1905.
- Towards Bolshevik Revolution: February March Revolution.
- The October Revolution of 1917 and the socio-economic foundation of a socialist state.

Unit IV The First World War and its Aftermath.

- New grouping of European States.
- Anglo-German Rivalry.
- Causes, events and results of the war.
- The war settlements: Economic and social consequences.

Reference Books :

1. History of the World (English) By Arjun Dev Indira Arjun Dev Orient Blackswan Pvt. Ltd.
2. History Of the Modern World (1500 to 2000 A.D. by Jain & MathurJain Prakashan Mandir.
3. Mastering Modern World History by Norman Lowe. Palgrave Macmillan.
4. Vishwa Itihas by Mahesh Kumar. Cosmos Publishers.
5. A short history of the world by H.G. Wells, Navyug Publishers.

MARRIAGE, FAMILY AND KINSHIP

Course Code: AUBABED 507 **Marks: 100 (60+40)**

Course Objective:

This course aims to highlight and critically examine contemporary concerns in the fields of marriage, family and kinship including theoretical issues and ethnographies with particular on diversity of practices.

Unit I Kinship:

- Meaning, Types and Significance.
- Biological and Social Kinship (Meaning and Categories)

Unit II Marriage:

- Meaning and Objectives of Marriage.
- Types of Marriage (Monogamy and Polygamy)

Unit III Family and Household

- Meaning. Characteristics and Types of Family (Nuclear and Joint)
- Family and Household, Reimagining Families (Changing Structures)

Unit IV Contemporary Issues in Marriage, Family and Kinship

- Emerging Family and Marriage Patterns in India
- Terms and Usages of Kinship and New Trends in Kinship

Reference Books:

1. Family, kinship & marriages in India by Patricia Uberai
2. Marriage families & relationships: making choice in diverse society by Agnes Riedmann & Mary Schwartz
3. Marriage and families by Agnes Riedmann & Mary Schwartz

SIXTH SEMESTER

Contemporary India and Education

Paper Code-(AUBAED/AUBSCED-601) **Marks: 100 (60 +40)**

Course objectives:

The student-teachers will be able to:

1. Understand the Constitutional Provisions for Education in India.
2. Understand the Fundamental Rights, Duties and Directive Principles of the State Policy.
3. Develop competencies to understand the various issues related to Educationand remedial measures.
4. Understand the Constitutional provisions for inequality, discrimination and marginalization in UEE.
5. Understand the importance of Education for the marginalized groups
6. Acquaint with the policy initiatives, educational policies and programme in Contemporary India.

Unit -1 Education and the Indian Constitution.

- Indian Constitution: Preamble, Rights and Duties, Directive Principles of the State Policy and Aims of Education as per Constitutional Values; Constitutional Provisions for Education: Article 14, 15, 21A, 45, 46 and 51A (K).

Unit-2 Inequality, Discrimination and Marginalization in Universalization of Education.

- Equality of Educational Opportunities: Meaning, Objectives and Scope.
- Discrimination: Meaning, Factors and Constitutional Safeguards.
- Right to Education: Historical Development, Provisions, issues and Challenges in implementation.
- Education of the Marginalized Groups (Women and Socially Disadvantaged): Status, Issues and Constitutional Provisions.

Unit-3 Policy Initiatives for Universalization of Elementary Education.

- Kothari Commission (1964-66) and NPE (1986 -1992) and Recommendations for UEE.
- Operation Blackboard: Concept and Provision.
- DPEP and SSA: Objectives, Provisions, Implementation and Evaluation.
- MDM: Objectives, Implementation and Problems.

Unit :4 Emerging Concerns and Education

- Education for Environmental Conservation: Global Environmental Crises, Local Environmental Issues, Steps for Environmental Conservation and Regeneration.
- Liberalization, Globalization and Privatization and their Impact on Indian Education.
- Social Basis of Education in the Context of Society, Culture and Modernity.

Activities (Any One of the following)

1. Presentation on various National Educational Policies.
2. Preparation of reports on the State and Centrally Sponsored Schemes of Education like SSA, RMSA, MDM.
3. Conduct surveys on Educational problems at school level.

REFERENCES:

1. Aggarwal J.C.(1984). Implementation of the Major Recommendations of the Education Commission 1964-66 and The New Pattern of Education India: New Delhi: Arya Book Depot.
2. BhakshiP.M., (1998). The Constitution of India, New Delhi: Universal Law PublishingCompany.
3. Bakshi, P.M. Basu, (2010). Constitution of India (2nd ed.) Delhi: Universal Law Publishing Co.
4. The Constitution of India Bare Act (2010). Delhi: Universal law Publishing Co.
5. Govt. of India (1986). National Policy of Education, MHRD, New Delhi. Govt. of India (1992). Programme of Action (NPE). MHRD, New Delhi.
6. NCERT (1986). School Education in India. Present Status and Future Needs, New Delhi: NCERT Publication. Jan Bostock, Barry K. Gills (2013). The Globalization of Environmental Crisis. New York:Routledge, Publication.

TEACHING OF SOCIAL SCIENCES

Paper Code- (AUBAED-602) **Marks: 50 (40 + 10)**

Course objectives:

The student -teachers will be able to:

1. Understand meaning, nature and scope of social sciences.
2. Understand the need and importance of teaching social sciences and relationship of social sciences with other subjects of school curriculum.
3. Understand aims and objectives of teaching social sciences at school stage.
4. Acquaint with different approaches of teaching social sciences at school stage.
5. Select and use appropriate methods and approaches of teaching social sciences.

UNIT-1 Foundations of Social Sciences Education

- Meaning, nature, need and scope of Social Sciences.
- Importance of Social Sciences, relationship of Social Sciences with other subjects of school curriculum.
- Curriculum in Social Sciences: Meaning, importance and principles of curriculum construction Process of Evaluation of Social Sciences Curriculum at School Level.
- Aims and objectives of teaching Social Sciences at School Stage. Writing instructional objectives in behavioral terms. Co-Curricular activities in Social Sciences.

Unit- II Approaches and Methods of Teaching of Social Sciences.

- Approaches of Teaching Social Sciences: logical, concentric, spiral, chronological and correlational, inductive and deductive.
- Methods and Techniques of Teaching Social Sciences: Meaning. Characteristics, types (Lecture method, lecture-cum-demonstration method, project method, story-telling method, observation method, discussion method, problem solving method and team teaching).
- Techniques of Teaching Social Sciences: Learning by doing, learning by experience, supervised study, role play, brainstorming, field visits and exhibition.

***Activity :**

Prepare a report mentioning in detail the procedure of applying project method of teaching any topic of social sciences. Explain with the help of a suitable example.

Prepare a report on critical analysis of social sciences curriculum prescribed by HPBSE/CBSE for secondary school stage.

***Suggested Readings**:

1. Arora N. D. Awasthy, S. S, 2003. Political Theory, New Dehili;Haranand Publication Pvt.Ltd.
2. Kochar, S.K. (1984) The Teaching of Social Sites. New Delhi Sterling Publishing Pvt. Ltd.
3. Kotter, Elen (2008) Secrets to Success for Social Studies Teachers. Corwin Press
Sage Publication, Oaks, CA 91320.
4. Sharma, BL. Manhart B.K. (2009) Teaching of Social Science. Meerut R. LallBook Depot, Near Government Inter College, 250001 (INDIA)

TEACHING OF ENGLISH

Paper Code -AUBAED-603 (i) **Marks: 50 (40 +10)**

***Course objectives**:

The student teachers will be able to:

1. Understand the nature, importance and use of English language.
2. Identity the proficiency, interests and needs of learners.
3. Understand methods and approaches of Teaching English Language.
4. Develop language skills: listening, speaking, writing and reading for Communication purpose.

Unit 1 Nature of English Language

- Concept, importance and functions of English language.
- Aims and objectives of teaching English language, Writing instructional objectives in behavioral terms.
- Basic Linguistics and General Principles of English Language; Phonetics: Meaning, importance and photonic symbols.
- Curriculum Construction in English: Concept, Principles and Process of Evaluation of English Curriculum at School Level.

Unit 2 Teaching Methods, Approaches and Techniques of Teaching English.

- Methods of Teaching English: Various types of Methods, Dr. West Method, Substitution Method, Bilingual Method, Grammar and Translation method.
- Approaches in Teaching English: The Situational Approach, The Structure Approaches. Linguistic Communicative Approach, Co-Operative Learning.
- Teaching of Prose, Poetry, Composition and Grammar- Objectives and Methodology.
- Techniques of Teaching English: Learning by doing, role play, brainstorming, field visits, cooperative learning technique etc.

***Activities** (Any one of the following):

1. Discussion on the Topic "Mother Tongue and Other Tongue.
2. Organize language games, Quizzes, Debate, group-discussion and other co-curricular activities in the teaching and learning of English.
3. Plan language game as a media for teaching of English in classroom.
4. Prepare a report on critical analysis of English curriculum prescribed by HPBSE/CBSE for secondary school stage.

***REFERENCES:**

1. Valdmen (1987) Trends in Language Teaching. New York, London: Mac Graw Hill.
2. Johnson, K (1963) Communicative Syllabus Design and MethodologyOxford, Pergamon Press.
3. Mukale. JC (1098) Approaches to English Language Teaching. New Delhi Staring Publishing House.
4. Palmer, Harold E.(2014) The Principles of Language Study, New York: Word BookCompany.
5. Sharma, K I(2012) Methods of Teaching English in india, Agra: Lakshm Narain Aggarwal Publisher. London.

Paper code AUBAED- 603 (ii)
TEACHING OF HINDI
(हिंदी शिक्षण)

पाठ्यक्रम: उदेश्य अंक: 50 (40+10)

पाठ्यक्रम के अंत में **छात्र**–अध्यापक निम्नलिखित में **सक्षम होगा**–

1. भाषा का अर्थ, प्रकृति एवं महत्व
2. भाषा की अलग–अलग भूमिका को जानना
3. भाषा के विभिन्न रूपों एवं अभिव्यक्तियों को जानना
4. मातृभाषा, क्षेत्रीय भाषा, विदेशी भाषा के रूप में हिन्दी
5. हिन्दी शिक्षण में गद्य, पद्य, रचना एवं व्याकरण के चरणों एवं उदेश्यों का ज्ञान

इकाई-1

1 भाषा का अर्थ, प्रकृति एवं महत्व

- भाषा का अर्थ एवं परिभाषा
- भाषा की प्रकृति
- भाषा के विभिन्न रूप
- भाषा का महत्व
- मातृभाषा, क्षेत्रीय भाषा, विदेशी भाषा के रूप में हिन्दी
- अनुदेशात्मक उद्देश्यों को व्यवहारिक रूप में लिखना।

2 हिन्दी शिक्षण के उद्देश्य

मातृभाषा के रूप में हिन्दी शिक्षण के उद्देश्य ।

द्विभाषा के रूप में हिन्दी शिक्षण के उद्देश्य।

- व्यावहारिक उदेश्य
- सांस्कृतिक उदेश्य
- साहित्यिक उदेश्य
- **भाषिक** उदेश्य

ध्वनि विज्ञान **का स्वरूप एवं ध्वनियों का वर्गीकरण** -

हिन्दी मे अक्षर विन्यास एवं विराम चिन्ह।

- **पाठ्यक्रम** का अर्थ, महत्व, सिद्धान्त, एवं रूपरेखा।
- हिन्दी पाठ्यक्रम निर्माण एवं समीक्षा विभिन्न शिक्षा आयोगों **द्वारा** हिन्दी पाठ्यक्रम सुधार के सुझाव।

इकाई-2

भाषा शिक्षण के सिद्धान्त एवं सूत्र (मूवी)

1 विधिवत शिक्षण की आवश्यकता।
2 भाषा शिक्षण के सामान्य सिधान्त।
3 शिक्षण सूत्र ।
4 भाषा शिक्षण के मुख्य तत्व ।

हिन्दी शिक्षण पद्धतियां

1. प्रत्यक्ष पदति।
2. व्याकरण पदति।
3. गणक यंत्र आधारित बोधना विधि।
4. समन्वय।
5. शब्द परिवर्तन।
6. **सारांचनात्मक** विधि।

निम्नलिखित में से **छात्र**– अध्यापक **कोई** एक कार्य का चुनाव करके **प्रतिवेदन** तैयार करेगा

1 हिन्दी के साहित्यकारों में से किसी एक साहित्यकार किसी एक विधा का आलोचनात्मक अध्ययन।
2 हिन्दी शिक्षण में मनोरंजनात्मक **क्रियाओं, शब्द** अंताक्षरी, दोहा अंताक्षरी, पहेलियों का आयोजन।

सन्दर्भ पुस्तके:

1. आचार्य, कपिल देव : अर्थ विज्ञान और व्याकरण दर्शन हिन्दुस्तानी एकेडेमी इलाहाबाद
2. उमा, मंगल (2008). हिन्दी शिक्षण, नई दिल्ली : आर्य बुक डिपो
3. कुमार, योगेश (2004). आधुनिक हिन्दी शिक्षण, नई दिल्ली एच. पी. एच **पब्लिशिंग कॉर्पोरेशन**
4. पारीक, **ममता** (2006) हिन्दी शिक्षण जयपुर : कल्पना पब्लिकेशन चांदपॉल बाजार
5. गुप्ता, मनोरमा : भाषा अधिगम केंद्रीय हिन्दी संस्थान आगरा
6. चतुर्वेदी, **शिक्षा** : हिन्दी शिक्षण सूर्या पब्लिकेशन मेरठ
7. तिवारी, भोलानाथ : भाषा विज्ञान कोष किताब महल इलाहाबाद

English (Core)

PAPER CODE AUBAED/AUBSCED-604 **Marks: 100 (60+40)**

UNIT-I

Listening Skills:

- Comprehending
- Retaining
- Responding
- Barriers to Listening
- Overcoming Barriers to Listening

UNIT-II

Emotional Intelligence:

Characteristics of Emotional Intelligence:

- Self-Awareness
- Self-Regulation
- Motivation
- Empathy
- Social and Cultural Sensitivity

Ways to Improve Emotional Intelligence

- Observe how you react to people
- Look at your work environment
- Do a self-evaluation
- Examine how you react to stressful situations
- Take responsibility for your actions
- Examine how your actions affect others

UNIT-III

Technical Writing: Definition and Preparation of Manual, Memorandum, Agenda, Minutes of a Meeting, and PowerPoint Presentation

UNIT IV

- Formal and Informal Letter Writing
- CV/ Resume Writing
- Report Writing
- Interview
- Notice Writing

Democracy and Governance

Course Code: AUBAED 605 **Marks: 100 (60+40)**

Course Content:

Unit I

Structure and process of Governance.
(a) Union Level: President, Prime Minister and Supreme Court.
(b) State Level: Governor, Chief Minister and High Court.

Unit II

(a) Political Communication: Nature, Forms and Importance.
(b) Role of Trade Unions and Farmers Associations.

Unit III

Contemporary Political Economy: Liberlisation and E-governance.

Unit IV

Dynamics of civil Society: New Social Movements (Gender, Tribe, Environment) and NGO's.

Suggested Readings:

B. C. Smith, Good Governance and Development, Palgrave, 2007.

J. Dreze and A. Sen, India: Economic Development and Social Opportunity. New Delhi: Oxford University Press, 1995.

Niraja Gopal Jayal (ed.), Democracy in India, Oxford University Press, 2007.

United Nation Development Programme, Reconceptualising Governance, New York, 1997.

B. Chakrabarty and M. Bhattacharya, (eds.) The Governance Discourse. New Delhi: Oxford University Press, 1998.

Modern and Contemporary World History II: 1919-1992

Paper Code (AUBAED-606) **Marks: 100 (60+40)**

UNIT -I From the Peace Settlement to 1939

- Versatile to Lucarno treaties, their political consequences
- The League of Nations
- USA and USSR
- Era of the Great Depression of 1929 Unit

UNIT II The End of Peace

- The Second World War: Origins
- Wartime diplomacy and the defeat the totalitarian State
- Nationalist movements and decolonization
- The emergence of new world order: UNO, aims and objectives

Unit-III The World since 1949

- Towards Chinese revolution of 1949
- The Cold war and its ideological and political origins
- Impact of the Cold War: Europe, Korea, Vietnam, Cuban crisis
- Military alliances: NATO, SEATO, CENTO, Warsaw Pact

Unit IV Social Conditions and Issues after the Post-Colonial World

- Concept of globalization
- Feminism and ecological movements
- The question of human rights
- Non-Aligned movement: origin, agenda and achievements

Reference Books :

1. History of the World (English) By Arjun Dev Indira Arjun Dev Orient Blackswan Pvt. Ltd.
2. History Of the Modern World (1500 to 2000 A.D. by Jain & Mathur Jain Prakashan Mandir.
3. Mastering Modern World History by Norman Lowe. Palgrave Macmillan.
4. Vishwa Itihas by Mahesh Kumar. Cosmos Publishers.
5. A short history of the world by H.G. Wells, Navyug Publishers

SOCIAL STRATIFICATION

Course Code- AUBABED 607 **Marks: 100 (60+40)**

Course Content

Course Objective: The course introduces the student to various ideas of Social inequality and their sociological study the different form and institutional manifestation of social stratification are explored here both technically and through case studies

Unit- I Social Stratification

- Meaning. Characteristics and basis of Social Stratification (Biological, Socio-Cultural, Economic and Political)
- Approaches of Social Stratification (Marxian and Dahrendorfian)

Unit II Forms of Social Stratification:

- Race and Ethnicity
- Caste, Class, Gender inequality

Unit III Social Stratification in Societies

- Stratification in Pre-Modern Societies
- Stratification in Modern Societies

Unit IV Social Mobility

- Meaning, Characteristics and Significance of Social Mobility.
- Types of Social Mobility (Horizontal and Vertical)

Reference Books:

1. Social Stratification: class race & gender in sociological perspective by Devid Grusky
2. Social Stratification & inequality by Harold R Kerbo
3. Social Stratification & mobility by K.L. Sharma
4. Social Stratification by Dipankar Gupta, Oxford India
5. Contemporary social mobility and social movements by Sarat C Joshi, Akansha Publishing
6. Social mobility for 21st Century by Steph Lawler & Jeoff Payne, Taylor & Francis Ltd.

SEVENTH SEMESTER
TEACHING OF SOCIAL SCIENCES

Paper Code- AUBAED-701 **Marks: 50 (40 + 10)**

Course objectives:

The student-teachers will be able to:

1. Prepare achievement test in social sciences.
2. Identify the qualities and responsibilities of a social science teacher.
3. Prepare unit plan and lesson plans in social sciences.
4. Select and prepare the appropriate teaching aids for effective teaching.

UNIT -I Teaching-Learning Resources in Social Sciences

- Resources: Reference books, Maps, Atlas, Globe Teachers Hand Book, Question Bank, Library, Resource Centre, e-resources, Documentaries, Museum, Community resources, newspapers and magazines.
- Teaching Aids: Meaning, Types and Importance.
- Text Books: Meaning, Importance of text books in Social Sciences, Qualities of good textbook, Evaluation of text book presented at the school stage.
- Social Science Teacher: Social Science Teacher qualities, ethics and social and environmental responsibilities of a social Science Teacher.

UNIT- 2 Planning for Teaching and Evaluation in Social Sciences

- Unit Planning: Meaning and Importance of unit planning, basic elements and its preparation. Questioning and evaluating approaches of unit planning.
- Lesson Planning: Meaning and Importance of lesson planning, basic elements and Its preparation. Different approaches of lesson planning.
- Evaluation in Social Sciences: Meaning, need, Types and Procedure; Evaluation devices - written, oral, assignment, project work, portfolio, open ended question, open book tests: strengths and limitations, Continuous and Comprehensive Evaluation. Identification of Difficulties in learning Social Sciences and remedial teaching.

Activity:

1. Construction of achievement test: Standardized, admired, tabulated, score and preparing a report for evaluation.

Suggested Readings:

1. Arora, N. D. Awasthy, S., S. (2003), Political Theory, New Delhi Haranand PublicationPvt.Ltd.
2. Gergen (1982). Toward a Transformation in Social Knowledge. New York Springer.
3. Verilog. Kirkpatrick, Evron (1977) Foundation of Political Science: Research, Methods and Scope, New York The Free Press.
4. Kocher, S.K. (1984). The Teaching of Social Studies New Delhi: Sterling Publishing Ptv. Ltd.
5. Kottler, Ellen (2008). Secrets to Success for Social Studies Teachers Corwin PressSage Publication, Oaks, CA 91320,

TEACHING OF ENGLISH

Paper Code -AUBAED 702 (i) **Marks: 50 (40 +10)**

Course objectives:

The student-teachers will be able to:

1. Acquaint with the latest methods and techniques for planning of successful English language teaching.
2. Enable the students to use technology to enrich language teaching.
3. Make students familiar in the effective use of learning resources.
4. Prepare lesson plans in English for instructional purposes.

Unit 1 Instructional Strategies

- Instructional Strategies: Meaning Importance & their Effective Use.
- Instruction Techniques: Student-centered techniques, Teacher-centered techniques. Lecture, Discussion, Panel discussion, team teaching, tutorials, guided discovery, Group learning, co-operative Learning, Computer Assisted Instruction, games, Project work and field trips etc.; importance and Limitations of instructional strategies in teaching.
- Instructional Material / Aids: Types, Importance and their merits and limitations; ICT in English language teaching; It's uses and importance in teaching Language.
- Language Laboratory: Concept, Types and Components, Merits and Limitations.

Unit 2 Planning for Teaching and Evaluation of English

- Unit planning: Meaning, importance, need and Steps.
- Lesson Planning: Meaning, Importance, Steps, Advantages and various Approaches of Lesson Planning.
- Meaning of Measurement & Evaluation: Purpose & Functions of Evaluation in English. Continuous and Comprehensive Evaluation, Formative and Summative Evaluation, Strengths and limitations.
- Characteristics of a good test preparation in English. Development of Language Test: Essay type, Short type and Objective type. Design and Blue print construction, Marking and grading system, Item-analysis.

Activities: (Any one of the following)

1. Construction of an Achievement Test.
2. Preparation of models, maps, charts, flash cards, scrap book, poster and transparencies.

REFERENCES:

1. Vedmed 1087) Trends in Language Teaching, New York. LondonMac.Graw Hill.
2. Johnson (1903) Communicative syllabus Design and MethodologyOxford, Pergamon Press.
3. Sharma, K.L.(2012) Methods of Teaching English in India, Agra La Narain Aggarwal Publisher.
4. Varghese, Paul. Teaching of English in India, University of London.
5. Sharma R.A.(2007) Teaching of English Education, Meerut Lal Book Depot.

Paper code AUBAED- 702 (ii)
TEACHING OF HINDI
(हिंदी शिक्षण)

पाठ्यक्रम: उदेश्य **अंक: 50 (40+10)**

पाठ्यक्रम के अंत में **छात्र**–अध्यापक निम्नलिखित में **सक्षम होगा**–

1. हिन्दी शिक्षण में गद्य, पद्य, रचना एवं व्याकरण के **चरणों** एवम् उदेश्यों का ज्ञान
2. हिन्दी भाषा में मूल्यांकन संबंधित क्षमता प्राप्त करते हुए प्रसन पत्र का निर्माण
3. विद्यार्थियों की सृजनात्मक क्षमता को **पहचानना**
4. हिन्दी शिक्षण में भाषा कौशल से सम्बंधित कौशल का विकास

इकाई-1

1. **भाषा कौशल का शिक्षण (skills):**
   श्रवण कौशल : महत्व, उदेश्य, विधियाँ, श्रवण कौशल में ध्यान देने योग्य बाते।
   भाषण कौशल : महत्व, उदेश्य, विधियाँ, श्रवण कौशल में ध्यान देने योग्य बाते।
   वाचन कौशल : महत्व, उदेश्य, विधियाँ, श्रवण कौशल में ध्यान देने योग्य बाते।
   लेखन कौशल : महत्व, उदेश्य, विधियाँ, श्रवण कौशल में ध्यान देने योग्य बाते।
2. **गया शिक्षण:**
   हिन्दी शिक्षण में गड़ा का स्थान, उदेश्य गाडी पाठ के प्रकार, गप शिक्षण की प्रणालियॉ ।
3. **व्याकरण शिक्षण:**
   अर्थ, आवश्यकता तथा महत्व, उदेश्य, व्याकरण के प्रकार और प्रणालियाँ, व्याकरण शिक्षण को प्रभावी बनाने के सुझाव।
4. **कविता शिक्षण:**
   कविता की परिभाषा एवं महत्व, उपाय, उदेश्य, सोपान कविता शिक्षण की प्रणालियाँ।
5. **रचना शिक्षण:**
   रचना का अर्थ और महत्व, विशेषताएं, भेद प्रणालियाँ, रचना संबंधी अषुधियाँ एव सुझाव, रचना संबंधी अषुधियाँ के कारण एवं सुझाव।
6. **कहानी शिक्षण**
   कहानी का अर्थ एवं परिभाषा, कहानी के तत्व, महत्व, उदेश्य, कहानी शिक्षण की प्रणालियाँ।
7. **नाटक शिक्षण:**
   नाटक का अर्थ एवं महत्व, उदेश्य, नाटक शिक्षण की प्रणालियाँ।
8. **अनुवाद शिक्षण**
   अर्थ एव महत्व, उदेश्य, प्रकार, प्रणालियाँ।

इकाई-2

1. हिन्दी शिक्षण में अधिगम संसाधन : अर्थ, वर्गीकरण एवं महत्व : शिक्षण सामग्री का निर्माण एवम् प्रयोग, **चार्ट,** एल. सी. डी. शिक्षाप्रद सी. डी. हिन्दी भाषा अध्यापन में आई. सी. टी का प्रयोग।
2. भाषा प्रयोगशाला : महत्व, उपकरण, एवम् कार्य प्रणाली।
3. हिन्दी पाठ्य पुस्तक की विशेषताएं, निर्माण के सिद्धांत एवम् समीक्षा।
4. हिन्दी भाषा अध्यापक के गुण, **कर्तव्य** और **वर्तमान** स्थिति।
5. पाठ्य पुस्तक : अर्थ, महत्व, विशेषतायें व मूल्यांकन।
6. सूक्ष्म शिक्षण कौशल : प्रक्रिया पाठ प्रस्तावना, **प्रश्न** कौशल, श्याम **पट्ट** प्रयोग कौशल, उदाहरण कौशल, सूक्ष्म शिक्षण पाठ योजना निर्माण।
7. हिन्दी शिक्षण में पाठ योजना अर्थ, आवश्यकता, सोपान, पाठ योजना निर्माण के विभिन्न उपागम व्याकरण, गद्य, पद्य एवम् रचना में पाठ योजना।
8. हिन्दी शिक्षण में मूल्यांकन अर्थ, विधियों और अंक विभाजन (**छठी** से दसवी तक)।
9. **छात्र** निष्पादन मूल्यांकन विभिन्न प्रकार का परीक्षण- वस्तुनिष्ठ, **लघुतरात्मक** एवं **निबंधात्मक**, अविरल एवं विस्तृत मूल्यांकन, अंकन एवं बडिंग प्रणाली, हिन्दी विषय में उपलब्धि परीक्षा का निर्माण

निम्नलिखित में से छात्र अध्यापक कोई दो कार्य का चुनाव करके प्रतिवेदन तैयार करेगा

1) किसी एक **छात्र** (केस स्टडी **करना** जिसे पढ़ने/ बोलने/ लिखने की समस्या हो का व्यक्तिगत अध्ययन **करना** तथा उसे उपचारात्मक शिक्षण देने के सुझाव पर प्रतिवेदन लिखना)।
2) अभिक्रमित अनुदेशन की विधा के अनुरूप **भाविक** तत्वों पर आधारित विशेष अधिगम सामग्री का **निर्माण** करना।
3) निबंधात्मक, लघुतर एवं **वस्तुनिष्ठ** परीक्षा के लिए किसी एक इकाई पर **प्रश्न पत्र का निर्माण करना**

सन्दर्भ पुस्तकेः

1. आचार्य, कपिल देव : अर्थ विज्ञान और व्याकरण दर्शन हिन्दुस्तानी एकेडेमी इलाहाबाद
2. उमा, मंगल (2008). हिन्दी शिक्षण, नई दिल्ली : आर्य बुक डिपो
3. कुमार, योगेश (2004). आधुनिक हिन्दी शिक्षण, नई दिल्ली एच. पी. एच **पब्लिशिंग कॉर्पोरेशन**
4. पारीक, ममता (2006) हिन्दी शिक्षण जयपुर : कल्पना पब्लिकेशन चांदपॉल बाजार
5. गुप्ता, मनोरमा : भाषा अधिगम केंद्रीय हिन्दी संस्थान आगरा
6. चतुर्वेदी, **शिक्षा** : हिन्दी शिक्षण सूर्या पब्लिकेशन मेरठ
7. तिवारी, भोलानाथ : भाषा विज्ञान कोष किताब महल इलाहाबाद

Skill in Teaching (School Subject -1 and Subject –2)

Paper Code -AUBAED -703 (A) & (B) Marks: 150 in Each Teaching Subject.

The Internship in teaching practice teaching in seventh semester of the Course (through regular mode) will be of six weeks duration. The student-teachers will prepare and submit following number of lessons which will be examined by the panel of external examiner to be appointed by the University.

1. **40 Macro Lessons in Each Teaching Subject (Total 80 Lessons).**
2. **20 Observation Lessons in Each Teaching Subject (Total 40 Lessons).**

The student-teachers will produce the file containing micro teaching lessons and simulated teaching lessons, reports of other activities carried out in the school and three handwritten copies of final lesson plans in each teaching subject at the time of final teaching practice examination. The two final lessons delivered by the student teachers along with above mentioned files and reports will be examined by the panel of examiners and due weightage will be given to these records while carrying out evaluation of the student-teachers. The lists of marks of students so evaluated shall be dispatched to the Assistant Registrar, Evaluation Branch, Abhilashi University, Chailchowk Mandi (H.P.) immediately after the completion of teaching practice examination. Each of the examiner will be paid remuneration for all the students so evaluated by three examiners. During practice teaching, the student teachers are required to take part in morning assembly of the school, check the home task given to the students and maintain attendance registers of school students.

EIGHTH SEMESTER
Knowledge and Curriculum

Paper Code - AUBAED/AUBSCED 80l **Marks: 100 (60 + 40)**

Course Objectives:

At the end of this course, students will be able to:

1. Understand the meaning and principles of curriculum.
2. Understand and appreciate curriculum as a means of development of the individual
3. Understand the foundations and evaluation of curriculum,
4. Comprehend the different models of curriculum compare the view point given by different commissions
5. Develop an understanding of the concept, need, scope and functions of school management
6. Develop an understanding of different components of human and material resources of the school

Unit I Knowledge and Education

- Knowledge: Concept, Types and Sources of Knowledge. Distinction between Knowledge and Skill, Teaching and Training, Knowledge and Information, Reason and Belief.
- Bases of Modem Child-centered Education: Concept of Activity, Discovery and Dialogue with reference to Gandhi, Sri Aurobindo, Giju Bhai and Paulo Freire.
- Education in Relation to Modem Values: Equity, Equality, Individual Opportunity and Social Justice with reference to Indian Constitution.
- Concept of Nationalism, Universalization , Secularism and their relationship to Education.

Unit II Basis and Principles of Curriculum

- Curriculum: Meaning, Nature, Need and Characteristics.
- Curriculum Development: Stages and Principles of a Curriculum.
- Bases of Curriculum: Philosophical, Psychological and Sociological.
- Approaches to Curriculum Development Subject-centred Learner-centred and Problem-centred.
-

Unit III Model, Patterns and Approaches of Curriculum Designing

- Models of Curriculum Designing: Administrative Line Staff (Taxler), Grassroot-level Planning (Hilda Taba).
- Models of Curriculum Designing: Tyler's Model and Wheel's Model.
- Approaches of Curriculum Development: Concept, Advantages and Limitations of Centralized and Decentralized Curriculum Designing.

Unit IV Curriculum Evaluation

- Evaluation of Curriculum: Need, Importance and Procedure of Curriculum Evaluation.
- Recommendations of Various Commissions: University Education Commission (1948), Secondary Education Commission (1952-53), Education Commission (1964-66) and NPE (1986-1992) with regard to curriculum development.
- NCF (2005) and its recommendations with regard to curriculum evaluation.

Activities (Any one of the following):

1. Evaluation of textbook of secondary level class and prepare a report.
2. Prepare a curriculum of any subject using Hilda Taba approach.

Suggested Readings

1. Aggarwal, Deepak (2007) Curriculum Development Concept Methods and Techniques. New Delhi Book Endave.
2. Aggarwal, J.C. (1967). Education Administration, School Organization and Supervision Delhi: Arya Book
3. Aggarwal, J. C. (2003). Handbook of Curriculum and Instruction, Delhi Doaba Book House
4. Arora, G.L (1984) Reflections on Curriculum. NCERT.
5. Bhatia, K. K & Chadda D. P. C. (1980). Modern Indian Education and its Problems Ludhiana: Prakash Brothers
6. Chopra, RK (1993). Status of Teacher in India, New Delhi: NCERT

UNDERSTANDING THE SELF

Paper Code -AUBAED/AUBSCED 802 **Marks: 50 (40 + 10)**

Course objectives:

At the end of this course, students will be able to:

1. understand self-concept and its importance in human life
2. understand self-confidence and its importance in human life
3. understand the nature, classification, sources, and methods of inculcation of human values
4. understand the role of different agencies in promotion of human values
5. define philosophy of yoga
6. explain the psychological and physiological basis of yoga

Unit 1 The Self and Human Values

- Meaning, Nature and Importance of Self-concept and Self-Confidence in Human Life.
- Human Values: Meaning, Nature, Importance, Sources and Methods of Inculcation of human values.
- Classification of Values.
- Role of Family, Educational Institutions, Community and NGO's in Promotion of Human Values.

UNIT 2: Philosophy and Psychology of Yoga

- Yoga: meaning, nature and importance.
- Concepts of the Prakriti and Purusha (ishwar): Concept and their relation with each other in Sankhya philosophy.
- Ashtanga Yoga of Patanjali.
- Therapeutic Values of Yoga, Yogic Diet & its Impact on Health, Asanas and their effects to promote a sound physical and mental health.

Activity (Any one of the Following)

1. Preparation of Scrap Book on any six major Yoga /Asanas with their benefits.
2. Select a story/ an episode / an incident from an epic or any situation and analyse the human values integrated in it.
3. Preparation of scrap book on any five human Values.

Suggested Readings:

1. Goel, A and Goel, S.L. (2005), Human Values and Education Deep and Deep Publications Pt. Ltd. New Delhi
2. Gokak, V.K. (1973). A Value Orientation to our System of Education, New Delhi: M.M. Gulb and Sons
3. Gore. M.W. (2005) Anatomy and Physiology of Yogic Practices, Kaivalyadhama, Lonavla
4. Gayal, B.R. (1979), Document on Social, Moral and Spiritual Values in Education. New Delhi:NCERT
5. Joshi, Kireet (1976). Education for Personality Development, New Delhi: NCERT, (NIE Lecture Series)
6. Katoch S.K. (2013) Manviya Mulya, Paryavaran Aur Manvadhikar Shiksha", Chandigarh Mohindra Capital Publishers (P) Ltd.
7. NCERT. (2000), Education for Values Development, Chapter 5, In National Curriculum Framework for School Education, New Delhi.

ICT IN TEACHING-LEARNING PROCESS

Paper Code -AUBAED/AUBSCED 803 **Marks: 50 (40 + 10)**

Course objectives:

The student-teachers will be able to:

1. Understand the concept and role of ICT in construction of Knowledge.
2. Acquire knowledge and understanding about National Policy on Education.
3. Identify the challenges in integration of ICT in school education.
4. Understand computer fundamentals.
5. Apply different Hardware Technologies in Modern Educational Practices.
6. Familiarize with the new trends in ICT.

UNIT I Introduction to ICT and Computer Fundamentals

- Concept of ICT: Meaning & Characteristics; Role of Information Technology in Construction of Knowledge.
- National Policy on ICT in School Education; Challenges in Integrating ICT in School Education.
- Computer Fundamentals: Meaning, Components & Types of Computer, Functions of Operating System, Application Softwares.
- Computer Application in Learning: Concept, Features and Advantages of Word (Word Processor); Excel (Spreadsheets) and PowerPoint (Slide Preparation & Presentation).

UNIT II ICT in Teaching - Learning Process

- Hardware Technologies and their Applications: Overhead Projector (OHP); Preparing Transparencies, Slide Projector, Audio-Video Recording Instruments.
- Hardware Technologies and their applications: DLP Projector, Movie Projector, Close Circuit Television (CCTV).
- New Trends in ICT: Concept, Elements and Advantages of Smart Classroom, EDUSAT.
- Internet & Online Learning Resources (e- Library, Websites, Web 2.0 Technology and Open Educational Resources) in learning.

Activities (Any one of the following):

1. Prepare your Curriculum Vitae using computer and obtain its printout.
2. Visit an institution having interactive white board and learn its features and functioning and prepare a report.
3. Prepare a Powerpoint presentation for secondary school students.

Suggested Readings:

1. Barton, R.(2004), Teaching Secondary Science with ICT. New Delhi: McGraw-Hill International
2. Bhaskara Rao. Digumarti (2013): Vidya. Samachara Sankethika Sastram (ICT in Education). Guntur masterminds, Sri Nagarjuna Publishers.
3. Denis, Kim, Sen and Morin (2000). Information Technology - The Breaking Wave New Delhi: Tata McGraw-Hill Publishing Co. Ltd.
4. Department of School Education and Literacy. MHRD (2012). National Policy on Information and Communication Technology (ICT) In School Education, New Delhi
5. Mangal, S.K. & Uma Mangal (2009). Essentials of Educational Technology. New Delhi PHI Learning P. Ltd.

HEALTH AND PHYSICAL EDUCATION

Paper Code - AUBAED/AUBSCED 804 **Marks: 50 (40 + 10)**

Course objectives:

The student-teachers will be able to

1. Understand concept of health, hygiene and health education.
2. Differentiate between communicable and non-communicable diseases.
3. Develop skills in marking grounds for different games.
4. Understand the objectives of school health services,
5. Understand the concept and importance of physical education.

Unit-1 Health Education

- Definition of Health, Health Education, Health Instruction, Health Supervision; Aim, objectives and Principles of Health Education.
- Health Services and guidance instruction in personal hygiene.
- Communicable and Non-Communicable Diseases; Obesity, Malnutrition, Adulteration in food, Environmental sanitation; Personal and Environmental Hygiene for schools.
- Objective of school health services, Role of health education in schools, Health Services- Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthy school environment, first-aid and emergency care.

Unit-2 Physical Education

- Meaning, Definition and Scope of Physical Education, Importance of Physical Education in present era, Misconception about Physical Education
- Aims and objectives of Physical Education
- Importance of Tournament, Types of Tournament and its organization: structure-knock-out Tournaments, league of Round Robin Tournaments, Combinations Tournament and challenge Tournament.
- Organization structure of Athletic Meet.

Activity (Any one of the following):

Mark a Sports ground and Prepare a report mentioning dimensions, rules, regulations and specification of any one of the following games: Volleyball/ Kabaddi/Kho-Kho / Wrestling /Badminton /Table Tennis/ Basketball/ Hockey.

References:

1. Agrawal, K.C. (2001). Environmental Biology Bikaner: Nidhi publishers Ltd
2. Frank, H. & Walter, H. (1976). Tumers School Health Education. Saint Louis: The C.V.Mosby Company
3. Nemir, A (n.d.). The School Health Education. New York: Harber and Brothers. Odum, EP. (1971). Fundamental of Ecology. USA:W.B.
4. Saunders Co Broyles, F.J. & Rober, H.D. (1979). Administration of Sports, Athletic Programme: A Managerial Approach. New York Prentice Hall Inc.

GUIDANCE AND COUNSELLING

Paper Code- AUBAED/AUBSCED 805 **Marks: 50 (40 + 10)**

Course objectives:

The student- teachers will be able to:

1. Understand the meaning, objectives, need, scope and principles of guidance.
2. Develop counseling skills.
3. Organize guidance programme in the secondary schools.
4. Develop the skills to prepare case study, to diagnose and identify problems, prepare report and provide guidance accordingly.

Unit –I Concept of Guidance

- Guidance: Meaning, need and scope
- Objectives, principles, issues and problems of Guidance.
- Types of Guidance: Educational, Vocational and Personal. Role of school and Teacher in Guidance program.
- Testing Techniques (Intelligence, Aptitude, Personality Inventory and Achievement Test) and Non-testing Techniques (Observation, Interview, Case Study and Cumulative Record).

Unit –ll Counselling

- Meaning, Objectives, Principles of Counselling.
- Approaches of Counseling: Directive, Non-directive and Eclectic.
- Techniques of Counseling.
- Organization of Counseling in Schools and Role of Counselor.

Activities (any one of the following):

1. Interview of a school counsellor.
2. Visit to a guidance or counselling centre and write a report.
3. Administration of individual test and preparing a report.
4. To prepare a case study,
5. Conduct a survey of the problems that are most prevalent in school which needimmediate attention of a guidance counsellor and prepare a brief report.

SUGGESTED READINGS:

1. Aggarwal, J.C. Educational & Vocational dance and Counseling Aadhar. DoabaHouse
2. Bhatia, KK. (2002) Principles of Guidance & Counseling Ludhiana Kalyani Pub
3. MAsch. (2000) Principles of dance and Counseling New Delhi Sarup and Sons
4. Safaya, BN (2002) Guidance & Counseling Chandigarh. Abhishek Publications
5. Sharma, Tara Chand (2002) Modem Methods of Guidance and Counseling New Delhi, Sarup and Sons
6. Shertzer, Bruce and Stone, Shelly C. (1074) Fundamentals of Counseling London Houghton Miss
7. Shirley, AHarmin (1987) Guidance in Secondary Schools New Delhi NCERT.

SYLLABUS

Bachelor of Science &Bachelor of Education

(B.Sc. B.Ed. Medical)

Four Years Integrated Course)

ASSESMENT BASED ON THE FOLLOWING CRITERIA

Sr.No	Assessment Criteria	Percentage To total 100 marks
1	Assignments	08
2	Attendance	05
3	Mid-Term Examination: 1st	08
4	Mid-Term Examination: 2nd	08
5	Class Test	05
6	Quizzes and Presentation	03
7	Attitude and Discussion	03
8	Sub-total (Total Marks of Assessment)	40
9	End- Term Theory Examination	60
10	Total Marks Allotted	100

Note: *End -Semester theory examination will be of sixty marks, while remaining forty marks pertains to internal assessment based on the above mentioned criteria. In theory paper, Candidates need to attempt five questions in all. Q.No.1 is compulsory with short- type answers containing twenty marks covering the whole syllabus. Further, two questions will be set from each unit where one question is compulsory (under each unit). In all, examination time will be of three hours.*

B.Sc.B.Ed. 4 years Integrated Course (Scheme) 2019-2023

Semester -I									
Sr .NO	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Theory Marks	Internal Assess	Total Mark
1	AUBSCED101	General Hindi	4	-	-	4	60	40	100
For PCM Group (Non Medical)									
2	AUBSCED102	Trigonometry & differential calculus	4	-	-	4	60	40	100
3	AUBSCED103	Mechanics	4	-	-	4	60	40	100
4	AUBSCED104	Organic Chemistry	4	-	-	4	60	40	100
5	AUBSCED102p	Skill Mathematics(Algebra)	-	-	1	1	50	50	100
6	AUBSCED103P	Mechanics Lab	-	-	1	1	50	50	100
7	AUBSCED104P	Organic Chemistry Lab		-	1	1	50	50	100
For ZBC Group (Medical)									
8	AUBSCED104	Organic Chemistry	4	-	-	4	60	40	100
9	AUBSCED105	Diversity of Microbes and Cryptogams(Thallophyta)	4	-	-	4	60	40	100
10	AUBSCED106	Animal Diversity Part-I(Protozoato Annelida)	4	-	-	4	60	40	100
11	AUBSCED104P	Organic Chemistry Lab	-	-	1	1	50	50	100
12	AUBSCED105P	Diversity of Microbes and Cryptogams(Thallophyta)	-	-	1	1	50	50	100
13	AUBSCED106P	Animal Diversity Lab	-	-	1	1	50	50	100
		Total	16	-	3	19	390	310	700

Semester– II									
Sr. N	Course Code	Course Name	Periods			Credit	Evaluation Scheme		
			L	T	P		Theory Marks	Internal Assess	Total Marks
1	AUBSCED201 (Education)	Environmental Studies	3	-	-	3	60	40	100
2	AUBSCED202	Computer Fundamentals, Internet,& MS-Office	3	-	1	4	60	40	100
For PCM Group (Non Medical)									
3	AUBSCED203	Partial Differential Equations	4	-	-	4	60	40	100
4	AUBSCED204	Electricity and Magnetism	4	-	-	4	60	40	100
5	AUBSCED205	Inorganic Chemistry	4	-	-	4	60	40	100
6	AUBSCED203P	Skill Mathematics (Algebra And Matrices)	-	-	1	1	50	50	100
7	AUBSCED204P	Electricity and MagnetismLab	-	-	1	1	50	50	100
8	AUBSCED205P	Inorganic Chemistry Lab	-	-	1	1	50	50	100
For ZBC Group (Medical)									
9	AUBSCED205	Inorganic Chemistry	4	-	-	4	60	40	100
10	AUBSCED206	Diversity of Cryptogams (Bryophyta, Pteridophyta and Paleobotany)	4	-	-	4	60	40	100
11	AUBSCED207	Animal Diversity Higher non Chordata	4	-	-	4	60	40	100
12	AUBSCED205P	Inorganic Chemistry Lab	-	-	1	1	50	50	100
13	AUBSCED206P	Diversity of Microbes and Cryptogams (Thallophyta) Lab	-	-	1	1	50	50	100
14	AUBSCED207P	Animal Diversity Lab	-	-	1	1	50	50	100
		Total	18	-	4	22	450	350	800

Semester – III									
Sr. No	Course Code	Course Name	Periods			Credit	Theory Marks	Internal Assess.	Total Marks
			L	T	P				
Core Courses									
1	AUBSCED301 (Education)	Childhood and Development Years	4	-	-	4	60	40	100
2	AUBSCED302 (Education)	Understanding Discipline& Subjects	2	-	-	2	40	10	50
3	AUBSCED303 (Education)	Language across the curriculum	2	-	-	2	40	10	50
4	AUBSCED304	English	3	-	-	3	60	40	100
For PCM Group (Non Medical)									
5	AUBSCED305 (Mathematics)	Real Analysis	4	-	-	4	60	40	100
6	AUBSCED306 (Physics)	Optics	4	-	-	4	60	40	100
7	AUBSCED307 Chemistry	Physical Chemistry	4	-	-	4	60	40	100
8	AUBSCED305P	Skill Mathematics (Integral calculus) lab	-	-	1	1	50	50	100
9	AUBSCED306P	Optics Lab	-	-	1	1	50	50	100
10	AUBSCED307P	Physical Chemistry Lab	-	-	1	1	50	50	100
For ZBC Group (Medical)									
11	AUBSCED307 Chemistry	Physical Chemistry	4	-	-	4	60	40	100
12	AUBSCED308 Botany	Plant Taxonomy and Embryology	4	-	-	4	60	40	100
13	AUBSCED309 (Zoology)	Chordata	4	-	-	4	60	40	100
14	AUBSCED307P	Physical Chemistry Lab	-	-	1	1	50	50	100
15	AUBSCED308P	Plant Taxonomy And Embryology	-	-	1	1	50	50	100
16	AUBSCED309P	Chordata Lab	-	-	1	1	50	50	100

Total	23	-	3	26	530	370	900

Semester – IV									
Sr.	Course Code	Course Name	Periods			Credit	Theory Marks	Internal Assess.	Total Marks
			L	T	P				
Core Courses									
1	AUBSCED401 (Education)	Learning and Teaching	4	-	-	4	60	40	100
2	AUBSCED402 (Education)	Drama & Art in education	2	-	-	2	40	10	50
3	AUBSCED403 (Education	Text Reading &Reflections	2			2	40	10	50
3	AUBSCED404	English	3	-	-	3	60	40	100
For PCM Group (Non Medical)									
4	AUBSCED405 (Mathematics)	Group Theory	4	-	-	4	60	40	100
5	AUBSCED406 (Physics)	Oscillations & Waves	4	-	-	4	60	40	100
6	AUBSCED407 (Chemistry)	Organic &Inorganic Chemistry	4	-	-	4	60	40	100
7	AUBSCED405P	Skill Mathematics lab	-	-	1	1	50	50	100
8	AUBSCED406P	Oscillations & Wave Lab	-	-	1	1	50	50	100
9	AUBSCED407P	Organic &Inorganic Chemistry Lab			1	1	50	50	100
For ZBC Group (Medical)									
10	AUBSCED407	Organic & Inorganic Chemistry Lab	4	-	-	4	60	40	100
11	AUBSCED408 (Zoology)	Plant Physiology and Metabolism	4	-	-	4	60	40	100
12	AUBSCED409	Evolution and Developmental Biology	4	-	-	4	60	40	100
13	AUBSCED407P	Organic &Inorganic Chemistry Lab	-	-	1	1	50	50	100
14	AUBSCED408P	Plant Physiology and Metabolism Lab	-	-	1	1	50	50	100
15	AUBSCED409P	Evolution and Developmental Biology Lab	-	-	1	1	50	50	100

Total			23	-	3	26	530	370	900
Semester – V									
Sr. No	Course Code	Course Name	Periods			Credit	Theory Marks	Internal Asses	Total Marks
			L	T	P				
Core Courses									
1	AUBSCED501 (Education)	Assessment for learning	4	-	-	4	60	40	100
2	AUBSCED502 (Education)	Teaching of Physical Science	2	-	-	2	40	10	50
3	AUBSCED503 (i)	Teaching of Mathematics	2	-	-	2	40	10	50
	AUBSCED503 (ii)	Teaching of Life Sciences	2	-	-	2	40	10	50
4	AUBSCED504	English	3	-	-	3	60	40	100
For PCM Group (Non Medical)									
5	AUBSCED505 (Mathematics)	Linear Algebra	4	-	-	4	60	40	100
6	AUBSCED506 (Physics)	Semiconductor/ Solid State Devices	4	-	-	4	60	40	100
7	AUBSCED507	Physical & Inorganic Chemistry	4	-	-	4	60	40	100
8	AUBSCED 505P	Skill Mathematics (Statistics)Lab	-	-	1	1	50	50	100
9	AUBSCED506P	Semiconductor / Solid State Devices	-	-	1	1	50	50	100
10	AUBSCED507P	Physical & Inorganic Chemistry Lab	-	-	1	1	50	50	100
For ZBC Group (Medical)									
11	AUBSCED507 (Botany)	Physical & Inorganic Chemistry	4	-	-	4	60	40	100
12	AUBSCED508 (Zoology)	Economic Botany and Plant Biotechnology	4	-	-	4	60	40	100
12	AUBSCED509	Cell Biology & Genetics	4	-	-	4	60	40	100
13	AUBSCED507P	Physical & Inorganic Chemistry Lab	-	-	1	1	50	50	100
14	AUBSCED508P	Economic Botany and Plant Biotechnology Lab	-	-	1	1	50	50	100
15	AUBSCED509P	Cell Biology & Genetics Lab	-	-	1	1	50	50	100

	Total	23	-	3	26	530	370	900

Semester – VI									
Sr	Course Code	Course Name	Periods			Credit External	Theory Marks	Internal Assess	Total Marks
			L	T	P				
Core Courses									
1	AUBSCED601(Edu)	Contemporary India &Education	4	-	-	4	60	40	100
2	AUBSCED602(Edu)	Gender, School and Society	2			2	40	10	50
3	AUBSCED603(Edu)	Inclusive School	2			2	40	10	50
4	AUBSCED604	English	3	-	-	3	60	40	100
For PCM Group (Non Medical)									
5	AUBSCED605 (Mathematics)	Numerical Analysis	4	-	-	4	60	40	100
6	AUBSCED606 (Physics)	Thermal & Low Temperature Physics	4	-	-	4	60	40	100
7	AUBSCED607	Physical & Organic Chemistry	4	-	-	4	60	40	100
8	AUBSCED605P	Skill MathematicsLab	-	-	1	1	50	50	100
9	AUBSCED606P	Thermal & Low Temperature Physics	-	-	1	1	50	50	100
10	AUBSCED607P	Physical & Organic Chemistry Lab	-	-	1	1	50	50	100
For ZBC Group									
11	AUBSCED607	Physical & Organic Chemistry	4	-	-	4	60	40	100
12	AUBSCED608 (Zoology)	Environmental Biotechnology	4	-	-	4	60	40	100
13	AUBSCED609	Mammalian Physiology	4	-	-	4	60	40	100
14	AUBSCED607P	Physical & Organic Chemistry Lab	-	-	1	1	50	50	100
15	AUBSCED608P	Environmental Biotechnology Lab	-	-	1	1	50	50	100
16	AUBSCED609P	Mammalian Physiology Lab	-	-	1	1	50	50	100
School Internship									

17	AUBSCED610	Preliminary School engagement (TP for 4 weeks)	Grading (on four points letter Grades) will be done on the basis of reports submitted by the students						
Total			23		3	26	530	370	900

Semester – VII					
S. No.	**Course Code**	**Course/Paper**	Theory Marks	Internal Assessment	Total Marks
School Internship/(Teaching Practice) 4 months					
1.	AUBSCED701	Teaching of physical Sciences	**40**	10	50
2	AUBSCED702	Teaching of Mathematics	**40**	10	50
2	AUBSCED703	Teaching of Life Sciences	**40**	10	50
3	AUBSCED704	Skill in Teaching (School Subject-I)	150		
4	AUBSCED705	Skill in Teaching (School Subject-II)	150		
	Total		**80 + 20 + 300 = 400**		

	Semester – VIII								
Sr.No	Course Code	CourseName	Periods			Credit External	Theory Marks	Internal Assessment	Total Marks
			L	T	P				
	Core Courses								
1	AUBSCED801	Knowledge and Curriculum	5	-	-	5	60	40	100
2	AUBSCED802	Human Values and Ethics (Understanding the self)	5	-	-	5	40	10	50
3	AUBSCED803	ICT in Teaching Learning Process	5	-	-	5	40	10	50
4	AUBSCED804	Health & Physical Education	5	-	-	5	40	10	50

05	AUBSCED805	Guidance&Counseling	5	-	-	5	40	10	50
Total			25	-	-	25	220	80	300

(All Semesters) Grand Total=	**5800**

B.Sc.B.Ed. 4 years Integrated Course (Scheme) 2020-2024

Semester –I									
Sr.No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Evaluation Scheme**		
			L	**T**	**P**		**Internal**	**External**	**Total Marks**
1	AUBSCED101	General Hindi	4	-	-	4	40	60	100
For PCM Group (Non-Medical)									
2	AUBSCED102	Trigonometry & differential calculus	4	-	-	4	40	60	100
3	AUBSCED103	Mechanics	4	-	-	4	30	50	100
	AUBSCED103P	Mechanics Lab	-	-	1		10	10	
4	AUBSCED104	Organic Chemistry	4	-	-	4	30	50	100
	AUBSCED104P	Organic Chemistry Lab	-	-	1		10	10	
For ZBC Group (Medical)									
5	AUBSCED104	Organic Chemistry	4	-	-	4	30	50	100
	AUBSCED104P	Organic Chemistry Lab	-	-	1		10	10	
6	AUBSCED105 (Botany)	Diversity of Microbes and Cryptogams (Thallophytic)	4	-	-	4	30	50	100
	AUBSCED105P	Diversity of Microbes and Cryptogams(Thallophytic) Lab	-	-	1		10	10	
7	AUBSCED106 (Zoology)	Animal Diversity Part-I (Protozoa Annelida)	4	-	-	4	30	50	100
	AUBSCED106P	Animal Diversity Part-I (Protozoa Annelida) Lab	-	-	1		10	10	
Total						16	160	240	**400**

Semester– II									
Sr. No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Evaluation Scheme**		
			L	**T**	**P**		**Internal**	**External**	**Total Marks**
1	AUBSCED201	Environmental Studies	4	-	-	4	40	60	100
2	AUBSCED202	Computer Fundamentals, Internet, & MS-Office	3	-	1	4	40	60	100
For PCM Group (Non-Medical)									
3	AUBSCED203 (Mathematics)	Partial Differential Equations	4	-	-	4	40	60	100
4	AUBSCED204 (Physics)	Electricity and Magnetism	4	-	-	4	30	50	100
	AUBSCED204P	Electricity and Magnetism Lab	-	-	1		10	10	
5	AUBSCED205 (Chemistry)	Inorganic Chemistry	4	-	-	4	30	50	100
	AUBSCED205P	Inorganic Chemistry Lab	-	-	1		10	10	
For ZBC Group (Medical)									
6	AUBSCED205 (Chemistry)	Inorganic Chemistry	4	-	-	4	30	50	100
	AUBSCED205P	Inorganic Chemistry Lab	-	-	1		10	10	
7	AUBSCED206 (Botany)	Diversity of Microbes and Cryptogams (Bryophyta, Pteridophyta and Paleobotany)	4	-	-	4	30	50	100
	AUBSCED206P	Diversity of Microbes and Cryptogans Lab	-	-	1		10	10	
8	AUBSCED207 (Zoology)	Animal Diversity Higher non-Chordata	4	-	-	4	30	50	100
	AUBSCED207P	Animal Diversity Lab	-	-	1		10	10	
		Total				20	200	300	**500**

Semester – III									
Sr. No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	T	P				
Core Courses									
1	AUBSCED301 (Education)	Childhood and Development Years	4	-	-	4	40	60	100
2	AUBSCED302 (Education)	Understanding Discipline& Subjects	2	-	-	2	10	40	50
3	AUBSCED303 (Education)	Language across the curriculum	2	-	-	2	10	40	50
4	AUBSCED304	English	4	-	-	4	40	60	100
For PCM Group (Non-Medical)									
5	AUBSCED305 (Mathematics)	Real Analysis	4	-	-	4	40	60	100
6	AUBSCED306 (Physics)	Optics	4	-	-	4	30	50	100
	AUBSCED306P	Optics Lab	-	-	1		10	10	
7	AUBSCED307 (Chemistry)	Physical Chemistry	4	-	-	4	30	50	100
	AUBSCED307P	Physical Chemistry Lab	-	-	1		10	10	
For ZBC Group (Medical)									
8	AUBSCED307 (Chemistry)	Physical Chemistry	4	-	-	4	30	50	100
	AUBSCED307P	Physical Chemistry Lab	-	-	1		10	10	
9	AUBSCED308 (Botany)	Plant Taxonomy and Embryology	4	-	-	4	30	50	100
	AUBSCED308P	Plant Taxonomy and Embryology Lab	-	-	1		10	10	
10	AUBSCED309 (Zoology)	Chordata	4	-	-	4	30	50	100
	AUBSCED309P	Chordata Lab	-	-	1		10	10	
Total						24	220	380	**600**

Semester – IV									
Sr. No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Mark**
			L	T	P				
Core Courses									
1	AUBSCED401 (Education)	Learning and Teaching	4	-	-	4	40	60	100
2	AUBSCED402 (Education)	Drama & Art in education	2	-	-	2	10	40	50
3	AUBSCED403 (Education	Text Reading &Reflections	2			2	10	40	50
4	AUBSCED404	English	4	-	-	4	40	60	100
For PCM Group (Non-Medical)									
5	AUBSCED405 (Mathematics)	Group Theory	4	-	-	4	40	60	100
6	AUBSCED406 (Physics)	Oscillations & Waves	4	-	-	4	30	50	100
	AUBSCED406P	Oscillations & Waves Lab	-	-	1		10	10	
7	AUBSCED407 (Chemistry)	Organic &Inorganic Chemistry	4	-	-	4	30	50	100
	AUBSCED407P	Organic &Inorganic Chemistry Lab	-	-	1		10	10	
For ZBC Group (Medical)									
8	AUBSCED407 (Chemistry)	Organic & Inorganic Chemistry	4	-	-	4	30	50	100
	AUBSCED407P	Organic &Inorganic Chemistry Lab	-	-	1		10	10	
9	AUBSCED408 (Botony)	Plant Physiology and Metabolism	4	-	-	4	30	50	100
	AUBSCED408P	Plant Physiology and Metabolism Lab	-	-	1		10	10	
10	AUBSCED409 (Zoology)	Evolution and Developmental Biology	4	-	-	4	30	50	100
	AUBSCED409P	Evolution and Developmental Biology Lab	-	-	1		10	10	
Total						24	220	380	**600**

Semester – V									
	Course Code	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	T	P				
Core Courses									
1	AUBSCED501 (Education)	Assessment for learning	4	-	-	4	40	60	100
2	AUBSCED502 (Education)	Gender, School and Society	2	-	-	2	10	40	50
3	AUBSCED503 (Education)	Inclusive School	2	-	-	2	10	40	50
4	AUBSCED504 (Education)	English	4	-	-	4	40	60	100
For PCM Group (Non-Medical)									
5	AUBSCED505 (Mathematics)	Linear Algebra	4	-	-	4	30	50	100
	AUBSCED 505P	Skill Mathematics Lab	-	-	1		10	10	
6	AUBSCED506 (Physics)	Semiconductor/Solid State Devices	4	-	-	4	30	50	100
	AUBSCED506P	Semiconductor/Solid State Devices Lab	-	-	1		10	10	
7	AUBSCED507 (Chemistry)	Physical & Inorganic Chemistry	4	-	-	4	30	50	100
	AUBSCED507P	Physical & Inorganic Chemistry Lab	-	-	1		10	10	
For ZBC Group (Medical)									
8	AUBSCED507 (Chemistry)	Physical & Inorganic Chemistry	4	-	-	4	30	50	100
	AUBSCED507P	Physical & Inorganic Chemistry Lab	-	-	1		10	10	
9	AUBSCED508 (Botany)	Economic Botany and Plant Biotechnology	4	-	-	4	30	50	100
	AUBSCED508P	Economic Botany and Plant Biotechnology Lab	-	-	1		10	10	
10	AUBSCED509 (Zoology)	Cell Biology & Genetics	4	-	-	4	30	50	100
	AUBSCED509P	Cell Biology & Genetics Lab	-	-	1		10	10	
		Total				24	220	380	**600**

Semester – VI									
Sr. No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	**T**	**P**				
Core Courses									
1	AUBSCED601 (Education)	Contemporary India &Education	4	-	-	4	40	60	100
2	AUBSCED602 (Education)	Teaching of physical Sciences	2	-	-	2	10	40	50
3	AUBSCED603 (Education) (N-Med.)	Teaching of Mathematics	2	-	-	2	10	40	50
4	AUBSCED604 (Education) (Med.)	Teaching of Life Sciences	2	-	-	2	10	40	50
5	AUBSCED605	English	4	-	-	4	40	60	100
For PCM Group (Non-Medical)									
6	AUBSCED606 (Mathematics) AUBSCED606P	Numerical Analysis	4	-	-	4	30	50	100
		Skill Mathematics Lab	-	-	1		10	10	
7	AUBSCED607 (Physics) AUBSCED607P	Thermal & Low Temperature Physics	4	-	-	4	30	50	100
		Thermal & Low Temperature Physics Lab	-	-	1		10	10	
8	AUBSCED608 (Chemistry) AUBSCED608P	Physical & Organic Chemistry	4	-	-	4	30	50	100
		Physical & Organic Chemistry Lab	-	-	1		10	10	
For ZBC Group (Medical)									
9	AUBSCED608 (Chemistry)	Physical & Organic Chemistry	4	-	-	4	30	50	100
		Physical & Organic Chemistry Lab	-	-	1		10	10	
10	AUBSCED609 (Botany) AUBSCED609P	Environmental Biotechnology	4	-	-	4	30	50	100
		Environmental Biotechnology Lab	-	-	1		10	10	
11	AUBSCED610 (Zoology) AUBSCED610P	Mammalian Physiology	4	-	-	4	30	50	100
		Mammalian Physiology Lab	-	-	1		10	10	

School Internship									
12	AUBSCED611	Preliminary School Engagement (TP for 4 weeks)	Grading (on four points letter Grades) will be done on the basis of reports submitted by the students						
Total						24	220	380	**600**

Semester – VII						
Sr.No.	**Course Code**	**Course Name**	**Credits**	**Internal**	**External**	**Total Marks**
Candidates will continue with same teaching subjects in VII Semester which they have opted in VI Semester:						
1.	AUBSCED701 (Education)	Teaching of physical Sciences	2	10	40	50
2	AUBSCED702 (Education)	Teaching of Mathematics	2	10	40	50
3	AUBSCED703 (Education)	Teaching of Life Sciences	2	10	40	50
School Internship/(Teaching Practice) 4 months						
4	AUBSCED704	Skill in Teaching (School Subject-I)		150		
5	AUBSCED705	Skill in Teaching (School Subject-II)		150		
	Total			**50 + 50 + 300 = 400**		

Semester – VIII									
Sr. No.	**Course Code**	**Course Name**	**Periods**			**Credit**	**Internal**	**External**	**Total Marks**
			L	**T**	**P**				
	Core Courses								
1	AUBSCED801 (Education)	Knowledge and Curriculum	4	-	-	4	40	60	100
2	AUBSCED802 (Education)	Understanding the self	2	-	-	2	10	40	50
3	AUBSCED803 (Education)	ICT in Teaching-Learning Process	2	-	-	2	10	40	50
4	AUBSCED804 (Education)	Health & Physical Education	2	-	-	2	10	40	50
05	AUBSCED805 (Education)	Guidance & Counseling	2	-	-	2	10	40	50
Total						12	80	220	300
(All Semesters) Grand Total=									**4000**

FIRST SEMESTER

GENERAL HINDI

Course Code-AUBAED 101 **Marks: 100 (60+40)**

उदेश्य-

छात्रो में भाषा को समझने तथा मूल्यांकन करने की दृष्टि बढ़ाना

शब्द संरचना प्रक्रिया के प्रति छात्रों का ध्यानाकर्षण कराना

छात्रों को प्रयोजनमूलक हिन्दी की व्यापकता से अवगत करवाना

हिन्दी भाषा की व्यवहारिक उपयोगिता का परिचय देना

इकाई-1 हिंदी ध्वनियों का स्वरूप -

स्वर और व्यंजन

संज्ञा,सर्वनाम,क्रिया,विशेषण,क्रिया विशेषण

वाक्य संरचना

इकाई-2 हिंदी शब्द संरचना

पर्यायवाची,समानार्थक,विलोमार्थक,अनेकार्थक, अनेक शब्दों के स्थान पर एक शब्द, समुहार्थक शब्दों के प्रयोग, निकातार्थी शब्दों के सूक्ष्म अर्थ - भेद, समानार्थक शब्दों के भेद, उपसर्ग, प्रत्यय

इकाई-3 वर्तनी, विराम चिन्ह एवं संशोधन

वर्तनी सम्बन्धी अशुद्धियाँ, मात्राओ की अशुद्धियाँ

वर्तनी सम्बन्धी अशुद्धियों के कारण, वर्तनी सम्बन्धी अशुद्धियों के सुधारने के उपाय

विराम चिन्ह- पूर्णविराम, प्रश्नवाचक चिन्ह, सम्बोधन या आश्चर्य चिन्ह, निर्देशक चिन्ह, अवतरण चिन्ह

इकाई -4 लेखन सम्बन्धी कोशल
लिखित भाषा शिक्षण के उद्देश्य
लेखन की विभिन्न विधियों, लेखन के दोष
निबंध लेखन, कहानी लेखन
राष्ट्रीय - अंर्तराष्ट्रीय तात्कालिक घटनाक्रमों पर लेखन

इकाई- 5

ओपचारिक पत्राचार / अनोपचारिक पत्राचार
राष्ट्रीय - अंर्तराष्ट्रीय तात्कालिक घटनाक्रमों पर लेखन

ORGANIC CHEMISTRY

Course Code: AUBSCED 104

L	T	P	C
4	0	0	4

Unit I

Basics of Organic Chemistry

Organic Compounds: Classification, and Nomenclature, Hybridization, Shapes of molecules, Influence of hybridization on bond properties. Electronic Displacements: Inductive, electromeric, resonance and mesomeric effects, hyperconjugation and their applications; Dipole moment. Homolytic and Heterolytic fission with suitable examples. Electrophiles and Nucleophiles; Nucleophlicity and basicity; Types, shape and their relative stability of Carbonations, Carbanions, Free radicals and Carbenes. Introduction to types of organic reactions and their mechanism: Addition, Elimination and Substitution reactions

Unit- II

Stereochemistry of organic compounds: Concepts of isomerism. Types of isomerism.Optical isomerism- elements of symmetry, molecular chirality, enantiomers, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers. Relative and absolute configuration, sequence rules, D & L and R & S systems of nomenclature. Geometric isomerism; determination of configuration of geometric isomers, E & Z system of nomenclature.

Unit- III

Alkanes and Cycloalkanes: IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties and chemical reactions of alkanes. Mechanism of free radical halogenation of alkanes: Mechanism of free radical, halogenation of alkanes: orientation, reactivity and selectivity.

Unit- IV

Arenes and Aromaticity: Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain. Structure of benzene: Molecular formula and Kekule structure. Stability and carbon –carbon bond length of benzene, resonance structure, Aromaticity –the Hückel rule, aromatic ions.Aromatic electrophilic substitution reaction –general pattern of the mechanism , role of σ and π complex. Mechanism of nitration , halogenation, sulphonation and Friedel- Crafts reaction. Ortho and para ratio. Birch reduction.

Suggested Books:

1. Stereo Chemistry by P.S. Kalsi.
2. Organic Chemistry by Paula Yurkanis Bruice.
3. Reaction Mechanism by O. P. Aggarwal.
4. Organic Chemistry by F. A. Carey, Tata McGraw Hill.
5. Organic Chemistry by Robert T. Morrison & Robert N. Boyd, Prentice Hall of India Pvt. Ltd.
6. Stereo Chemistry of Organic Compounds by Ernest L Eliel, Tata McGraw-Hill.

PRACTICAL SYLLABUS

ORGANIC CHEMISTRY

Course Code: AUBSCED104P

L	T	P	C
0	0	1	1

List of Experiments:

1. Qualitative Analysis.
2. Detection of elements.
3. Detection and identification of functional groups.
4. Determination of melting point.
5. Determination of boiling point.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

DIVERSITY OF MICROBES AND CRYPTOGAMS (THALLOPHYTA)

Course Code: AUBSCED105

L	T	P	C
4	**0**	**0**	**4**

Course Objectives:

- To make students understand about the various features of plant kingdom and algae.
- To make students aware about the various characteristics of Bacteria and Fungi.
- To impart knowledge about the different Plant diseases.

Outcomes:

- Students will learn about The general characters of Cryptogams.
- Students will learn the basic concept of Botany.
- Students will gain knowledge about the plant diseases.

Course Content:

Unit I:

Viruses and Bacteria: General account of viruses and mycoplasma, Bacteria-structure, nutrition. Reproduction and economic importance, General account of Cyanobacteria, Nostoc, Oscillatoria and economic importance,.

Unit II

Algae: General Characters, classification and economic importance, important features and life history of chlorophyceae: Spirogyra,Ulothrix, Xanthophyceae-Vaucheria, Phaeophyceae Ectocarpus, Sargassum, Rhodophyceae-Polysiphonia.

Unit III

Fungi: General characters, classification and economic importance; important features and life history of Mastigomycotina-Phytophthora Oomycotina-Albugo, Ascomycotina-, Penicillium,yeast, , Basidiomycotina-Puccinia,Ustilago and Agaricus, Deuteromycotina-, Colletotrichum, Alternaria and General account of Lichens.

Unit IV

Plant diseases special studies about green ear disease, white rust, Stem rust, disease of Wheat, Smut disease, Citruscanker, Tobacco mosaic disease.

RecommendedTexts:

1. Pandey S. N. & others.1995, A Text Book of Botany Vol. I, Vikas Publications Delhi.
2. Gupta P. K. 1999.Genetics Rastogi Publications, Meerut.
3. Vashistha, B.R. 1989, Algae, S. Chand and Co. Delhi.
4. Vashistha, B.R. 1989, Fungi, S. Chand and Co. Delhi.

PRACTICAL SYLLABUS

DIVERSITY OF MICROBES AND CRYPTOGAMS

Course Code: AUBSCED105P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. Microscopic preparations and study of the following algalmaterial: Nostoc, Oscillatoria, Chlamydomonas, Volvox, spirogyra, Oedogonium,Vaucheria, Chara, Ectocarpus Sargassum and Polysiphonia
2. Staining of different types of Bacteria.
3. Study of some locally available plant diseases caused by Viruses. Mycoplasma, Bacteria and Fungi in field/laboratory.
4. TMV, Black stem rust of wheat, loose smut of wheat. Citrus canker.
5. Brown leaf spot of rice, Red rot of sugarcane, Early blight of potato, Wilt disease of potato, Tomato.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

Animal Diversity Part-I

(Protozoa to Annelida)

Course Code: AUBSCED 106

L	T	P	C
4	0	0	4

Objective: The objective is to give students basic idea of the lower invertebrates through taxonomy of different phylum of lower invertebrates and by educating them on the fundamental of structural organization, physiologies and life histories of different life forms fall in this category.

Outcome: As an outcome we are expecting the students will understand and learn the differences in the cellular organization of the organism at different levels and they will be able to write and draw the structure of various organisms.

Course Content:

Unit I

Taxonomy:- Classification of Protozoa. Porifera, Coelenterata, Platyhelminthes and Nematoda up to order with examples. Fundamentals of body organization emphasizing symmetry, metamerism, coelom and levels of structural organization.

Unit II

Protozoa: - Study of structural organization and life history of *Trypanosoma* and *Paramecium*. Study of locomotion, osmoregulation, nutrition and reproduction in protozoa. Parasitism, pathogenecity and control in protozoa with special reference to *Entamoeba*, *Giardia*, *Leishmania*, *Trichomonas* and *Plasmodium*.

Unit III

Porifera: - Habit, habitat, structure and function of *Sycon*. Types of canal system.
Coelenterata: - Habit, habitat, structure, function and life history of Aurelia. Polymorphism in coelenterata, coral reef.
Ctenophora - Structural organization and affinities.

Unit IV

Platyhelminthes: - Structural organization and life history of *Fasciola* & *Taenia* Parasitic adaptations in Helminthes.
Nematyhelminthes: - Study of structure and life history of *Ascaris* Nematode parasites and human diseases.

Classification of Annelida (up to subclass); metamerism and coelom in Annelida General account and types of Annelida (earthworm) structural organization, Physiology & life history of *Nereis*, Trochophore larva.

Recommended Texts:

1. Kotpal R.L, Invertebrates, Rastogi Publications, Meerut (2018).
2. Sabharwal, A. Invertebrates-I, Modern Publishers, New Delhi (2015).
3. Barrington, E.J.W. Invertebrate Structure and Functions. Houghton Mifflin Co. Boston. (1967).

***** Latest editions of all the suggested books are recommended.

PRACTICAL SYLLABUS

ANIMAL DIVERSITY

Course Code: AUBSCED 106P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

General survey of Invertebrate (Spot & Slides)

(A) **Protozoa: -** *Entamoeba, Polystomella, Monocystis, Euglena, Noctiluca Leismania, Nyctotherus, Paramecium, Vorticella*. **Porifera-** *Sycon, Hyalonema, Euplectella, Spongilla* and *Euspongia*. **Coelenterate-** *Obelia* colony (polyp & medusa) *Physalia, Porpita, Aurelia, Rhizostom, Alcyonium, Corallium, Gorgonia, Pennatula, Madrepora*.

Platyhelminthes:- *Dugesia, Fasciola, Taenia, Schistosoma*. **Nematode-** *Filaria, Dracunculus, Wuchereria, Enterobius.*

Annelida: - *Neries* (Heroneries with parapodia) *Aphrodite, Arenicola, Pontobdella, Hirudinaria, Peripatus.*

(B) Study of TS/LS of organs & developmental stages.

(i) **Porifera: -** T.S. of *Sycon*. (ii) **Coelenterata-** Planula larva of jelly fish.

(iii) **Platihelminthes-** T.S of *Fasciola*, scolex of *Taenia*, mature & gravid segment of *Taenia*, Hexacanth, bladderworm & cysticercus stage of *Taenia*, miracidium, sporocyst, redia, circaria larva of *Fasciola*.

(iv) **Annelida-** T.S through different region of leach.

(C) Dissection Through chart / model / Photograph / CD. – *Hirudinaria* – Morphology, general anatomy, digestion, nervous & excretory and reproductive system.
Earthworm – Anatomy, morphology, digestive and nervous system.
(D) Mounting- (Permanent)

Protozoa – *Euglena, Paramecium, Polystomela* Porifera- Spicules, fibres, gemmule Coelenterata- *Obelia* medusa.
Platyhelminthes – *Taenia* (proglotid) Annelida – *Nereis* (parapodia).

Evaluation Scheme of Practical Examination: Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

SECOND SEMESTER

ENVIRONMENTAL STUDIES

Course Code– AUBAED/AUBSCED 201 **Marks 100 (60+40)**

L	T	P	C
4	**-**	**-**	4

Objective: To create awareness among students about environment protection.

Course Content

Unit-I

Definition and Scope of environmental studies, multidisciplinary nature of environmental studies, Concept of sustainability & sustainable development.

Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid & Ecological succession,

Unit II

Natural Resources: Renewable & Non-Renewable resources; Land resources and land use change; land degradation, Soil erosion & Deforestation.

Biodiversity: Definition: genetic, species and ecosystem diversity, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Bio-geographical Classification of India.

Unit III

Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

Climate change & Global Warming (Green house Effect),Ozone Layer-Its Depletion and Control Measures, Photochemical Smog, Acid Rain: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act,

Unit IV

Human Communities &Environment:

Human population growth; impacts on environment, human health & welfare, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Land slides, Environmental Ethics; Role of Indian & other religions & culture in environmental conservation, Environmental communication & public awareness; Case studies.

Text Books:

1. "Environmental Chemistry", De, A. K., New Age Publishers Pvt. Ltd.
2. "Introduction to Environmental Engineering and Science", Masters, G. M. Prentice Hall India Pvt. Ltd.
3. "Fundamentals of Ecology", Odem, E. P., W. B. Sannders Co.

Reference Books:

1. "Biodiversity and Conservation", Bryant, P. J. ,Hyper text Book

"Textbook of Environment Studies", Tewari, Khulbe & Tewari, I. K. Pu

Computer Fundamentals, Internet, & MS-Office

Course Code-AUBAED/AUBSCED 202 **Marks 100 (60+40)**

L	T	P	C
3	0	1	4

Objective: To give the basic knowledge of computer hardware, internet and application software with DOS keys to the students.

Outcomes:

After studying this course, you should be able to:

- Understand the fundamental hardware components that make up a computer's hardware and the role of each of these components.
- Understand the difference between an operating system and an application program, and what each is used for in a computer.
- Describe some examples of computers and state the effect that the use of computer technology has had on some common products.
- Be familiar with software application.
- Understand file management.

Unit-I

Introduction and Definition of Computer: Computer generation, characteristics of computer, advantages and limitations of a computer, classification of computers, functional components of a computer system (Input, CPU, Storage and Output unit), types of memory (primary and secondary), memory hierarchy. Hardware: a) Input devices b) output devices. Software: Introduction, types of software with examples. Introduction to languages, compiler, interpreter and assembler.

Number system: Decimal, octal binary and hexadecimal conversions, BCD, ASCII and EBCDIC codes.

Unit-II

MS-DOS: Getting started on DOS with Booting the system, internal commands: CHDIR (CD), CLS, COPY, DATE,DEL,DIR, CHARACTER, EXIT, MKDIR (MD), REM, RENAME (REN), RMDIR (RD), TIME, TYPE, VER, VOL. External Commands: ATTRIB, CHKDSK, COMMAND, DOSKEY, EDIT, FORMAT, HELP, LABEL, MORE, REPLACE, RESTORE,SORT, TREE, UNDELETE, UNFORMAT, XCOPY.

Introduction of internet: History of internet, web browsers, searching and surfing, creating an email account, Sending and receiving emails.

Unit-III

MS WORD: Starting MS WORD, creating and formatting a document, changing fonts and point size, table Creation Operations, autocorrect, auto text, spell check, word art, inserting objects, page setup, page preview, printing a document, mail merge.

MS EXCEL: Starting excel, worksheet, cell inserting data into rows/columns, alignment, text wrapping, sorting data, auto sum, use of functions, cell referencing form, generating graphs, worksheet data and charts with WORD, creating Hyperlink to a WORD document, page set up, print preview, printing worksheets.

Unit-IV

MS POWERPOINT: Starting MS-Power point, creating a presentation using auto content wizard, blank presentation, Creating, saving and printing a presentation, adding a slide to presentation, navigation through a presentation, slide Sorter, slide show, editing slides, using clipart, word art gallery.

Text books:

1. Sinha P.K., Computer Fundamentals, BPB Publishing.
2. Bill Bruck., The Essentials office 2000 Books, BPB Publishing.
3. Leon A. & Leon M., Introductions to computer, Vikas publications.

Reference books:

1. Peter Nortons, Introduction to computers, Tata McGraw Hill.
2. Prince Michael, Office in Easy steps, TMH Publications.

**Latest editions of all the suggested books are recommended.*

INORGANIC CHEMISTRY

Course Code: AUBSCED205

L	T	P	C
4	0	0	4

Unit-I

Atomic Structure: Dual nature of matter; de Broglie concept. Heisenberg uncertainty principle; its significance. Atomic orbitals, Schrödinger wave equation (no derivation); significance of ψ and ψ^2. Quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p and d orbitals. Aufbau's principle and its Limitations Pauli's exclusion principle. Hund's rule of maximum multiplicity. Electronic configuration of elements (s block, p block and first series of d-block elements). Effective nuclear charge.

Unit-II

Periodic Properties: Atomic and ionic radii, ionization potential, electron affinity, electro negativity-definition, methods of determination/evaluation, trends of variation in periodic table and their application in prediction and explaining the chemical behavior of elements and compounds.

Unit-III

Chemical Bonding: Covalent bond-valence bond theory and its limitations; ; various types of hybridization and shapes of different inorganic molecules and ions. Valence shell electron pair repulsion theory (VSEPR) and shapes of NH_3, H_2O, H_3O^+, SF_4, ClF_3 and other simple molecules/ions. Molecular orbital theory as applied to diatomic homonuclear/heteronuclear (CO and NO) inorganic molecules, difference between VB and MO theories.

Unit-IV

s-Block elements: General discussion with respect to all periodic and chemical properties, diagonal relationship, salient features of hydrides, solvation and complexation tendencies, Role of alkali and alkaline earth metal ions in bio-systems.

p-Block elements: General discussion and comparative study (all periodic and chemical properties including diagonal relationship) of groups 13 to 17 elements; chemistry of elements-hydrides, oxides & oxy-acids, and halides. Diborane-properties & structure, borohydrides, carbides, fluorocarbons, inter-halogen compounds, polyhalides and basic properties of iodine.

Suggested Books:

1. Concise inorganic Chemistry 4th Edn. By J.D.Lee.ELBS.
2. Huheey, J.E. Inorganic Chemistry, Prentice Hall 1993.
3. Cotton, F.A. and Wilkinson, G, Advanced Inorganic Chemistry, Wiley, VCH, 1999.
4. Greenwood, N.N. and Earnshaw, Chemistry of the Elements, Butterworth-Heinemann. 1997.
5. Day, M.C. and Selbin, J. Theoretical Inorganic Chemistry, ACS Publications 1962.
6. Douglas, B.E. and Mc Daniel, D.H., Concepts & Models of Inorganic Chemistry, Oxford 1970.
7. Shriver & Atkins, Inorganic Chemistry, Third Edition, Oxford Press 1994.
8. H.W. Porterfield, Inorganic Chemistry, Second Edition, Academic Press, 2005.

PRACTICAL SYLLABUS

INORGANIC CHEMISTRY

Course Code:AUBSCED205P

L	T	P	C
0	0	1	1

List of Experiments:

1. Qualitative analysis.
2. Analysis of mixtures.
3. Dry tests or Preliminary tests.
4. Wet and Confirmatory tests for acid radicals.
5. Systematic wet analysis for basic radicals.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

DIVERSITY OF CRYPTOGAMS
(BRYOPHYTA, PTERIDOPHYTA AND PALEOBOTANY)

Course Code: AUBSCED206

L	T	P	C
4	0	0	4

Course Objectives:

- To make students capable of differenciation between different classes of Bryophyta.
- To impart knowledge about advancement of characters in Pteridophyta with respect to Bryophyta.
- To make students well versed with the Geological timescale.

Outcomes:

- Students will learn about the general characters of Bryophyta.
- Students will learn the general characters of Pteridophyta
- Students will learn the basic concept of fossil Bryophyta through Geological time scale.

Course Content:

Unit I

Bryophyta: General characteristics and classification of bryophyta, alternation of generation.

Unit II

Structure, reproduction and economic importance of Hepaticopsida. Riccia, Marchantia, Anthoceratopsida- Anthoceros, Bryopsida-Sphagnum, funaria.

Unit III

Pteridophyta: The first vascular land plant , classification of Pteridophyta, important characteristics of Psilopsida, Lycopsida,Sphenopsida, and Pteropsida, types of stele. General characters of Selaginella, Equisetum, Adiantum and Marsilea.

Unit IV

Gymnosperm:-General characteristies, classification, General characteristics of Cycas, Pinus, Ephedra.

Recommended Texts:

1. Pandey S. N. & others.1995, A Text Book of Botany Vol. I, Vikas Publications Delhi.
2. Pandey S.N. & others.1995, A Text Book of Botany Vol. II, Vikas Publications Delhi.

PRACTICAL SYLLABUS

DIVERSITY OF CRYPTOGAMS
(BRYOPHYTA, PTERIDOPHYTA AND PALEOBOTANY)

CourseCode:AUBSCED206P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. Study of External morphology and microscopic preparations of following bryophytes: Riccia, Marchantia, Anthoceros, Sphagnum and Polytrichum.
2. Microscopic temporary, double stained preparations and study of stem/cone/sporocarp of Lycopodium, Selaginella, Equisetum, Adiantum and Marsilea.
3. Study of External morphology and microscopic preparations of following gymnosperm: Cycas, Pinus and Ephedra.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

ANIMAL DIVERSITY: HIGHER NON-CHORDATA

Course Code: AUBSCED207

L	T	P	C
4	0	0	4

Objective: The objective is to give students the exposure of some higher invertebrate phylum like Arthropoda, Mollusca and Echinodermata and the life histories of the organism fall in this category. To make them understand about the structure and function of the cells and differences.

Outcome: The outcome will be in terms of understanding the body organization of different life forms in higher invertebrates and they will be able to explain the differences in the taxonomic characters of different phylum. Students can draw and write about the structure and functions of the cells.

Course Content:

UNIT I

Taxonomy: Classification of Arthropoda, Mollusca and Echinodermata up to order, Mouth parts of insects, economic importance of insects.

UNIT II

Arthropoda: Habit, habitat, morphology, physiology, reproduction, development of ***Palaemon*** (Prawn). ***Pariplaneta*** (cockroach).

UNIT III

Mollusca: Habit, habitat, morphology, physiology, reproduction, development of *Pila* (Apple snail).

Unit IV

Echinodermata: Habit, habitat, morphology, physiology, reproduction, and development of *Asterias (*Star fish).

Recommended books:

1. *Kotpal R.L, Invertebrates, Rastogi Publications, Meerut (2009).*
2. Sabharwal, A. Invertebrates-II, Modern Publishers, New Delhi (2015).
3. Barrington, E.J.W. Invertebrate Structure and Functions. Houghton Mifflin Co. Boston. (1967).

PRACTICAL SYLLABUS

ANIMAL DIVERSITY: HIGHER NON-CHORDATA

Course Code: AUBSCED207P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

Observation of the following slides / spotters / models

Arthropoda: *Palaemon, Lepas, Crab, Lobester, Squilla, Balanus, Apis, Lepisma, Apis, Limulus, Scolopendra, Peripleneta*.

Mollusca: *Lamellidense, Pila,Chiton,Teredo,Doris,Aplysia,Detalium,Nautilus,Sepia.*

Echinodermata: *Pentacerous,Echinis,Ophiothrix,Holothuria,Antidon.*

Slides:

Mouth parts of *Anopheles* (male and female), *Culex* (male and female), *Cyclops*, *Dephnia*, *Zoea* larva. Cell structure,

Activity: Preparation of onion root tip for the stages of mitosis.

Rexene Charts

1. Prawn nervous system.
2. Prawn digestive system.
3. *Pila* nervous system.
4. *Unio* nervous system.
5. Starfish water vascular system.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

THIRD SEMESTER

Childhood and Development Years

Paper Code-AUBAED / AUBSCED- 301 **Marks: 100 (60 + 40)**

Course Objectives:

- Understand the meaning, nature and scope of educational psychology.
- Understand growth and development of the learner and its importance in the learning process.
- Understand the need and problems of adolescence.
- Identify educational needs of various types of children
- Understand concept of intelligence and personality, theories of intelligence and personality and their educational implications.

UNIT 1: Child Development

- Educational Psychology: Meaning, Nature, Scope and Role of Educational Psychology in Teaching-Learning Process.
- Concept of Growth, Maturation and Development.
- Principles of Growth and Development.
- Heredity and Environment: Concept, Importance of Heredity and Environment in Child's Development.

Unit 2: Managing Individual Differences

- Individual Differences: Meaning, Dimensions (Cognitive Abilities, Interest, Aptitude, Creativity, Personality, Emotions, Values, Attitudes, Study Habits Psycho-motor Skills, Self-concept and Gender).
- Causes of Individual Differences (Race, Sex, Heredity, Social, Economic Status, Culture, Rural-Urban Home, Language Spoken and Language of Instruction).
- Characteristics, Identification and Remedial Measures for diverse learners (Creative, Slow, Gifted Learners, Learners with Specific Learning Disabilities).
- Role of Teacher to minimize Individual Differences.

Unit 3: Social, Emotional and Moral Development

- Social Development: Meaning, Stages and Factors affecting Social Development, Characteristics of Social Development during Childhood and Adolescence.
- Emotional Development: Meaning, Factors affecting Emotional Development, Characteristics of Emotional Development during Childhood and Adolescence.
- Moral Development: Meaning, Stages (Kohlberg), Factors affecting Moral Development, Characteristics of Moral Development during Childhood and Adolescence.
- Childhood and Adolescence: Meaning, Characteristics, Problems of Adolescence Period.

UNIT 4: Cognitive and Personality Development

- Cognitive Development: Meaning, Factors affecting Cognitive Development, Characteristics of Cognitive Development during Childhood and Adolescence.
- Theories of Cognitive Development (Piaget and Bruner).
- Personality Development: Meaning, Factors affecting Personality, Developmental Stages of Personality (Views of Sigmund Freud and Allport).
- Adjustment: Meaning, Types and Factors affecting Adjustment, Symptoms of Maladjustment and Role of the Teacher.

Activities (Any one of the following)

1. Prepare a report of administration and interpretation of any one psychological test, selecting one from: Personality/Adjustment/Mental Health.
2. Visit to a school and write a report on problems being faced by the students.
3. Administration of an individual test and preparing a report.

Suggested Readings

1. Aggarwal, J.C (1994). Essentials of Educational Psychology. New House Delhi: Vikas Public House.
2. Berk, L.E (2012). Child Development (6th Ed.) New Delhi: Prentice Hall of India.

Understanding Disciplines and Subjects

Paper Code-AUBAED / AUBSCED- 302 **Marks: 50 (40 + 10)**

Course objectives:

The student teachers will be able to:

1. Understand the nature of discipline and school subjects.
2. Differentiate between school subjects and curriculum.
3. Integrate and apply concepts and theories in real classrooms

UNIT-1: Concept of Discipline

- Nature and role of Discipline knowledge in School Curriculum.
- Paradigm shift in the nature of discipline, Emergence of School subjects and disciplines from Philosophical, Social and Political Contexts.
- Needed changes in the Discipline Oriented Text Books.

UNIT-2: Quality in Classroom Learning

- Indicators of Quality Learning.
- Teaching and Learning as Interactive Process.
- Major issues in classroom learning: Catering individual differences, student-teacher interaction in the classroom.
- Learning beyond text books- other sources of learning.

Activity (Any one of the following)

1. Prepare a report mentioning the changes required in current school level text books prescribed by CBSE or HPBSE.
2. Prepare a report highlighting major issues and concerns in teaching of Mathematics or English at secondary school stage.

SUGGESTED READINGS

1. Apple, M. (1978): Ideology and Curriculum, New York: Routledge.
2. Fuller, B. (2007): Standardized Childhood, Stanford, CA: Stanford University Press.
3. Romero-Little, M.E. (2006). Honoring Our Own: Rethinking Indigenous Languages and Literary. Anthropology and Education quarterly, *37*(4), 399-402.

LANGUAGE ACROSS THE CURRICULUM

Paper Code-AUBAED / AUBSCED- 303 **Marks: 50 (40 + 10)**

Course Objectives:

The student teachers will be able to:

1. Understand the nature, importance and use of Language.
2. Acquaint with some latest methods and approaches for planning of successful language teaching.
3. Identify and be sensitive to the proficiency, interests and needs of learners.
4. Practice learner centered methods and techniques in the classroom.
5. Use technology to enrich language teaching,
6. Encourage continuous professional development.

UNIT 1 - LANGUAGE AND SOCIETY

- Meaning, Nature and Scope of Language, Role of Language in life: Intellectual, Emotional, Social, Literary and Cultural Development.
- Characteristics of Language Development.
- Factors affecting Language Learning: Physical, Psychological and Social.
- Theories of Language: Divine Gift Theory, the Pooh or the Interjectional Theory. The Ding-Dong Theory. The sing- song Theory, The Ta - Ta Theory, The Babble- Luck Theory. The Tongue-Tie Theory.

UNIT 2 - CURRICULAR PROVISIONS, POLICIES FOR LANGUAGE EDUCATION AND DEVELOPMENT OF LANGUAGE SKILLS

- Position of Languages in India; Article 343-351, 350A; of Constitution of India.
- Kothari Commission (1964-66): NPE-1986; POA-1992; National Curriculum of India. Framework-2005 (Language Education), NCFTE - 2009 (Language Education).
- Meaning, Importance and Need for development of Language Skills.
- Approaches to Language Learning: Traditional Method, Textbook Method, Communicative Method, Grammar-cum-Translation Method, Principles and Maxims of Language Learning.

Activities (Any One of the following):

1. Discuss 'Multilingualism as a Resource.
2. Analyze advertisements aired on Radio Television on the basis of language and gender,
3. Analyze few passages from Science, Social Science and Maths textbooks of Classes VI to VII and Write a Report based on Following Issues
    a) how the different registers of language have been introduced
    b) Does the language clearly convey the meaning of the topic being discussed?
    c) Is the language learner-friendly?
    d) Is the language too technical?
    e) Does it help in language learning?

SUGGESTED READINGS

1. Valdmen (1987) Trends in Language Teaching, New York, London: Mcgraw Hill.
2. Johnson, K (1983): Communicative Syllabus Design and Methodology. Oxford: Pergamon press
3. Sharma, KL.(2012): Methods of Teaching English in India, Agra, lakshmi Narain Agarwal Publisher
4. Kohli, A.L: Techniques of Teaching English, New Delhi: Dhanpat Rai Publisher.
5. Geéta Rai (2010): Teaching of English, Meerut: R. LAL book DEPOT.
6. Praveen Sharma (2008): Teaching of English language, Delhi: Shipra Publications.
7. Joseph Mukalel C. (2011). Teaching of English Language, New Delhi: DiscoveringPublishing House.
8. Sharma Yogendra K. Sharma Madhulika (2011): Teaching of English Language, New Delhi: Kanishka Publishers, Distributors.

English (Core)

PAPER CODE: AUBAED/AUBSCED-304 **Marks: 100 (60+40)**

UNIT-I Essays

i. The Power of Prayer by A. P. J. Abdul Kalam

ii. Vivekananda: The Great Journey to the West by Romain Rolland

iii. More Than 100 Million Women are Missing by Amartya Sen

iv. On the Ignorance of the Learned (Excerpts by William Hazlitt)

v. Simply Living (Excerpts by Ruskin Bond).

UNIT-II Poetry.

i Bacon 'Of Studies'

ii Richard Steele 'Recollections of Childhood'

iii Joseph Addison 'Sir Roger at Church'

iv Charles Lamb 'The Convalescent'

UNIT-III Applied Grammar

i One Word Substitution (5 Expressions)

ii Words Used as Nouns and Verbs (5 words)

(Students will be required to use the given words in sentences both as nouns and verbs)

iii Transformation Interchange of Degree

(5 Sentences in all) , Homonyms, Homographs and Homophones (5 words)

(Students will be required to use the given words in sentences so as to illustrate their meaning).

UNIT-IV Classroom Activity

i Reading, Speaking and Listening Exercises

ii Conversation

iii Etiquettes: Personality Development

PHYSICAL CHEMISTRY

Course Code: AUBSCED307

	L	T	P	C
Unit – I	**4**	**0**	**0**	**4**

Gaseous States : Postulates of kinetic theory of gases, deviation from ideal behavior, van der Waal's equation of states, relationship between critical constants and van der Waals constants, reduced equation of state.
Molecular velocities: Root mean square, average and most probable velocities, qualitative discussion of the Maxwell's distribution of molecular velocities,

Liquid State: Intermolecular forces, structure of liquids (a qualitative description) Structural differences between solids, liquids and gases. Physical properties of liquids including their methods of determination: surface tension, viscosity and refractive index.

Unit-II

Solid State: Definition of space lattice, unit cell, crystal planes, Miller indices, Laws of crystallography – (i) law of constancy of interfacial angels (ii) law of rationality of indices (iii) law of symmetry. Symmetry elements in crystals, X-ray diffraction by crystals,. Derivation of Bragg's equation. Determination of crystal structure of NaCl, KCl and CsCl (Laue's method and powder method).

Unit-III

Chemical Kinetics: Chemical kinetics and its scope, rate of a reaction, factors influencing the rate of a reaction– concentration, temperature, pressure, solvent, light, catalyst. Concentration dependence of rates mathematical characteristics of simple reaction – zero order, first order, second order, pseudo order, half life determination of the order of reaction – differential method, method of half life period and isolation methods concept of activation energy.

Unit-IV

Thermodynamics: Definition of thermodynamic terms, system, surroundings etc. types of systems, intensive and extensive properties, thermodynamic process, concept of heat and work, First law of thermodynamics, definition of internal energy and enthalpy. Heat capacity – heat capacities at constant volume and at constant pressure and their relationship, Joule – Thomson coefficient and inversion temperature, Standard enthalpy of formation – Hess's law of heat summation and its application, Enthalpy of neutralization, bond dissociation energy and its calculation from thermochemical data, Kirchoff's equation.

Suggested Books:

1. Physical Chemistry by S.C.Khetarpal, G.S, Sharma and R.K. Kalia.
2. A text Book of Physical Chemistry by K.K.Sharma and I.K. Sharma.
3. Physical Chemistry by P.N.Kapil and S.K.Guglani.
4. A text book of Biophysical Chemistryby U.N.Das.
5. Surface Chemistry by Adison,L.I.Osipow.
6. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry 8th Ed., Oxford University Press (2006).
7. Ball, D. W. Physical Chemistry Thomson Press, India (2007).
8. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).

PRACTICAL SYLLABUS

PHYSICAL CHEMISTRY

Course Code:AUBSCED307P

L	T	P	C
0	0	1	1

List of Experiments:

1. Measurement of density.
2. Measurement of surface tension.
3. Measurement of viscosity.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)
Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

PLANT TAXONOMY AND EMBRYOLOGY

Course Code: AUBSCED308

L	T	P	C
4	0	0	4

Course Objectives:

- To make students understand about the Botanical gardens and Herbarium.
- To make students aware about the different classification of Angiosperms.
- To impart knowledge about general characteristics of members of Angiosperm family.

Outcomes:

- Students will earn the systematic position of flowering plants.
- Students will be able to do identification of plants using scientific classification.
- Students will earn to describe the general leaf, flower and fruit characteristics of members of the Angiosperm family.

Course Content:

Unit I: Introduction To Plant Taxonomy

- Fundamental components of taxonomy (identification, nomenclature, classification).
- Taxonomic resources: Herbarium-functions & important herbaria, Botanical gardens, Flora.
- Botanical Nomenclature-Principles and rules of ICBN (ranks and names; principle of priority, binomial system; type method, authorcitation, valid-publication).

Unit II: Classification

- Types of classification-Artificial, Natural and Phylogenetic.
- Bentham & Hooker's system of classification-merits and demerits.
- Engler & Prantle's system of classification-merits and demerits.

Unit III

- Systematic study and economic importance of the following families: Annonaceae, Brassicaceae, Rutaceae, Curcurbitaceae, and Apiaceae.
- Systematic study and economic importance of plants belonging to the following families: Asteraceae, Asclepiadaceae, Lamiaceae, Ephorbiaceae, Arecaceae, and Poaceae.

Unit IV: Embryology

- Anther structure, microsporogenesis and development of male gametophyte.
- Ovule structure and types; Megasporogenesis, development of Monosporic, Bisporic and Tetrasporic types (*Peperomia* ,*Drusa*, *Adoxa*) of embryosacs.
- Pollination and Fertilization (out lines) Endosperm development and types.
- Development of Dicot and Monocot embryos, Polyembryony.

Recommended Texts:

- Porter, C. L.: Taxonomy of flowering Plants, Eurasia Publishing house, New Delhi.
- Lawrence, G. H. M. (1953): Taxonomy of Vascular Plants, Oxford & IBH Publishers, New Delhi.
- Bhojwani, S. S. & Bhatnagar, S. P.(2000): The Embryology of Angiosperms (4^{th}Edition).
  Vikas Publishing House (P) Ltd., UBS Publisher's Distributors, New Delhi.
- Maheswari, P(1963): Recent Advances in the Embryology of Angiosperms (Ed.,) International Society of Plant Morphologists- University of Delhi.
- Maheswari, P.(1985): An Introduction to the Embryology of Angiosperms Tata McGraw Hill Publishing Co., Ltd., New Delhi.

Latest editions of all the suggested books are recommended.

PRACTICAL SYLLABUS

PLANT TAXONOMY AND EMBRYOLOGY

Course Code: AUBSCED308P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. Systematic study of locally available plants belonging to the families prescribed in theory syllabus.
2. Demonstration of herbarium techniques.
3. Structure of pollen grains using whole mounts (*Hibiscus*, *Acacia*, Grass).
4. Demonstration of Pollen viability test using *in-vitro* germination (*Catharanthus*).
5. Study of ovule types and developmental stages of embryo sac using permanent slides/Photographs.
6. Structure of endosperm (nuclear and cellular); Developmental stages of dicot using permanent slides /Photographs.
7. Field visits .Study of local flora and submission of Field Note Book.

Evaluation Scheme of Practical Examination: **Internal Evaluation (50 marks)**

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

ANIMAL DIVERSITY-CHORDATA

Course Code: AUBSCED309

L	T	P	C
4	0	0	4

Objective: The objective is to give an idea of the Chordata and their five classes. To teach the students about the chordate animals like fishes, amphibians, aves, reptiles and mammals and some of their behavior and difference in structures and life histories.

Outcome: Upon the completion of the semester the students are expected to explain taxonomy of different classes and their difference. The physiology, structure and life histories of animals fall in this category.

Course Content:

UNIT I

Urochordata: Classification and detailed study (Habit, Morphology, anatomy, Physiology,) of *Herdmaina.*

Cephalochordata: Classification and detailed study of *Branchiostoma* (Amphioxus).

UNIT II

Pisces: General characters and classification of Pisces (up to orders with examples) Parental care in fishes.

Amphibia: General characters and classification of amphibia (up to orders with examples) Parental care in amphibia.

UNIT III

Reptilia: General characters and classification of Reptilia (up to orders with examples) Identification of Poisonous and non- poisonous snakes. Biting mechanism of poisonous snakes.

Unit IV

Aves: General characters and classification of Aves (up to orders with examples) Characters of Archaeopteryx, Flight adaptation in Birds.

Mammals: General characters and classification of Mammalia up to orders. Dentition in Mammals.

Recommended books:

1. Kotpal R.L, Vertebrates, Rastogi Publications, Meerut (2018).
2. Kent, G. C. and Carr, R. K. (2001), Comparative Anatomy of the Vertebrates 9th edition,McGraw Hill Higher Education, New York.

PRACTICAL SYLLABUS

CHORDATA

Course Code: AUBSCED309P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

Study of Specimens:

Urochordata– Herdmania, salpa doliolum.

Cephalochordata– Amphioxus.

Cyclostomata –petromyzon, myxine.

Pisces –*Pristis, torpedo*, *notopterus, exocoetus, clarius*, *ophiocephalus* , *catla* , *rohu* , *mrigal*

Amphibia– *Ichthyophis*, *bufo*, salamander, *uraeotyphlus*, *necturus*, *hyla*, *rhacophorus.*

Study of permanent slide:

Balanoglossus sections through probossiss, collar ,branchiogenital and hepatic region

Amphioxus – oral hood, whole mount section through pharyngeal, intestinal & caudal region, Temporary unstained preparation of placoid, cycloid and ctenoid scales.

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10 MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10 MARKS)			(50 MARKS)

External Evaluation (50 marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

FOURTH SEMESTER

Learning and Teaching

Paper Code :AUBAED/AUBSCED- 40l **Marks: 100 (60 + 40)**

Course objectives:

The student teachers will be able to:

1. Understand the nature, characteristics of learner and principles to mako teaching-learning effective and productive.
2. Explain the concept, nature of learning as a process and conditions of learning.
3. Describe the Gagne's types of learning.
4. Explain the concept, types and strategies to develop memory.
5. Understand nature, causes, factors and strategies to minimize forgetting.
6. Apply the knowledge and understanding of the learning process, principles and theories of learning with their educational Implications.
7. Describe the concept, Importance and level of transfer of learning.

Unit 1 Learner and Learning

- Changing Nature of Learner, Characteristics of Effective Learner, Guiding Principles to make Teaching-Learning Effective and Productive.
- Concept and Nature of Learning as a Process, Learning Curve, Conditions of Learning - objective, subjective and methodological, Learning and Maturation.
- Gagne's Types of Learning, Events of Instruction, Learning Outcome.
- Memory - Concept, Types and Strategies to develop Memory; Forgetting - Nature, Factors and Strategies to Minimize Forgetting.

Unit 2 Understanding the Learning Process

- Learning: Meaning, Types and Levels of Concept Development, Strategies for Concept Learning.
- Learning through Association- Classical Conditioning, learning through Consequences - Operant Conditioning, learning through Trial and Error, learning through Observation Modeling/Observational Learning, Learning through Insight- Discovery Learning and their Educational implications.
- Social Constructivist Learning - Concept of Vygotsky, Educational Implications.
- Transfer of Learning: Concept, Types and Strategies to Maximize Transfer of Learning.

Unit 3 Teacher and Teaching

- Teacher: Qualities and Role in the Changing Scenario - Transmitter of Knowledge, Model, Facilitator.
- Concept of Teaching, Principles and Maxims of Teaching
- Teaching as a Profession: Meaning of Profession, Characteristics of a Profession, Professional Ethics for the Teachers, Role of Teacher Training in Developing Professionalism in Teachers Educators.
- Relationship between Teaching and Learning, Principles of effective Teaching and Learning.

Unit IV Phases and Models of Teaching

- Phases of Teaching: Pre-active, Interactive and Post Active. Operations involved in each.
- Models of Teaching: Meaning, Need, Types and Elements of Model of Teaching, Basic Teaching Models (Glaser).
- Concept Attainment Model (Bruner) and Advance Organiser Model (Ausbel).
- Strategies of Teaching: Brainstorming, Simulation. Role Play and Gaming,

Activities - (Any one of the following)

1. A study of educational, social & cultural functions of any informal agency of education.
2. Prepare a report of educational problems of learners in any school.
3. Prepare a report of problem of SC/ST/Backward/ Minority group of children in the rural & urban area of Himachal Pradesh.

Suggested Readings

1. Bower, G H and Hilgard E R (1981) Theories of learning, Englewood Cliffs, New Jersey: Prentice Hall Inc.
2. Chauhan S.S. (1995) Advanced Educational Psychology, New Delhi: Vikas Publishing House Pvt. Ltd.
3. Mangal S.K. 2005) Advanced Educational Psychology, New Delhi. Prentice Hall of India.
4. Dandapani S. (2005). Advanced Educational Psychology, New Delhi: Anmol Publications.
5. NCERT (2005) National Curriculum Framework, New Delhi.
6. NCTE (2009) National Curriculum Framework for Teacher Education, New Delhi.

DRAMA AND ART IN EDUCATION

Paper Code - AUBAED/AUBSCED -402 Marks: 50 (40 + 10)

Course objectives:

The student teachers will be able to:

1. Understand the concept and importance of various arts in human life.
2. Understand aims, objectives and principles of performing and visual arts.
3. Appreciate Indian folk and visual and performing arts.
4. Understand various methods and techniques of teaching creative arts.
5. Understand the importance of visits in arts exhibitions and cultural festivals.

UNIT-I Origin and Development of Art in India.

- Meaning of Art: Concept and Scope of Art.
- Origin & development of Arts in India with special reference to the performing and visual arts.
- Importance of various Arts in Life and Education.
- Aims and objective of teaching performing and visual arts, Principles of Art.

UNIT-II Methods and Approaches of Teaching Creative Arts

- Understanding Indian folk and visual and performing arts.
- Methods of teaching creative arts: a. Lecture cum Demonstration method, b. Direct Observation method. c. Method of Imagination and Free Expression.
- Importance of visits in art exhibitions and cultural festivals.
- Process of preparing canvas, Types of Colours and Paints.

Activity (Any one of the following):

Practical work to be submitted by students during the session: Size- Imperial Size Sheet. One Canvas in size 18'X 22' to be submitted along with the sheets.

1. Landscapes –1
2. Still life – 1
3. Poster-1

Suggested Readings:

1. Brown, Percy (1953). Indian Painting, Calcutta.
2. Chawla, S.S. (1986). Teaching of Art. Patiala: Publication Bureau, Punjabi University.
3. Harriet, Goldstein (1964). Art in Everyday Life. Calcutta: Oxford and IBH Publishing Company
4. Jaswani, K.K., Teaching and Appreciation of Art in Schools. Lowenfeld Viktor.
5. Creative and Mental Growth. Margaret, Marie Deneck (1976)
6. Indian Art. London: The Himalaya Publication.
7. Sharma, L.C., History of Art, Meerut: Goel Publishing House.
8. Read.Herbert. Education through Art [paperback).
9. Shelar, Sanjay. Still Life. Jyotsna Prakashan.

TEXT READING AND REFLECTIONS

Paper Code : AUBAED/AUBSCED-403 **Marks: 50 (40 + 10)**

Course objectives: The student teachers will be able to:

1. Learn to read Newspaper Follow Radio, TV & Internet media critically and with understanding.
2. Form and exchange viewpoints on political and social Issues.
3. Distinguish fact, fiction and opinion in Newspaper articles.
4. Develop teachers professionally and support their aspirations as teachers.

UNIT-1 Analytical and Critical Thinking

- Analytical and Critical Thinking: Meaning and Importance for Reading and Writing. Role of Critical Reading and Critical Thinking in Enhancing Writing Skills.
- Ways of Developing Reading Skills, Importance of Developing Reading Skills; Reading Aloud and Silent Reading; Extensive Reading, Study Skills including using Thesaurus, Dictionary, Encyclopedia.
- Ways of developing Writing Skills: Formal and Informal Writing (such as Poetry, Short Story, Letter, Diary, Notices, Articles, Reports, Dialogue, Speech and Advertisement.

UNIT-II Pedagogies of Reading and Writing

- Models for Assessing the components of Reading (Phonemic Awareness, Phonics, Fluency, Vocabulary, and Text Comprehension).
- Instructional Approaches for Developing Students' Concepts of Grammar, Punctuation, Spelling and Handwriting.
- Responding to the Texts: Approach to Response Based Study (The Core of the Text, Personal Connection. Reading Beyond the Text, Revisiting the Text).
- Responding to the Contexts: Sharing Responses (Purpose of Sharing. Role of the Teacher and Benefits of Sharing)

ACTIVITIES (Any one of the following):

1. Writing a review or a summary of the text with comments and opinion.
2. Student teacher will select news paper/magazine articles on topics of contemporary issues.
3. REFLECTION EXERCISES:
    a) Why did this particular (event, barrier, success, accident) happen?
    b) What was the best thing I did and Why?
    c) If I did this again tomorrow, what would I do differently?

SUGGESTED READINGS:

1. Alberta Learning (2003), Responding to Text and Context, Senior High School English Language Arts Guideto Implementation. Alberta, Canada. Retrieved from https://education.alberta.ca/media/883678/4_respond.pdf.
2. Cottrell Stella (2011) Critical Thinking Skills: Developing Effective Analysis and Argument (Palgrave study skills) Basingstoke: Palgrave Macmillan
3. Cox, Ailsa (2005) Writing Short Stories (English) London: Routledge.
4. Fisher Alec (2001) Critical Thinking:An Introduction, UK: Cambridge University press.
5. Fitkids T.J. (2011) Common Mistakes in English (With Exercises), New Delhi: Jain Book Agency.

English (Core)

PAPER CODE AUBAED/AUBScED-404 **Marks:100 (60+40)**

Unit -I

British Literature (Play and Novel)

Drama - William Shakespeare: Macbeth

Unit II

Non-Detailed Study:

Novel - Charles Dickens: *Oliver Twist*

Unit III

i Prem Chand, ―The Holy Panchayat

ii Vaikom Muhammad Basheer, ―The Card-Sharper's Daughter

iii Saadat Hasan Manto, ―Toba Tek Singh

iv Ambai, ―Squirrel‖

v. Ismat Chugtai, ―The Sacred Duty

UNIT IV

i. "Toys" by Roland Barthes
ii. "Indian Movie, New Jersey" by Chitra Banerjee Divakaruni
iii. "The Brand Expands" by Naomi Klein

Selections from Vinod Sood, et al, eds. The Individual and Society: Essays, Stories and Poems. Delhi: Pearson, 2005.

ORGANIC & INORGANIC CHEMISTRY

Course Code: AUBSCED 407

L	T	P	C
4	0	0	4

Unit - I

Cycloalkanes: Nomenclature, methods of formation, chemical reactions, Baeyer's strain theory and its limitations. Ring strain in small rings (cyclopropane and cyclobutane), theory of strainless rings.

Aldehydes and Ketones: Nomenclature and structure of Carbonyl gropus, Synthesis of Aldehydes and Ketones with particular reference to the synthesis of Aldehydes from acid chlorides, Synthesis of Aldehydes and Ketones using 1,3 dithianes, Synthesis of Ketones from Nitriles and from Carboxylic acids.

Aldol, Perkin and Knoevenegel Condensations, Wittig reaction, Mannich reaction. Cannizaro reaction, Clemmensen , Wolff-kishner, $LiAlH_4$ and $NaBh_4$ reduction.

Unit-II

Alcohols: Classification and nomenclature

Monohydric alcohols- nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding, Acidic nature, reactions of alcohols.

Phenols: Nomenclature structure and bonding, preparation of phenols, physical properties and acidic character. Comparative acidic strength of alcohols and phenols, mechanism of Fries rearrangement, Claisen rearrangement, Gatterman synthesis and Reimer-Tiemann synthesis.

Unit- III

Non-Aqueous Solvents: Introduction to non-aqueous solvents, their classification, effect of physical properties of the solvents on the role of solvent in chemical reactions, solvent system concept of acids and bases, studies of NH_3HF, H_2SO_4 and SO_2 as non-aqueous solvents, failure of solvent system concept and coordination model of non-aqueous solvents.

Unit-IV

Structures of diamond and graphite, Inorganic compounds of carbon (CO,CO_2, CS_2, CCl_4, HCN, SIC), composition and theory of setting of cement, Catenation, silicate minerals, silanes, silicone polymers, comparison of C and Si. Allotrophy of P. Oxides and oxy-acids of both N and P. hydrides of N and P (NH_3, N2H4, NH_2OH, NH_3, P_2H_4 and PH_3). Ammonium sulphate and calcium ammonium nitrate (CAN) manufacture and uses. Oxides and oxyacids of S, hydrides and halides of sulphur. Oxides and oxyacids of halogens, hydrides of halogens.

Suggested Books:

1. Reaction and Mechanism by Singh & Mukherjee.
2. Organic Chemistry (Reaction and Mechanism) by P.S. Kalsi.
3. Finar, I. L. Organic Chemistry (Volume 1), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
4. Finar, I. L. Organic Chemistry (Volume 2: Stereochemistry and the Chemistry of Natural Products), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).
5. Organic Chemistry by Paula Yurkanis Bruice.
6. Organic Chemistry by Baeyer and Walter.
7. Concise inorganic Chemistry 4th Edn. By J.D.Lee.
8. Inorganic Chemistry by J.E.Huheey.
9. Advanced Inorganic Chemistry byCotton And Wilkinson.
10. Chemistry of Elements by Greenwood & Earnshaw.
11. Theoretical Inorganic Chemistry By Day & Selbin.

PRACTICAL SYLLABUS

ORGANIC & INORGANIC CHEMISTRY

Course Code: AUBSCED407P

L	T	P	C
0	0	1	1

List of Experiments:

1. Estimation of Barium and Sulphate ions.
2. Estimation of Iron.
3. Inorganic preparation of Prussion Blue $Fe_4[Fe(CN)_6]_3$.
4. Inorganic preparation of Tetra-amine copper (II), Sulphate-Tetra ammonium Cupric sulphate $[Cu(NH_3)_4]SO_4H_2O$.
5. Inorganic preparation of Chrome alums $K_2SO_4Cr_2(SO_4)_324H_2O$.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				ON THE DAY OF EXAM (15 MARKS)		TOTAL
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50 MARKS)

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

PLANT PHYSIOLOGY AND METABOLISM

Course Code: AUBSCED408

L	T	P	C
4	0	0	4

COURSE OBJECTIVE

- To make students capable of understanding basic physical processes occurring in plants.
- To impart Knowledge about plant growth regulators related to growth and development.
- To make student learn about the Mineral nutrition in plants.
-

Learning Outcomes:

- Students will learn about the physical processes occurring in plants.
- Students will learn the function of different plant growth regulators.

Course Content:

Unit 1: Plant-water relations

Importance of water, water potential land its components; Transpiration and its significance; Factors affecting transpiration; Root pressure and guttation.

Unit 2: Mineral nutrition and Translocation

Essential elements, macro and micronutrients ;Criteria of essentiality of elements; Role of essential elements, Transportations across cell membrane, active and passive transport, carriers, channels and pumps.
Translocation in phloem.: Composition of phloem sap, girdling experiment; Pressure flow model; Phloem loading and unloading

Unit 3: Photosynthesis and Respiration

Photosynthetic Pigments (Chlab, xanthophylls, carotene); Photosystem I and II, reaction center, Electron transport and C3, C4 and CAM pathways of carbon fixation.
Respiration: glycolysis, anaerobic respiration, TCA cycle; Oxidative phosphorylation.

Unit 4: Enzymes and Nitrogen metabolism

Structure and properties; Mechanism of enzyme catalysis and enzyme inhibition. Nitrogen metabolism**:** Biological nitrogen fixation; Nitrate and ammonia assimilation.

Plant growth regulators and Plantresponse to light and temperature

Discovery and physiological roles of auxins, gibberellins, cytokinins, ABA, ethylene. Plant response to light and temperature: Photoperiodism (SDP, LDP, Dayneutralplants);
Phytochrome (discovery and structure), redand far red light responses on photomorphogenesis; Vernalization.

Recommended books:

1. Hopkins, W.G., Huner, N.P., (2009). Introduction to Plant Physiology. John Wiley & Sons, U.S.A. 4th Edition.
2. Bajracharya, D., (1999). Experiments in Plant Physiology-A Laboratory Manual. Narosa Publishing House, New Delhi.
3. Taiz,L., Zeiger,E., MØller,I.M. and Murphy,A. (2015). Plant Physiology and Development. Sinauer Associates Inc. USA. 6th edition.

PRACTICAL SYLLABUS

PLANT PHYSIOLOGY AND METABOLISM

Course Code: AUBSCED408P

L	T	P	C
0	0	1	1

LIST OFEXPERIMENTS:

1. To prepare a temporary mount of onion bulb peel and study structure of its cells.
2. To determine the stomatal index (S.I) on abaxial and adaxial surface of the leaf.
3. To demonstrate the stomatal transpiration by four leaves method.
4. Study the cells of onion and spirogyra.
5. To demonstrate the phenomenon of osmosis through plasma membrane of a plant material by using Potato osmoscope.
6. To determine the water absorption and transpiration ratio by absorb transpirometer.
7. To demonstrate the growth of plant by Arc auxanometer.
8. To study the rate of transpiration by Ganong's photometer method.
9. To separate the chloroplast pigments by paper chromatography.
10. To demonstrate the phenomenon of imbibition pressure by using dry seeds.
11. To study the germination of gram seeds.
12. Separation of amino acids by paper chromatography.

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10 MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10 MARKS)			(50 MARKS)

External Evaluation (50marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

EVOLUTION AND DEVELOPMENTAL BIOLOGY

Course Code: AUBSCED 409

L	T	P	C
4	0	0	4

Objectives: To educate the students on the concept and theories of the evolution and embryology. The development of chick and placentation.

Outcomes: As an outcome the student will be able to explain and write the different theories given to explain the evolution during the time period like Darwininsm and Lamarkism and can be understand the developmental biology.

Course Content:

Unit – 1

Concept of evolution. Evidences of natural selection, Theory of evolution (including Neo-Lamarckism, Darwin – Wallace theory of natural selection, Neo- Darwinism modern synthetic theory.

Unit-2

Gametogenesis: spermatogenesis and oogenesis, vitellogenesis egg membrane, Fertilization, Parthenogenesis.

Unit-3

Types of animal eggs: structure of eggs. Types and patterns of cleavage.

Unit -4

Process of blastulaion and gastrulation. Development of chick up to the formation of primitive streak and extra embryonic membrane. Development of extra embryonic membrane in mammals. Placentation and types of placenta.

Recommended books:

1. Gilbert, S.F. (2006), development biology, VIII edition, sinauer associates Inc publishers, sunder land, Massachusetts, USA.
2. Balinsky, B.I. (2008) an introduction to embryology, international Thomson computer press.
3. Kalthoff, (2000) Analysis of biological development ,II edition, mc graw hill professional.
4. Verma P.S. & V.K. aggrawal, chordate embryology, s. Chand & co.
5. Berril & crop development biology. Mc Graw hill book company , m,c, New York.
6. Jain P.C. 1998, elements of development biology. Vishal publication , New Delhi

PRACTICAL SYLLABUS

EVOLUTION AND DEVELOPMENT BIOLOGY

Course Code: AUBSCED 409P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. **Reptiles –** study of chamelon , *varanus* , pharynosoma , *draco* , tortoise , cobra , Krait, Russel's viper, sea snake testuda.

1. *Hemidactytus, uromastix* , *ophiosaurus* , *hydrophis* , crocodiles.
2. **Birds –** study of owl, woodpecker , king fisher, kite , duck, parrot, study of dozen birds of delhi.
3. **Mammals –** study of squirrel, mangoose, bat, loris, rabbit.

Development biology

1. **Frog-** study of developmental stage w.m &section through permanent slides cleavage , stage, blastula , gastrula , neurula tadpole.
2. **Chick –** study of developmental stage primitive streak,- 21h , 24h , 28h, 33h, 36h, 48h, 72h.
3. Section of testis and ovary (mammalian).
4. Slides of mammalian sperm and ovum.

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10 MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10 MARKS)			(50 MARKS)

External Evaluation (50 marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

FIFTH SEMESTER

ASSESSMENT FOR LEARNING

Paper Code:AUBAED/AUBSCED-501 **Marks: 100 (60 + 40)**

Course Objectives:
The student-teachers will be able to;

1. Understand the nature of assessment and its role in teaching-learning process.
2. Understand the different perspectives of learning on assessment.
3. Realize the need for school-based assessment in schools.
4. Examine the contextual roles of different forms of assessment.
5. Understand the different dimensions of learning and the related assessment procedures, tools and techniques.

Unit-1 Perspectives on Assessment

- Concept of measurement, assessment, evaluation and their interrelationship.
- Purposes of Assessment: Prognostic, Monitoring of Learning. Providing Feedback, Selection, Promotion, Placement, Certification, Grading and Diagnostic.
- Classification of assessment: based on purpose (prognostic, formative, diagnostic and summative), nature of Interpretation (norm-referenced, criterion-referenced).
- Need for continuous and comprehensive school-based assessment: Grading: Concept, Types and Application Indicators for grading,

Unit 2 Assessment of Learning

- Dimensions of learning: cognitive, affective and performance.
- Assessment of cognitive learning: types and levels of cognitive learning: understanding and application. Thinking skills - convergent, divergent, critical, problem solving, decision making and procedures for their assessment.
- Assessment of affective learning: Attitudes, values, interests and procedures for their assessment.
- Assessment of Performance. Tools and techniques for assessment of skills.

Unit 3 Planning, Executing, Interpreting and Reporting of Assessment

- Construction/ Selection of test items: Guidelines for construction of test items.
- Guidelines for administration and scoring, Preparation of blueprint; Performing item analysis.
- Processing test performance: Calculation of percentages and central tendency measures: graphical representations; Analysis and interpretation of learners' performance; Reporting learners' performance - Progress report. Cumulative records, Portfolios.
- Means of providing remedial instruction for improving learning.

Unit 4 Issues, Concerns and Trends in Learning Assessment

- Existing Practices: Unit tests, half-yearly and annual examinations, semester system, Board examinations and Entrance tests, State and National achievement surveys, Use of question banks.
- Issues and Problems: Marking Vs. Grading. Non-detention policy, Objectivity Vs Subjectivity,
- Policy perspectives on examinations and assessment: Recommendations of NPE, 1986 and NCF, 2005.
- Trends in assessment and evaluation: Online examination, Peer assessment, Self-Assessment, Computer-based examinations and other technology-based assessment practices.

*** Activity (Any One of the Following):**

1. Construct an achievement test in any subject of your interest containing a minimum of 50 items with its marking scheme and scoring procedure, evaluation practices adopted by the school teachers.
2. Visit an elementary school and prepare a report on the assessment and prepare a report on the assessment and evaluation practices adopted by the school teachers.
3. Study the parameters / indicators followed in Continuous and Comprehensive Assessment System of CBSE and HP State Education Department. Prepare a critical report highlighting the similarities and differences in the two systems.
4. Visit a school and study how the progress reports and cumulative records of students are maintained by the teachers. Prepare a detailed report highlighting the content and format of students' progress reports and cumulative records.

***Suggested Readings:**

1. Bransford, J., Brown, AL, & Cocking. RR. (Eds.) (2000). How People Learn: Brain,
2. Mind, Experience, and School. Washington, DC: National Academy Press. Burke, K. (2005).
3. Nandra, Inder Dev Singh (2012). Learning Resources and Assessment of Leaming.Patiala: 21" Century Publications.
4. Natrajan and Kulshreshta S.P. (1983). Assessing Non-Scholastic Aspects-Learners Behaviour, New Delhi: Association of Indian Universities.
5. NCERT(1985) Curriculum and Evaluation, New Delhi.

GENDER, SCHOOL AND SOCIETY

Paper Code-AUBAED/AUBSCED-502 **Marks: 50 (40+10)**

Course Objectives:

The student-teachers will be able to:

1. Develop basic understanding and familiarity with key concepts: Gender bias, gender stereotype, empowerment, equity and equality, patriarchy, matriarchy, masculinity and feminism.
2. Understand some important landmarks in connection with gender and education in the historical and contemporary perspective.
3. Learn about gender issues in school curriculum, textual materials across discipline, pedagogical processes and its interaction with class, caste, religion and region.

Unit-1 Gender Issues and Gender Studies

- Concept of Gender: Meaning of gender equality, need and importance, Gender bias, Gender stereotypes.
- Gender equity and equality in India in relation to caste, class, religion, ethnicity, disability and region.
- Historical backdrop: Some landmarks from social reform movements of the 19^{th} and 20^{th} centuries with focus on women education.
- Policy Initiatives for Gender equality and women empowerment in India.

Unit –2 Gender, Education and Empowerment

- Socialization theory of gender and educational implications.
- Gender identities and socialization practices in: family, school, other formal and informal organizations.
- Schooling of girls: Inequalities and resistances, issues of access, retention and exclusion (infrastructure and hidden curriculum).
- Role of education in dealing with social Issues: Domestic violence against women, female foeticide and infanticide and dowry.

Activity:

1. Development of a project on the organizational climate of two schools' single sex and co-educational school.

References:

1. Aaker's. (1994) Feminist Theory and The Study of Gender and Education In S. Acker, Gendered Education: Sociological Reflections on Women. Teaching and Feminism, Buckigham Open University Press.
2. Bars, O. (1971) Sociology of Education Ed. 2 London: Batsford.
3. Shokeshaft, Charol (1989), Women in Education Administration, New Bury Park:Sage Publication.
4. Devendra, K (1994). Changing Status of Woman in India, New Delhi: Vikas Publishing House.
5. Gupta, AK. (1986). Women and Society. New Delhi: Sterling Publication.

INCLUSIVE SCHOOL

Paper Code - AUBAED/AUBSCED-503 **Marks: 50 (40+10)**

Course Objectives:

The student teachers will be able to:

1. Understand the concept, nature and types of disabilities.
2. Identify the characteristics and need, identification of different types of disabled children.
3. Understand the concept, nature and approaches of inclusion in education.
4. Understand and reflect on models of inclusion in education.
5. Acquire knowledge and understanding about the provisions made for disabled children under SSA and RTE Act, 20096.
6. Understand different pedagogical and assessment techniques for inclusion of CWSN.
7. Employ different pedagogical approaches for inclusion of CWSN in regular schools.

Unit-1 Disabilities and Inclusion in Education

- Disability: Concept and Nature; Disabled Children: Types, Characteristics and their identification.
- Inclusion in Education: Meaning, Need, Scope and Advantages.
- Constitutional Provisions for Inclusion in Education: Sarva Shiksha Abhiyan and Right to Education Act, 2009. Infrastructural Facilities required for Inclusion in Schools: Concept of Resource Room.
- Approaches to Inclusion: Full Inclusion and Partial Inclusion; Models of Inclusion: Consultant Model, 3-Dimensional (3D) Model of Inclusion: Ways of Ensuring Community/Parents' Participation in Creating Inclusive Schools.

Unit - 2 Pedagogical and Assessment Approaches for Creating Inclusive Schools

- Pedagogical Approaches for CWSN: Curriculum Adaptation, Activity-based Learning, Developing Specially Designed Resource Materials, Collaborative and Cooperative Learning, Team Teaching.
- Assessment Approaches for CWSN: Observation, Continuous and Comprehensive Assessment (Formative and Diagnostic Assessment).
- Identifying Barriers to Learning and Participation of CWSN.
- Means of Providing Remedial Instruction and Feedback; Role of School Head and Teachers in Evolving Inclusive Practices and Developing Inclusive Values.

Activity (Any one of the following):

1. Visit a primary school in your locality and identity the pedagogical practices employed by the teachers for inclusion of CWSN. Prepare a detailed report highlighting pedagogical practices, their relevance and difficulties faced by teachers.
2. Visit a School where resource room has been established by the State Govt. Interact with the in-charge of resource room and prepare a report highlighting its layout, types of equipment and their usage by the teachers for imparting education in inclusive settings.

Suggested Readings:

1. Alur, Mithu and Bach, Michael (2009). The Journey for Inclusive Education in the Indian Sub-Continent. New York: Routledge.)
2. Das, Shankar and Kattumuri, Ruth (2013). Inclusive Education: AContextual Working Model. New Delhi: Concept Publishing Company)
3. Friend, M. and Bursuck, W. D. (1999), Including Students with Special Needs: A Practical Guide for Classroom Teacher. Boston: Allyn and Bacon.)
4. Mangal, S. K. (2009) Educating Exceptional Children: An Introduction to Special Education. New Delhi: Prentice Hall

English (Core)

PAPER CODE: AUBAED/AUBSCED-504 **Marks:100 (60+40)**

UNIT-I

Literary Terms: Plot, Characterization, Dialogue, Monologue, Soliloquy, Aside, Narrator, Persona, Irony, Metaphor, Simile, Metonymy, Alliteration, Rhyme, Onomatopoeia, Oxymoron, Point of View and Them

UNIT-II

i. Ozymandias

ii. Blow Blow thou Winter Wind

i. Good Morrow

iv. The Man he Killed

v. Lines Written in Early Spring

Poems from *The Blossoming Mind.* Ed. V. K. Khanna and Meenakshi F. Paul. New Delhi: Macmillan.

UNIT-III

i. "The Parrot in the Cage"

ii. "Dinner for the Boss"

iii. "The Reddening Tree"

iv. "At the Himalayas"

Stories and **Essays** from *Life Unfolded.* Ed. V. K. Khanna and Meenakshi F. Paul. New Delhi: Oxford University Press.

UNIT-IV

Applied Grammar:

The use of Articles, Prepositions, Verb Forms, Phrasal Verbs and Comprehension (The literary pieces incorporated in the course are to be used as tools to teach language through literature with emphasis on reading, listening, comprehension, summarizing, inference and discussion.)

PHYSICAL & INORGANIC CHEMISTRY

Course Code: AUBSCED507

L	T	P	C
4	0	0	4

Unit I

Second law of thermodynamics: Need for the law, Different statements of the law, Carnot cycle and its efficiency, Carnot theorem, Thermodynamics scale of temperature.
Third law of thermodynamics: Concept of entropy, variation of entropy with T and V, T and P, P and V_2, Nernst heat theorem, Evaluation of absolute entropy from heat capacity data, Entropy of real gaseous and application of third law.
Free energy and work Function: Gibb's function (G) and Helmohltz function (A) as thermodynamic state function, Maxwell relations, Standard free energies, Gibb's Helmholtz equation and its applications.

Unit II

Electrochemistry: Electrical transport-conduction in metals and in electrolyte solutions, Specific and molar conductivity variations of conductivity with concentration, Kohlrausch law, Arrhenius theory of electrolyte dissociation and its limitations, Weak and strong electrolytes, Transport number.
Electrolytic and Galvanic cells: Derivation of cell EMF, EMF of cell and its measurement, Elecrode potential, Standard Hydrogen electrode, Standard electrode potential, Sign conversions.
Definitions of pH and pKa values, determination of pH using Hydrogen, Buffers mechanism of buffer action, Henderson-Hazel equation, Hydrolysis of salts.

Unit-III

Metal-Ligand bonding in Transtions Metal Complexes: Electrostatic crystal field splitting of d-orbitals in octahedral, Tetrahedral, square planar and tetragonally distorted octahedral stereochemistry, Factors affecting the crystal filled parameters, CFSC, Spectro chemical series, Origin of diamagnetism, paramagnetism, ferromagnetism and antiferromagnetism, Types of magnetic behaviour shown by transition elements and compound, Gouy's method for measuring magnetic susceptibility, Origin of colour in transition metal complexes, Explanation of colour in $[Ti(H_2O)_6]Cl_3$ and $CuSO_4.5H_2O$ and lack of colour in $CuSO_4$ and $Cu_2\ SO_4$ in terms of d-orbital splitting.

Unit-IV

Organometallic Compounds and $\pi-$acid Complexes: Definition type and classification of organometallic compounds, EAN and nomenclature, Ionic metal carbon bonding, Metal carbon multiple bonding, Preparation and reaction of feerocene, Nature of bonding in Metal olefin and metal alkyne complexes. Formation of reaction in Carbonyl compounds of transition elements, Bonding in linear carbonyls (simple spectral evidence), structure of mono and polynuclear carbonyls.

Suggested Books:

1. Physical Chemistry by S. C. Khetarpal, G.S, Sharma and R. K. Kalia.
2. Physical Chemistry by P. N. Kapil and S. K. Guglani.
3. Castellan, G. W. Physical Chemistry 4th Ed. Narosa (2004).
4. Atkins, P. W. & Paula, J. de Atkin's Physical Chemistry 8th Ed., Oxford University Press (2006).
5. Ball, D. W. Physical Chemistry Thomson Press, India (2007).
6. Concise inorganic Chemistry 4th Edn. By J. D. Lee.
7. Inorganic Chemistry by J. E. Huheey.
8. Advanced Inorganic Chemistry by Cotton And Wilkinson.
9. Chemistry of Elements by Greenwood & Earnshaw.
10. Theoretical Inorganic Chemistry By Day & Selbin.

PRACTICAL SYLLABUS
PHYSICAL & INORGANIC CHEMISTRY

Course Code: AUBSCED507P

L	T	P	C
0	0	1	1

List of Experiments:

1. Thermodynamic: Heat of neutralization, Heat of solution.
2. Preparation of buffer solution and the determination of the pH values by the use of indicator.
3. $KMnO_4$ Titration.
4. Iodine Titration.
5. EDTA Titration.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

ECONOMIC BOTANY AND PLANT BIOTECHNOLOGY

Course Code: AUBSCED508

L	T	P	C
4	**0**	**0**	**4**

Course Objectives:

- To make students capable of understanding the centres of origin of different crops.
- To impart knowledge about economic importance of some cash crops.
- To makes student learn about the techniques in plant biotechnology.

Outcomes:

- Students will learn about the centres of origin of different crops.
- Students will learn the origin and plant parts used in some important cash crops.
- Students will learn the latest techniques in plant biotechnology.

Course Content :

Unit-I:

Origin of Cultivated Plants: Concept of centres of origin and diversity of cultivated plants, Vavilovian centres. Cereals : Rice -Origin, morphology, uses Legumes : General account with special reference to Gram and soybean.

Unit II

Spices and Beverges: General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses) Beverages: Tea (morphology, processing, uses).

Fat and Fibre yielding plants: General description with special reference to groundnut Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses).

Unit III: Introduction to Biotechnology

Plant tissue culture: Micropropagation; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications

Unit IV

Recombinant DNA Techniques

Blotting techniques: Northern, Southern and Western
Blotting, DNA Finger printing ; Molecular DNA markers
i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR.

Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Humangene Therapy.

Recommended Texts:

1. Kochhar, S. L. (2011). Economic Botany in the Tropics, MacMillan Publishers India Ltd., New Delhi. 4th edition.
2. Bhojwani, S. S. and Razdan, M. K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B. R., Pasternak, J. J. (2003). Molecular Biotechnology-Principles and Applications of recombinant DNA. ASM Press, Washington.

PRACTICAL SYLLABUS

ECONOMIC BOTANY AND PLANT BIOTECHNOLOGY

Course Code: AUBSCED508P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. Study of economically important plants: Wheat, Gram, Soybean, Blackpepper, Clove Tea, Cotton, Groundnut through specimens, sections and microchemical tests.

2. Familiarization with basic equipments in tissue culture.

3. Study through photographs: Antherculture, somatic embryogenesis, endosperm and embryo culture; micropropagation.
4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall been entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10 MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10 MARKS)			(50 MARKS)

External Evaluation (50 marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

CELL BIOLOGY AND GENETICS

Course Code: AUBSCED 509

L	T	P	C
4	0	0	4

Objectives: The objective of this semester is to educate students on cell biology and genetics. Structure and function of cell and other cell organelles will be taught to them. Knowledge on Mendel's principles on genetics, Structure of chromosomes, DNA and RNA will be given to them.

Outcomes: After completion of the semester the student will be able to explain the genetics and how the traits transfers from one generation to another. They can also be able to draw and explain the structure of cell and cell organelles.

Course Content:

Unit I: Structure and function of cell, Ultrastructure of Plasma membrane

Structure and function of cell organelles with special emphasis on mitochondria, golgi bodies,

nucleus, ribosome and endoplasmic reticulum.

Unit II

Structure of Chromosomes, Watson & Crick Model of DNA, Differences between DNA & RNA Cell Division: Mitosis and Meiosis.

Unit III

Mendel's principles of heredity on chromosomal basis, Monohybrid cross, test cross, dihybrid

cross, back cross, incomplete dominance, Multiple Alleles, Blood group inheritance.

Unit IV

Linkage and crossing over, interaction of genes. Role of DNA in heredity. Sex determination, sex

differentiation, Sex-linked characters, Genetic diseases and abnormalities, chromosomal

aberrations.

Recommended Texts:

1. *De Robertis, E.D.P. and De Robertis, E.M.F. 2006 Cell and molecular Biology 8th edition lippincott willians and Wilkins, Philadelphia.*
2. *Gupta P.K. Genetics Rastogi publication Meerut.*
3. *Verma P.S.and V.K. Agarwal, Concept of cell Biology S Chand Publications.*
4. *Lodish et al :- molecular cell Biology (scientific American book).*
5. *Veer Bala Rastogi Introduction to Cell biology, Rastogi publication Meerut.*
6. *Gene VI, Benjamin Lewin, Oxford University Press, U.K.*

***** Latest editions of all the suggested books are recommended.***

\

PRACTICAL SYLLABUS

CELL BIOLOGY& GENETICS LAB

Course Code: AUBSCED 509P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. Microscopy – Theoretical knowledge of light and electron microscope.
2. 2- Study of structure of cell organelles through electron microscope.
3. Study of mitosis and meiosis from permanent slides
4. Preparation and study of slides for mitosis using squash technique (onion root tip).
5. Study of hardy – Weinberg law using simulations (seed).
6. Osteology – study of skeleton of fowl Axial skeleton, Appendicular skeleton.

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10MARKS)			(50 MARKS)

External Evaluation (50 marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

SIXTH SEMESTER

Contemporary India and Education

Paper Code-AUBAED/AUBSCED-601 **Marks: 100 (60 +40)**

Course objectives:

The student-teachers will be able to:

1. Understand the Constitutional Provisions for Education in India.
2. Understand the Fundamental Rights, Duties and Directive Principles of the State Policy.
3. Develop competencies to understand the various issues related to Educationand remedial measures.
4. Understand the Constitutional provisions for inequality, discrimination and marginalization in UEE.
5. Understand the importance of Education for the marginalized groups
6. Acquaint with the policy initiatives, educational policies and programme in Contemporary India.

Unit -1 Education and the Indian Constitution.

- Indian Constitution: Preamble, Rights and Duties, Directive Principles of the State Policy and Aims of Education as per Constitutional Values; Constitutional Provisions for Education: Article 14, 15, 21A, 45, 46 and 51A (K).

Unit-2 Inequality, Discrimination and Marginalization in Universalization of Education.

- Equality of Educational Opportunities: Meaning, Objectives and Scope.
- Discrimination: Meaning, Factors and Constitutional Safeguards.
- Right to Education: Historical Development, Provisions, issues and Challenges in implementation.
- Education of the Marginalized Groups (Women and Socially Disadvantaged): Status, Issues and Constitutional Provisions.

Unit-3 Policy Initiatives for Universalization of Elementary Education.

- Kothari Commission (1964-66) and NPE (1986 -1992) and Recommendations for UEE.
- Operation Blackboard: Concept and Provision.
- DPEP and SSA: Objectives, Provisions, Implementation and Evaluation.
- MDM: Objectives, Implementation and Problems.

Unit :4 Emerging Concerns and Education

- Education for Environmental Conservation: Global Environmental Crises, Local Environmental Issues, Steps for Environmental Conservation and Regeneration.
- Liberalization, Globalization and Privatization and their Impact on Indian Education.
- Social Basis of Education in the Context of Society, Culture and Modernity.

Activities (Any One of the following)

1. Presentation on various National Educational Policies.
2. Preparation of reports on the State and Centrally Sponsored Schemes of Education like SSA, RMSA, MDM.
3. Conduct surveys on Educational problems at school level.

REFERENCES:

1. Aggarwal J.C.(1984). Implementation of the Major Recommendations of the Education Commission 1964-66 and The New Pattern of Education India: New Delhi: Arya Book Depot.
2. BhakshiP.M., (1998). The Constitution of India, New Delhi: Universal Law PublishingCompany.
3. Bakshi, P.M. Basu, (2010). Constitution of India (2nd ed.) Delhi: Universal Law Publishing Co.
4. The Constitution of India Bare Act (2010). Delhi: Universal law Publishing Co.
5. Govt. of India (1986). National Policy of Education, MHRD, New Delhi. Govt. of India (1992). Programme of Action (NPE). MHRD, New Delhi.
6. NCERT (1986). School Education in India. Present Status and Future Needs, New Delhi: NCERT Publication. Jan Bostock, Barry K. Gills (2013). The Globalization of Environmental Crisis. New York:Routledge, Publication.

TEACHING OF PHYSICAL SCIENCES

PAPER CODE:-AUBSCED-602 **Marks: 100 (60+40)**

Course objective:

The student teachers will be able to:

1. Familiarize with nature of physical science.
2. Formulate instructional objectives in behavioral terms.
3. Apply various approaches and methods of teaching physical science.
4. Select and integrate various kinds of instructional media.

UNIT-I: Foundations of Physical Science

-Meaning, Nature and Scope of Physical Science.
-Aim and Objectives of Teaching Physical science; Taxonomy of Educational objectives; Writing Instructional objectives in behavioral terms.
-Importance of Physical Sciences as a Subject of the School Curriculum.
-Brief life history of Eminent Indian Scientists and their contributions-C.V. Raman, J.C. Bose, Satyendranath Bose, Vikram sarabhai, Homi Jahangir Bhabha, A.P.J. Abdul Kalam.

UNIT-II : Curriculum, Methods and Approaches of Teaching Physical Sciences.

-Curriculum in Physical Science: Meaning, Objectives, Principles and steps of Curriculum construction.
- Process of Evaluation of Physical Science Curriculum at School Level.
-Methods of teaching Physical Science with Reference to lecture, Lecture-Cum-Demonstration, Project Method, Problem Solving Approach, Laboratory, Heuristic and Inductive-Deductive Approach, CAI.
-Activity Approaches and Non-Formal Methods of teaching Physical Science in terms of Field trips, Sciences Club, Science, Museum, Science Fairs.

Activity (Any one of the following)

1. Preparation of low cost and no cost teaching aids and studying their effectiveness a classroom transaction.
2. Developing a unit plan of own choice.
3. Prepare a report on critical analysis of physical sciences curriculum prescribed by HPBSE/CBSE for secondary school stage.

Suggested Readings:

Das, R.C. (1989): Science Teaching in Schools, New Delhi: Sterling Publishers:
Kumar, Amit (2002): Teaching of Physical Science, New Delhi: Anmol Publications,.
Mangal, S.K.(1997): Teaching of Science, New Delhi: Arya Book Depot.
Mohan, Radha (2002): Innovative Physical Science Teaching Methods. New Delhi: P.H.I.
Sharma, R.C.(1998): Modern Science of Teaching, New Delhi: Dhanpat Rai and Sons,. Vaidya, Narendera (1996): Science of teaching for 21st Century, New Delhi: Deep and Deep Publishers.

TEACHING OF LIFE SCIENCES

PAPER CODE: AUBSCED-604 **Marks: 100 (60+40)**

Course objective:

The students teachers will be able to:

1. Understand various objectives of teaching life sciences and to write the same in behavioral terms.
2. Understand and apply various methods of teaching life sciences.
3. Understand, analyze and improve present curriculum of life sciences operative at school level.

4. Understand the importance and appropriate use of different audio visual aids and improvised apparatus in Indian conditions with reference to concepts to be taught.

Unit 1. Foundations of Teaching of Life Science.

- Meaning, nature and scope of Life Science, Historical development of Life Sciences in secondary school curriculum.
- Aims and Objectives of Teaching Life Sciences at secondary stage; Writing instructional Objectives in behavioral terms. Formulation and classification of Instructional Objectives for teaching of Life Sciences with reference to cognitive, affective and psychomotor domains.
- Life Science Curriculum at School stage; concept, scope and principles of curriculum construction, approaches of curriculum construction such as concentric approach, topical approach and unit approach.
- Process of Evaluation of Life Science Curriculum at School level (HPBSE and CBSE).

Unit2: Teaching Methods, Approaches and Techniques.

- Teaching methods in Life Science: lecture method, lecture-cum demonstration method, project method, heuristic method, laboratory method.
- Approaches in Life Science: Inductive-deductive approach, problem solving approach, computer assisted instructions and web based instructions.
- Visualizing, organizing and contextualizing learning situations through:
  a. Field Trips.
  b. Biological Associations, Science Fairs and Exhibitions.
  c. Botanical Garden.
  d. Museum.
  e. Aquarium and Vivarium.
  f. Biology Clubs.
  g. Science Excursions.
  h. Concept Mapping.
- Facilitating Life Science Learning: issues in practice; collective learning, peer learning; dealing students in heterogeneous classes.

Activity (Any one of the Following)

The students teacher will perform the following experiments and record them in the practical journal/ file.

1. To prepare a temporary mount of a leaf peel to show stomata.
2. To show experimentally that carbon dioxide is given out during respiration.

Prepare a report on critical analysis of life sciences curriculum prescribed by HPBSE/CBSE for secondary school stage.

Suggested Readings:

Bhandula, N. Chandha, Sharma, P.C. (1989): Teaching of Science, Ludhiana: Prakash Brothers.

Gupta V.K.(1994): Life Science Education Today. Chandigarh: Arun Publishing House. Kohli, V.K.(2006): How to Teaching Science. Ambala: Vivek Publishers,.

Sood, J.K.(1987): Teaching of life Science. A Book of methods. Chandigarh: Kohli Publishers.

Venkataish, S.(2002); Science Education in 21st century, New Delhi: Anmol Publications.

Yadav, K.: Teaching of Life Science, New Delhi: Anmol Publications.

Manal S.K. (2005): Teaching of Life Science India: Arya Publication,. Sharma, P. (2007): Teaching of Life Science, New Delhi: APH Publishing Corporation.

English (Core)

PAPER CODE AUBAED/AUBSCED-605 **Marks: 100 (60+40)**

UNIT-I

Listening Skills:

- Comprehending
- Retaining
- Responding
- Barriers to Listening
- Overcoming Barriers to Listening

UNIT-II

Emotional Intelligence:

Characteristics of Emotional Intelligence:

- Self-Awareness
- Self-Regulation
- Motivation
- Empathy
- Social and Cultural Sensitivity

Ways to Improve Emotional Intelligence

- Observe how you react to people
- Look at your work environment
- Do a self-evaluation
- Examine how you react to stressful situations
- Take responsibility for your actions
- Examine how your actions affect others

UNIT-III

Technical Writing: Definition and Preparation of Manual, Memorandum, Agenda, Minutes of a Meeting, and PowerPoint Presentation

UNIT IV

- Formal and Informal Letter Writing
- CV/ Resume Writing
- Report Writing
- Interview
- Notice Writing

PHYSICAL & ORGANIC CHEMISTRY

Course Code: AUBSCED 608

L	T	P	C
4	0	0	4

Unit-I

Spectroscopy: Regions of spectrum, Born-Oppenheimer approximation, degree of freedom.

Rotational spectrum: Diaatomic Molecules, Energy level of rigid rotor, selection rules, Spectral intensity, Maxell-Boltzmann distribution, Qualitative description of non-rigid rotor, Isotope effect.

Vibrational spectrum: Infrared spectrum, Energy levels of simple harmonic oscillator, Selection rules, Pure vibratuional spectrum, Intensity, Determination of force constant and qualitative relation of force constant and bond energies, Effect of an harmonic motion and isotope on the spectrum, Idea of vibrational frequencies of different functional groups.

Electronic spectrum: Concept of potential energy curve for bonding and antibonding molecular orbital, qualitative description of selection rules and Franck-Condon principle.

Unit-II

Photochemistry: Interaction of radiation with matter, Difference between thermal and photo chemical processes.

Laws of photo chemistry: Grothus-Drapper law, Stark-Einstein law, Jablonsky diagram depicting various processes occurring in the excited states, Fluorescence, Phosphorescence, Photosensitized reactions-energy transfer processes.

Physical properties and molecular structure: Polarization-Clausius-Mossotti equation, Orientation of dipoles in an electric field, Magnetic properties , Paramagnetism, Diamagnetism and Ferromagnetism.

Unit-III

Spectroscopy: Ultraviolet (UV) absorption spectroscopy-absorption laws (Beer-Lambert law), Presentation and analysis of UV spectra, Types of electronic transition, Effect of conjugation, Concept of Chromophore and Auxochrome. Bathochromic, Hypsochromic and Hypochromic shift.

Infra-red (IR) absorption spectroscopy, Hook's law, selection rules, Position of IR bands, Measurement of IR spectrum, Finger print region, Characteristic absortion of various functional groups and interpretation of IR spectra of simple organic compound.

Nuclear magnetic resonance (NMR) spectroscopy, Proton magnetic resonance (^{1}HNMR) spectroscopy, Nuclear shielding and deshielding, Chemical shift, Spin-spin splitting and coupling

constant. Interpretation of PMR spectra of simple organic molecules such as ethanol, acetaldehyde, 1,1,2-tribromomethane.

Unit-IV

Photo chemistry and Heterocyclic Compounds

Scope and importance, Photochemical and Thermochemical reactions, Jablonski diagram.

Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine, Nucleophilic substitution reactions in pyridine derivatives, Comparison of basicity of pyridine, piperidine and pyrrole. Reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis and Bischler-Napieralski synthesis, Mechanism of electrophilic substitution reaction of indole quinoline and iso quinoline.

Suggested Books:

1. Physical Chemistry by S. C. Khetarpal, G.S, Sharma and R.K. Kalia.
2. A text Book of Physical Chemistry by K. K. Sharma and I. K. Sharma.
3. Physical Chemistry by P. N. Kapil and S. K. Guglani.
4. Surface Chemistry by Adison, L. I. Osipow.
5. Organic Chemistry by Paula Yurkanis Bruice.
6. Organic Chemistry by F. A. Carey, Tata McGraw Hill.
7. Organic Chemistry by Robert T. Morrison & Robert N. Boyd, Prentice Hall of India Pvt. Ltd.

PRACTICAL SYLLABUS
PHYSICAL & ORGANIC CHEMISTRY

Course Code: AUBSCED608P

L	T	P	C
0	0	1	1

List of Experiments:

1. Determination of molecular weight by Rast's method.
2. Study of Hydrolysis of Methyl Acetate in the presence of HCL acid at room temperature.
3. Identification of Sugar (Glucose, Fructose, Sucrose, Lactose) by paper Chromatography.
4. Qualitative analysis of Ions (Cu^{++}, Cd^{++}, Ni^{++}, and Co^{++}) by paper Chromatatography.

Evaluation Scheme of Practical Examination:

Internal Evaluation (50 marks)

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 4-point scale which would include the practical conducted by the students and a Viva taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PER FORMANCE & VIVA DURING THE SEMESTER (35 MARKS)				**ON THE DAY OF EXAM (15 MARKS)**		**TOTAL**
EXPERIMENT (05 MARKS)	FILE WORK (10 MARKS)	ATTENDANCE (10 MARKS)	VIVA (10 MARKS)	EXPERIMENT (05 MARKS)	VIVA (10 MARKS)	INTERNAL (50

External Evaluation (50 Marks)

The external evaluation would also be done by the external Examiner based on the experiment conducted during the examination.

Experiment	**File work**	**Viva**	**Total**

(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

ENVIRONMENTAL BIOTECHNOLOGY

Course Code: AUBSCED609

L	T	P	C
4	0	0	4

Course Objectives:

- To make students capable of understanding current environmental issues.
- To impart knowledge about role of Microbiology in treatment of waste.
- To make student learn about role of common people in Environment protection.

Learning Outcomes:

- Students will learn about the current environmental issues.
- Students will learn the role of different microorganisms in treatment of waste.
- Students will learn how the public participation can help in protection environment.

Course Content:

Unit I

Environment

Basic concepts and issues, global environmental problems-ozone depletion, UV-B, green house effect and acid rain, their impact and approaches for management.

Environmental pollution-types of pollution, sources of pollution, measurement of pollution, methods of measurement of pollution, fate of pollutants in the environment, Bioconcentration, bio/geomagnification.

Unit II

Microbiology of wastewater treatment and Xenobiotic compounds

Aerobic process-activated sludge, oxidation ponds, trickling filter, rotating drums, oxidation ditch. Anaerobic process-anaerobic digestion, anaerobic filters, upflow anaerobic sludge blanket reactors. Xeno biotic compounds**:** Bioremediation of xenobiotics in environment-ecological consideration, decay behavior and degradative plasmids, techniques in bioremediation, degradation of pesticides and hydrocarbons.

Unit III

Role of immobilized cells/enzymes intreatment of toxic compounds

Biopesticides, bioreactors, bioleaching, biomining, biosensors, bio techniques for air pollution.

Unit IV

Sustainable Development

Economics and Environment: Economic growth and quality of life, ,Economics of Pollution control, WTO and Environment, Corporate Social Responsibility, Environmental awareness and Education; Environmental Ethics. Public Participation for Environmental Protection.

Environmental movement and people's participation with special references to Gandhamardan, Chilika and Narmada Bachao Andolan, Chipko and Silent valley Movement; Women and Environmental Protection, Role of NGO in bringing environmental awareness and education in the society.

Reference Books:

1. Waste water engineering treatment, disposal land reuse, Metcalf and Eddy Inc., Tata McGraw Hill, New Delhi.
2. Environmental Chemistry, A. K. De, Wiley Eastern Ltd, New Delhi.
3. Introduction to Biodeterioration, D. Allsopp and K. J. Seal, ELBS/ Edward Arnold.
4. Bioremidation, Baaker, KH and Herson D.S., 1994. Mc. Graw Hill Inc, New York.
5. Environmental Molecular Biology, Paul. A, Rochelle, 2001. Horizon Press.
6. Environmental Protection and Laws by Jadhav and Bhosale, V. M. Himalaya publ. House.
7. Biodiversity Assessment and Conservation by P. C. Trivedi.

Latest editions of all the suggested books are recommended.

PRACTICAL SYLLABUS

ENVIRONMENTAL BIOTECHNOLOGY

Course Code:AUBSCED609P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

1. Water/Soilanalysis-DO, salinity, pH, total hardness, alkalinity, acidity.
2. Gravimetric analysis-Total solid, dissolved solid, suspended solid in an effluent.
3. Isolation and pure culture of microbial strains from air, water and soil sample.
4. Colony counting on nutrient agar media.
5. Measurement and optimization of microbial growth and kinetics.

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THESEMESTER (30 MARKS)			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10 MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10 MARKS)			(50 MARKS)

External Evaluation (50 marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

BIOCHEMISTRY AND MAMMALIAN PHYSIOLOGY

Course Code: AUBSCED 610

L	T	P	C
4	0	0	4

Objectives: In this semester the students will be provided the knowledge of different physiologies. They will also learn the mechanism of different organs functions in the body of animals. Each physiology will comprise the structure of central organ and their functions and what are their importance in the life of animal.

Outcomes: One can expected to learn the process of physiology like digestion, respiration, excretion and blood circulation etc. They will be able to draw and write all about they had learnt.

Course Content:

Unit-1

Biochemistry: structure and metabolism of carbohydrate, protein and lipids.

Unit-2

Nutrition and digestion :Histology and function of gastrointestinal tract and its associated glands.

Digestion and absorption of proteins, carbohydrates &lipids.

Respiration Mechanism and regulation of breathing. Transport of oxygen and carbon dioxide.

Unit-3

Blood and circulation :Composition, structure and functions of blood. Coagulations of blood – blood group and Rh factor. Cardiac cycle, heart beat & its regulation. Blood pressure and Electrocardiogram.

Unit-4

Excretion Structure of urinoferous tubule mechanism of urine formation, Nervous system: - conduction of nerve impulse, reflex action. Endocrinology :Structure and function of major endocrine glands – (Pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, etc.)

Reference Books:

1. Human physiology – Chatterjee A.G. vol.- I&II.
2. Parameswaran, Anantakrishnan and Ananta subramanyam, 1975, outline of Animal physiology. 3-Tortora G.J. & Grabowski, S (2006).
3. Hall, J. E., Guyton and Hall Text Book of Medical Physiology, 12th edition, Saunders Company (2010).

PRACTICAL SYLLABUS

MAMMALIAN PHYSIOLOGY

Course Code: AUBSCED 610P

L	T	P	C
0	0	1	1

LIST OF EXPERIMENTS:

Experiments to be performed by candidates:

1- Test for amylase on starch.
2- Preparation of haemin crystals.
3- Determination of Hb% in blood sample.
4- RBC count by haemocytometer in blood.
5- Test for sugar, proteins and lipids.

Experiments for demonstration and comments:

1. Osmosis
2. Muscle twitch by stimulating it with mechanical, chemical and thermal stimuli.
3. Reflex action
4. Respiration
5. Recording of blood pressure using a sphygmomanometer

Prepared slides:

Study of Histological slides of mammals –

1. T.S. salivary gland , T.S. pancreas, T.S. liver, T.S. Intesting.
6. T.S. kidney, T.S. lungs , T.S. stomach
7. Pituitary , gland, thyroid gland
8. Medulated and nonmedulated nerve fibre 5- Smooth & striated muscle

Each experiment would be evaluated by the faculty concerned on the date of the experiment on a 5 point scale (two for experiment, two for file work and one for viva) which would include the practical conducted by the students and a Viva voce taken by the faculty concerned. The marks shall be entered on the index sheet of the practical file.

Evaluation scheme:

PRACTICAL PERFORMANCE & VIVA DURING THE SEMESTER (30 MARKS)			ATTENDANCE	VIVA	TOTAL
EXPERIMENT	FILE WORK	VIVA	(10 MARKS)	(10 MARKS)	INTERNAL
(10 MARKS)	(10 MARKS)	(10MARKS)			(50 MARKS)

External Evaluation (50 marks)

Experiment	File work	Viva	Total
(20 MARKS)	(10 MARKS)	(20 MARKS)	(50 MARKS)

SEVENTH SEMESTER
TEACHING OF PHYSICAL SCIENCES

PAPER CODE: AUBSCED-701

Marks: 50 (40+10)

Course objectives:

The student teachers will be able to:

1. Select and integrate various kinds of instructional media.
2. Organize various co-curricular activities.
3. Select appropriate text books.
4. Explain the concept of evaluation.
5. Plan lessons in physical science.

UNIT-I: Learning Resources in Physical Sciences.

-Text Books- Meaning, Types, Importance, Uses and Evaluation of Text Books.

-Laboratory Materials-Importance, Planning, Designing and Maintenance of Different type of Laboratory Materials, Common Accidents and their prevention in Science Laboratories.

-Journals, Handbooks, Student's Works Books, Display-Slides, Audio-Visual Support Material, Smart Classrooms, e- learning Resourses.

-Teaching Aids: Classification of Teaching Aids and Their Description. Importance of Teaching Aids in Teaching Physical Science: Preparation and Development of Low Cost Improvised Apparatus.

UNIT-II: Planning for Teaching, Assessment and Evaluation.

-Unit and Lesson Planning: Need, Advantages, Steps, Various Approaches and Strategies of Lesson Planning.

-Meaning and Difference between Assessment and Evaluation; Evaluation in Physical Sciences-Importance and Types of Evaluation viz. Formative and Summative.

-Common Difficulties in learning Physical Science and Remedial measures-procedures in preparation of Criterion Reference and Norm Referenced Tests.

-Evaluting Outcomes of Science Teaching; Preparing Different Type of Test Items and Their Advantage and Limitations; Diagnostic Testing and Remedial Teaching.

Activity (Any one of the following)

-Seminar on contribution of eminent Indian Scientists to science and their implication in science advancement.

-Developing an action plan for organization of a science exhibition, framing guideline on a selected theme and various sub-themes.

Suggested Readings:

Das, R.C. (1989): Science Teaching in Schools, New Delhi: Sterling Publishers. Kohli, V.K. (1998): How to Teach Science, Ambala: Vivek Publishers,.

Kumar, Amit (2002): Teaching of Physical Sciences, New Delhi: Anmol Publications,.

Mangal, S.K. (1997): Teaching of Science, New Delhi: Artya Book Depot.

Mohan, Radha (2002): Innovative Physical Science Teaching Methods. New Delhi: Sharma, R.C. (1998): Modern Science of Teaching, New Delhi: Dhanpat Rai and Sons,.

Kulshreshtha, R.P. (2010): Teaching Physical Science. Meerut: R. Lall.

TEACHING OF LIFE SCIENCES

PAPER CODE: AUBSCED-703 **Marks: 50 (40+10)**

Course objectives:

The student-teachers will be able to:

1. Relate the knowledge of life sciences with other subjects of school curriculum.
2. Develop basic teaching skills for improvement of teaching-learning process.
3. Get familiar with principles and materials for setting an ideal life science laboratory.
4. Understand the present techniques of evaluation in life sciences.

Unit 1. Learning Resources in Life Science.

- Learning Resources: Meaning, types, functions, preoaration and utilization of learning resources in Life Sciences; Models, Blackboards, Charts, Television, Computer, Educational CD's and use of Smart Classrooms; Effective use of Life Science Text Book as a learning resource.
- Life Science teacher: qualities and professional growth.
- Organization of Life Science Laboratory: layout of laboratory, Procuring and Maintenance of equipments for Life Science Laboratory and use of Laboratory for practical work and teaching of Life Sciences. Accident prevention and first aid requirements in Life Science Laboratory.
- Developing Teaching Skills as a base for effective teaching with special reference to Blackboard writing, demonstration, expiation, illustrating with examples, probing question, stimulus variation and reinforcement.

Unit2:Planning for Teaching of Life Sciences and Evaluation techniques

- Importance of Planning for Teaching; Unit Planning and Lesson Planning: Meaning, need, advantages, stages and various approaches of lesson planning.
- Evaluation in Life Sciences: purpose of evaluation, types of evaluation, different evaluation techniques with special reference to continuous and comprehensive evaluation (CCE) technique.
- Achievement Test in Life Science: Meaning, types of Achievement Test (Norm Referenced and Criterion referenced test); various steps involved in the construction and standardization of Achievement test, types of test items, short answer type and objective type.
- Assessment of Experiment work/Project work in Life Science

Activity (Any one of the Following)

The student-teacher will perform the following experiments and record them in the practical journal/ file;

1. To study (a) binary fission in Amoeba and (b) budding in Yeasts with the help of prepared slides.
2. To determine the percentage of water absorbed by resin.

Suggested Readings:

Bhandula, N. Chandha, Sharma, P.C. (1989): Teaching of Science, Ludhiana: Prakash Brothers.

Gupta V.K.(1994): Life Science Education Today. Chandigarh: Arun Publishing House. Kohli, V.K.(2006): How to Teaching Science. Ambala: Vivek Publishers,.

Sood, J.K.(1987): Teaching of life Science. A Book of methods. Chandigarh: Kohli Publishers.

Venkataish, S.(2002); Science Education in 21st century, New Delhi: Anmol Publications.

Yadav, K.: Teaching of Life Science, New Delhi: Anmol Publications.

Mangal S.K. (2005): Teaching of Life Science India: Arya Publication,. Sharma, P. (2007): Teaching of Life Science, New Delhi: APH Publishing Corporation.

Skill in Teaching (School Subject -1 and Subject –2)

Paper Code -AUBSCED -704 & 705 **Marks: 150 in Each Teaching Subject**.

The Internship in teaching practice teaching in seventh semester of the Course (through regular mode) will be of six weeks duration. The student-teachers will prepare and submit following number of lessons which will be examined by the panel of external examiner to be appointed by the University.

1. **40 Macro Lessons in Each Teaching Subject (Total 80 Lessons).**
2. **20 Observation Lessons in Each Teaching Subject (Total 40 Lessons).**

The student-teachers will produce the file containing micro teaching lessons and simulated teaching lessons, reports of other activities carried out in the school and three handwritten copies of final lesson plans in each teaching subject at the time of final teaching practice examination. The two final lessons delivered by the student teachers along with above mentioned files and reports will be examined by the panel of examiners and due weightage will be given to these records while carrying out evaluation of the student-teachers. The lists of marks of students so evaluated shall be dispatched to the Assistant Registrar, Evaluation Branch, Abhilashi University, Chailchowk Mandi (H.P.) immediately after the completion of teaching practice examination. Each of the examiner will be paid remuneration for all the students so evaluated by three examiners. During practice teaching, the student teachers are required to take part in morning assembly of the school, check the home task given to the students and maintain attendance registers of school students.

EIGHTH SEMESTER
Knowledge and Curriculum

Paper Code - AUBAED/AUBSCED 80l **Marks: 100 (60 + 40)**

Course Objectives:

At the end of this course, students will be able to:

1. Understand the meaning and principles of curriculum.
2. Understand and appreciate curriculum as a means of development of the individual
3. Understand the foundations and evaluation of curriculum,
4. Comprehend the different models of curriculum compare the view point given by different commissions
5. Develop an understanding of the concept, need, scope and functions of school management
6. Develop an understanding of different components of human and material resources of the school

Unit I Knowledge and Education

- Knowledge: Concept, Types and Sources of Knowledge. Distinction between Knowledge and Skill, Teaching and Training, Knowledge and Information, Reason and Belief.
- Bases of Modem Child-centered Education: Concept of Activity, Discovery and Dialogue with reference to Gandhi, Sri Aurobindo, Giju Bhai and Paulo Freire.
- Education in Relation to Modem Values: Equity, Equality, Individual Opportunity and Social Justice with reference to Indian Constitution.
- Concept of Nationalism, Universalization , Secularism and their relationship to Education.

Unit II Basis and Principles of Curriculum

- Curriculum: Meaning, Nature, Need and Characteristics.
- Curriculum Development: Stages and Principles of a Curriculum.
- Bases of Curriculum: Philosophical, Psychological and Sociological.
- Approaches to Curriculum Development Subject-centred Learner-centred and Problem-centred.
-

Unit III Model, Patterns and Approaches of Curriculum Designing

- Models of Curriculum Designing: Administrative Line Staff (Taxler), Grassroot-level Planning (Hilda Taba).
- Models of Curriculum Designing: Tyler's Model and Wheel's Model.
- Approaches of Curriculum Development: Concept, Advantages and Limitations of Centralized and Decentralized Curriculum Designing.

Unit IV Curriculum Evaluation

- Evaluation of Curriculum: Need, Importance and Procedure of Curriculum Evaluation.
- Recommendations of Various Commissions: University Education Commission (1948), Secondary Education Commission (1952-53), Education Commission (1964-66) and NPE (1986-1992) with regard to curriculum development.
- NCF (2005) and its recommendations with regard to curriculum evaluation.

Activities (Any one of the following):

1. Evaluation of textbook of secondary level class and prepare a report.
2. Prepare a curriculum of any subject using Hilda Taba approach.

Suggested Readings

1. Aggarwal, Deepak (2007) Curriculum Development Concept Methods and Techniques. New Delhi Book Endave.
2. Aggarwal, J.C. (1967). Education Administration, School Organization and Supervision Delhi: Arya Book
3. Aggarwal, J. C. (2003). Handbook of Curriculum and Instruction, Delhi Doaba Book House
4. Arora, G.L (1984) Reflections on Curriculum. NCERT.
5. Bhatia, K. K & Chadda D. P. C. (1980). Modern Indian Education and its Problems Ludhiana: Prakash Brothers
6. Chopra, RK (1993). Status of Teacher in India, New Delhi: NCERT

UNDERSTANDING THE SELF

Paper Code -AUBAED/AUBSCED 802 **Marks: 50 (40 + 10)**

Course objectives:

At the end of this course, students will be able to:

1. understand self-concept and its importance in human life
2. understand self-confidence and its importance in human life
3. understand the nature, classification, sources, and methods of inculcation of human values
4. understand the role of different agencies in promotion of human values
5. define philosophy of yoga
6. explain the psychological and physiological basis of yoga

Unit 1 The Self and Human Values

- Meaning, Nature and Importance of Self-concept and Self-Confidence in Human Life.
- Human Values: Meaning, Nature, Importance, Sources and Methods of Inculcation of human values.
- Classification of Values.
- Role of Family, Educational Institutions, Community and NGO's in Promotion of Human Values.

UNIT 2: Philosophy and Psychology of Yoga

- Yoga: meaning, nature and importance.
- Concepts of the Prakriti and Purusha (ishwar): Concept and their relation with each other in Sankhya philosophy.
- Ashtanga Yoga of Patanjali.
- Therapeutic Values of Yoga, Yogic Diet & its Impact on Health, Asanas and their effects to promote a sound physical and mental health.

Activity (Any one of the Following)

1. Preparation of Scrap Book on any six major Yoga /Asanas with their benefits.
2. Select a story/ an episode / an incident from an epic or any situation and analyse the human values integrated in it.
3. Preparation of scrap book on any five human Values.

Suggested Readings:

1. Goel, A and Goel, S.L. (2005), Human Values and Education Deep and Deep Publications Pt. Ltd. New Delhi
2. Gokak, V.K. (1973). A Value Orientation to our System of Education, New Delhi: M.M. Gulb and Sons
3. Gore. M.W. (2005) Anatomy and Physiology of Yogic Practices, Kaivalyadhama, Lonavla
4. Gayal, B.R. (1979), Document on Social, Moral and Spiritual Values in Education. New Delhi:NCERT
5. Joshi, Kireet (1976). Education for Personality Development, New Delhi: NCERT, (NIE Lecture Series)
6. Katoch S.K. (2013) Manviya Mulya, Paryavaran Aur Manvadhikar Shiksha", Chandigarh Mohindra Capital Publishers (P) Ltd.
7. NCERT. (2000), Education for Values Development, Chapter 5, In National Curriculum Framework for School Education, New Delhi.

ICT IN TEACHING-LEARNING PROCESS

Paper Code -AUBAED/AUBSCED 803 **Marks: 50 (40 + 10)**

Course objectives:

The student-teachers will be able to:

1. Understand the concept and role of ICT in construction of Knowledge.
2. Acquire knowledge and understanding about National Policy on Education.
3. Identify the challenges in integration of ICT in school education.
4. Understand computer fundamentals.
5. Apply different Hardware Technologies in Modern Educational Practices.
6. Familiarize with the new trends in ICT.

UNIT I Introduction to ICT and Computer Fundamentals

- Concept of ICT: Meaning & Characteristics; Role of Information Technology in Construction of Knowledge.
- National Policy on ICT in School Education; Challenges in Integrating ICT in School Education.
- Computer Fundamentals: Meaning, Components & Types of Computer, Functions of Operating System, Application Softwares.
- Computer Application in Learning: Concept, Features and Advantages of Word (Word Processor); Excel (Spreadsheets) and PowerPoint (Slide Preparation & Presentation).

UNIT II ICT in Teaching - Learning Process

- Hardware Technologies and their Applications: Overhead Projector (OHP); Preparing Transparencies, Slide Projector, Audio-Video Recording Instruments.
- Hardware Technologies and their applications: DLP Projector, Movie Projector, Close Circuit Television (CCTV).
- New Trends in ICT: Concept, Elements and Advantages of Smart Classroom, EDUSAT.
- Internet & Online Learning Resources (e- Library, Websites, Web 2.0 Technology and Open Educational Resources) in learning.

Activities (Any one of the following):

1. Prepare your Curriculum Vitae using computer and obtain its printout.
2. Visit an institution having interactive white board and learn its features and functioning and prepare a report.
3. Prepare a Powerpoint presentation for secondary school students.

Suggested Readings:

1. Barton, R.(2004), Teaching Secondary Science with ICT. New Delhi: McGraw-Hill International
2. Bhaskara Rao. Digumarti (2013): Vidya. Samachara Sankethika Sastram (ICT in Education). Guntur masterminds, Sri Nagarjuna Publishers.
3. Denis, Kim, Sen and Morin (2000). Information Technology - The Breaking Wave New Delhi: Tata McGraw-Hill Publishing Co. Ltd.
4. Department of School Education and Literacy. MHRD (2012). National Policy on Information and Communication Technology (ICT) In School Education, New Delhi
5. Mangal, S.K. & Uma Mangal (2009). Essentials of Educational Technology. New Delhi PHI Learning P. Ltd.

HEALTH AND PHYSICAL EDUCATION

Paper Code - AUBAED/AUBSCED 804 **Marks: 50 (40 + 10)**

Course objectives:

The student-teachers will be able to

1. Understand concept of health, hygiene and health education.
2. Differentiate between communicable and non-communicable diseases.
3. Develop skills in marking grounds for different games.
4. Understand the objectives of school health services,
5. Understand the concept and importance of physical education.

Unit-1 Health Education

- Definition of Health, Health Education, Health Instruction, Health Supervision; Aim, objectives and Principles of Health Education.
- Health Services and guidance instruction in personal hygiene.
- Communicable and Non-Communicable Diseases; Obesity, Malnutrition, Adulteration in food, Environmental sanitation; Personal and Environmental Hygiene for schools.
- Objective of school health services, Role of health education in schools, Health Services- Care of skin, Nails, Eye health service, Nutritional service, Health appraisal, Health record, Healthy school environment, first-aid and emergency care.

Unit-2 Physical Education

- Meaning, Definition and Scope of Physical Education, Importance of Physical Education in present era, Misconception about Physical Education
- Aims and objectives of Physical Education
- Importance of Tournament, Types of Tournament and its organization: structure-knock-out Tournaments, league of Round Robin Tournaments, Combinations Tournament and challenge Tournament.
- Organization structure of Athletic Meet.

Activity (Any one of the following):

Mark a Sports ground and Prepare a report mentioning dimensions, rules, regulations and specification of any one of the following games: Volleyball/ Kabaddi/Kho-Kho / Wrestling /Badminton /Table Tennis/ Basketball/ Hockey.

References:

1. Agrawal, K.C. (2001). Environmental Biology Bikaner: Nidhi publishers Ltd
2. Frank, H. & Walter, H. (1976). Tumers School Health Education. Saint Louis: The C.V.Mosby Company
3. Nemir, A (n.d.). The School Health Education. New York: Harber and Brothers. Odum, EP. (1971). Fundamental of Ecology. USA:W.B.
4. Saunders Co Broyles, F.J. & Rober, H.D. (1979). Administration of Sports, Athletic Programme: A Managerial Approach. New York Prentice Hall Inc.

GUIDANCE AND COUNSELLING

Paper Code- AUBAED/AUBSCED 805 **Marks: 50 (40 + 10)**

Course objectives:

The student- teachers will be able to:

1. Understand the meaning, objectives, need, scope and principles of guidance.
2. Develop counseling skills.
3. Organize guidance programme in the secondary schools.
4. Develop the skills to prepare case study, to diagnose and identify problems, prepare report and provide guidance accordingly.

Unit –I Concept of Guidance

- Guidance: Meaning, need and scope
- Objectives, principles, issues and problems of Guidance.
- Types of Guidance: Educational, Vocational and Personal. Role of school and Teacher in Guidance program.
- Testing Techniques (Intelligence, Aptitude, Personality Inventory and Achievement Test) and Non-testing Techniques (Observation, Interview, Case Study and Cumulative Record).

Unit –ll Counselling

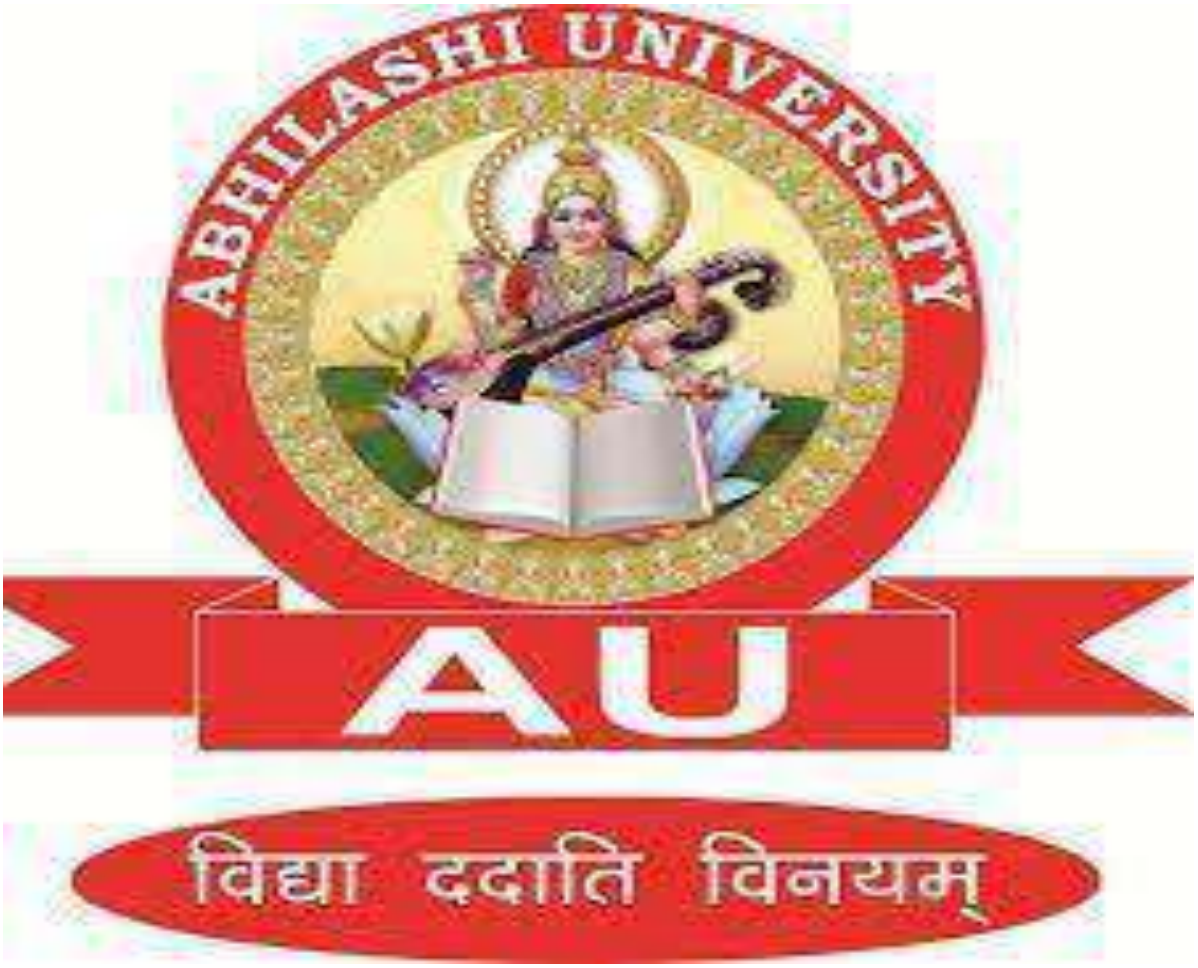
- Meaning, Objectives, Principles of Counselling.
- Approaches of Counseling: Directive, Non-directive and Eclectic.
- Techniques of Counseling.
- Organization of Counseling in Schools and Role of Counselor.

Activities (any one of the following):

1. Interview of a school counsellor.
2. Visit to a guidance or counselling centre and write a report.
3. Administration of individual test and preparing a report.
4. To prepare a case study,
5. Conduct a survey of the problems that are most prevalent in school which needimmediate attention of a guidance counsellor and prepare a brief report.

SUGGESTED READINGS:

1. Aggarwal, J.C. Educational & Vocational dance and Counseling Aadhar. DoabaHouse
2. Bhatia, KK. (2002) Principles of Guidance & Counseling Ludhiana Kalyani Pub
3. MAsch. (2000) Principles of dance and Counseling New Delhi Sarup and Sons
4. Safaya, BN (2002) Guidance & Counseling Chandigarh. Abhishek Publications
5. Sharma, Tara Chand (2002) Modem Methods of Guidance and Counseling New Delhi, Sarup and Sons
6. Shertzer, Bruce and Stone, Shelly C. (1074) Fundamentals of Counseling London Houghton Miss
7. Shirley, AHarmin (1987) Guidance in Secondary Schools New Delhi NCERT.



SYLLABUS

Masters of Arts in Economics

ASSESSMENT BASED ON THE FOLLOWING CRITERIA

Sr.No	**Assessment Criteria**	**Percentage To total 100 marks**
1	Assignments	08
2	Attendance	05
3	Mid-Term Examination: 1st	08
4	Mid-Term Examination: 2nd	08
5	Class Test	05
6	Quizzes and Presentation	03
7	Attitude and Discussion	03
8	Sub-total (Total Marks of Assessment)	40
9	End- Term Theory Examination	60
10	Total Marks Allotted	100

Note: End -Semester theory examination will be of sixty marks, while remaining forty marks pertains to internal assessment based on the above mentioned criteria. In theory paper, Candidates need to attempt five questions in all. Q.No.1 is compulsory with short- type answers containing twenty marks covering the whole syllabus. Further, two questions will be set from each unit where one question is compulsory (under each unit). In all, examination time will be of three hours

FIRST YEAR

SEMESTER-I

Course No.	Subject	Contact Hours				Credits	Examination		
		L	T	P	Total		IA	EA	Total
AUMAECO-101	Microeconomics	4	-	-	4	4	40	60	100
AUMAECO-102	International Economics	4	-	-	4	4	40	60	100
AUMAECO-103	Elementary Mathematical Economics	4		-	4	4	40	60	100
Total Credits		**12**	**-**	**-**	**12**	**12**			**300**

Legend: L-lecture,T-Tutorial,P-Practical

FIRST YEAR

SEMESTER-11

Course No.	Subject	Contact Hours				Credits	Examination		
		L	T	P	Total		IA	EA	Total
AUMAECO -104	Macro Economics	4	-	-	4	4	40	60	100
AUMAECO -105	Money and Banking	4	-	-	4	4	40	60	100
AUMAECO -106	Business Statistics	4		-	4	4	40	60	100
Total Credits		**12**	**-**	**-**	**12**	**12**			**300**

Legend:L-lecture,T-Tutorial,P-Practical

SECOND YEAR
SEMESTER-III

Course Code	Course Title	Contact Hours				Credit	Examination		
		L	T	P	Total		IA	EA	Total
AUMAECO -107	Economics of Developme and Planning	4	-	-	4	4	40	60	100
AUMAECO -108	History of Economic Thought	4	-	-	4	4	40	60	100
Optional subjects: Choose any one of the following:									
AUMAECO -109(*)	Agriculture Economics	4	-	-	4	4	40	60	100
AUMAECO -110(*)	Regional Economics	4	-	-	4	4	40	60	100
AUMAECO -111(*)	Economics of Population	4	-	-	4	4	40	60	100
AUMAECO -112(*)	Basics of Econometrics	4	-	-	4	4	40	60	100
Total Credits		**12**	**-**	**-**	**12**	**12**			**300**

SECOND YEAR
SEMESTER-IV

Course Code	Course Title	Contact Hours				Credit	Examination		
		L	T	P	Total		IA	EA	Total
AUMAE-113	Indian Economy	4	-	-	4	4	40	60	100
AUMAE-114	Environmental Economics	4	-	-	4	4	40	60	100
Optional subjects: Choose any one of the following:									
AUMAE-115(*)	Labour Economics	4	-	-	4	4	40	60	100
AUMBA-116(*)	Industrial Economics	4	-	-	4	4	40	60	100
AUMBA-117(*)	Public Finance	4	-	-	4	4	40	60	100
Total Credits		**12**	**-**	**-**	**12**	**12**			**300**

Instructions:

This scheme follows the standard of credits where each lecture hour (per week) is equal to 1 credit and each tutorial/ practical hour (per week) is equal to half credit.

Each credit is equal to 25 marks so subject's maximum marks would be defined accordingly.

Abhilashi University

Course Structure, Admission & Scheme of Examination of M.Sc. Chemistry.

(1) Course Duration: - Two years spread over four semesters.

(2) Eligibility for Admission: - Graduate in science with Chemistry as Principal (Major) subject, other subjects may be Physics, Math, Botany, and Zoology as minor. The student must have passed graduation degree course with minimum 55% of aggregate (General category), 50% of aggregate (SC/ST category) or as per H.P. Government norms.

(3) There will be four theory papers and three labs in each semester. In fourth semester the student will deliver Power Point Seminar Presentation.

(4) Evaluation of seminar will be done by the committee constituted by Dean of the faculty. The composition of the committee will be as follows:

(i) Head of the department.

(ii) Any two faculty teachers.

The committee will evaluate the seminar presentation as per the given proforma.

ABHILASHI UNIVERSITY

CURRICULUM FOR M.SC. CHEMISTRY

SEMESTER SYSTEM

SCHEME OF EXAMINATION

FIRST SEMESTER

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/ Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
1	**I**	AUMCH I-01	Inorganic Chemistry	4	60	40	100	4
2	**II**	AUMCHI-02	Organic Chemistry	4	60	40	100	4
3	**III**	AUMCHI-03	Physical Chemistry	4	60	40	100	4
4	**IV**	AUMCHI-04	Mathematics for Chemist & Applications of Computer in Chemistry	4	60	40	100	4
5	**V**	AUMCHI-05	Inorganic Chemistry Lab	6	50	50	100	3
6	**VI**	AUMCHI-06	Organic Chemistry Lab	6	50	50	100	3
7	**VII**	AUMCHI-07	Physical Chemistry Lab.	6	50	50	100	3

SECOND SEMESTER

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
8	**VIII**	AUMCHI-08	Inorganic Chemistry	4	60	40	100	4
9	**IX**	AUMCHI-09	Organic Chemistry	4	60	40	100	4
10	**X**	AUMCHI-10	Physical Chemistry	4	60	40	100	4
11	**XI**	AUMCHI-11	Chemistry of Life & Environmental Chemistry	4	60	40	100	4
12	**XII**	AUMCHI-12	Inorganic Chemistry Lab.	6	50	50	100	3
13	**XIII**	AUMCHI-13	Organic chemistry Lab.	6	50	50	100	3
14	**XIV**	AUMCHI-14	Physical chemistry Lab	6	50	50	100	3

THIRD SEMESTER

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/ Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
15	**XV**	AUMCH2-15	Inorganic Chemistry	4	60	40	100	4
16	**XVI**	AUMCH2-16	Organic Chemistry	4	60	40	100	4
17	**XVII**	AUMCH2-17	Physical Chemistry	4	60	40	100	4
18	**XVIII**	AUMCH2-18	Inorganic/Organic/Physical Chemistry special.	4	60	40	100	4
19	**XIX**	AUMCH2-19	Inorganic Chemistry Lab	6	50	50	100	3
20	**XX**	AUMCH2-20	Organic Chemistry Lab.	6	50	50	100	3
21	**XXI**	AUMCH2-21	Physical chemistry Lab	6	50	50	100	3

FOURTH SEMESTER

(A) Inorganic Chemistry Specialization

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/ Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
22	**XXII**	AUMCH2-22	Advanced Organometallics	4	60	40	100	4
23	**XXIII**	AUMCH2-23	Modern Techniques of Chemical Analysis	4	60	40	100	4
24	**XXIV**	AUMCH2-24	Inorganic Spectroscopy	4	60	40	100	4
25	**XXV**	AUMCH2-25	Bio- Inorganic Chemistry	4	60	40	100	4

(A) Organic Chemistry Specialization

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/ Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
26	**XXVI**	AUMCH2-26	Synthetic Strategy	4	60	40	100	4
27	**XXVII**	AUMCH2-27	Natural Products	4	60	40	100	4
28	**XXVIII**	AUMCH2-28	Medicinal Chemistry	4	60	40	100	4
29	**XXIX**	AUMCH2-29	Polymer Chemistry	4	60	40	100	4

(B) Physical Chemistry Specialization

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/ Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
30	**XXX**	AUMCH2-30	Advanced Quantum Chemistry	4	60	40	100	4
31	**XXXI**	AUMCH2-31	Solid State Chemistry	4	60	40	100	4
32	**XXXII**	AUMCH2-32	Biophysical Chemistry	4	60	40	100	4
33	**XXXIII**	AUMCH2-33	Chemistry of Macromolecules	4	60	40	100	4

Practicals

Sr. No.	Paper No.	**Paper** code	**Title**	**Periods/ Week**	**Maximum Marks**			**Credits**
					External Exam	**Internal exam**	**Total Marks**	
34	**XXXIV**	AUMCH2-34	Inorganic Chemistry Special	18	150	150	300	9
35	**XXXV**	AUMCH2-35	Organic Chemistry Special	18	150	150	300	9
36	**XXXVI**	AUMCH2-36	Physical Chemistry Special	18	150	150	300	9
37	**XXXVII**	AUMCH2-37	Seminar	2	25	25	50	2

M.Sc (Chemistry)
SEMESTER-I
(COURSE – I)
(INORGANIC CHEMISTRY)
AUMCH1-01
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Group theory: The concept of group, Symmetry elements and symmetry operations, Assignment of point groups to Inorganic molecules, Some general rules for multiplications of symmetry operations, Multiplication tables for water and ammonia, Representations (matrices, matrix representations for C2V and C3V point groups irreducible representations), Character and character tables for C2V and C3V point groups. Applications of group theory to chemical bonding (hybrid orbitals for σ-bonding in different geometries and hybrid orbitals for π-bonding. Symmetries of molecular orbitals in BF3, C2H4 and B2H6.

UNIT-II

Application of Group Theory in Vibrational Spectroscopy: A brief idea about Infrared and Raman scattering spectroscopy. Vibrational modes as basis of group representations w.r.t. SO2, POCl3, PtCl4 2- and RuO4. Mutual exclusion principle, Classification of vibrational modes (i.e. stretching and angle deformation vibrations w.r.t. SO2, POCl3 and PtCl42-.

UNIT-III

Non-Aqueous Solvents: Factors justifying the need of Non Aqueous solution Chemistry and failure of water as a Solvent. Solution chemistry of Sulphuric acid: Physical properties, Ionic self dehydration in H2SO4, high electrical conductance in spite of high viscosity, Chemistry of H2SO4 as an acid, as an dehydrating agent, as an oxidizing agent, as an medium to carry out acid-base neutralization reaction and as a differentiating solvent. Liquid BrF3: Physical properties, solubilities in BrF3 , self ionization, acid base neutralization reactions, solvolytic reactions and formation of transition metal fluorides. Chemistry of Molten salts as Non-Aqueous Solvents: Solvent properties, solution of metals, complex formation, Unreactivity of molten salts, Low temperature molten salts.

UNIT-IV

Inorganic Hydrides: Classification, preparation, bonding and their applications. Transition metal

compounds with bonds to hydrogen, carbonyl hydrides and hydride anions. Classification, nomenclature, Wade's Rules, preparation, structure and bonding in boron hydrides (boranes),carboranes, metalloboranes and metallocarboranes.

Organic Reagents in Inorganic Chemistry: Chelation, factors determining the stability of chelates (effect of ring size, oxidation state of the metal, coordination number of the metal); Use of the following reagents in analysis:

(a) Dimethylglyoxime (in analytical chemistry)
(b) EDTA (in analytical chemistry and chemotherapy)
(c) 8-Hydroxyquinoline (in analytical chemistry and chemotherapy)
(d) 1,10-Phenanthroline (in analytical chemistry and chemotherapy)
(e) Thiosemicarbazones (in analytical chemistry and chemotherapy)
(f) Dithiazone (in analytical chemistry and chemotherapy)

Books Recommended:

1. Chemical applications of Group Theory – F.A.Cotton
2. Inorganic Chemistry – Durrant and Durrant
3. Symmetry in Chemistry- Jaffe and Orchin
4. Non-aqueous solvents – H.Sisler
5. Non-aqueous solvents – T.C.Waddington
6. Non-aqueous solvents – Logowsky
7. Advanced Inorganic Chemistry:Cotton & Wilkinson,Vth Edn.
8. Concise course in Inorganic Chemistry- J.D.Lee
9. Nature of Chemical Bond – L. Pauling
10. Chemistry of Elements – Greenwood and Earnshaw
11. Inorganic Chemistry – T. Moeller
12. Inorganic Chemistry – J.E.Huheey 3rd Edn.
13. Topics in Current Chemistry (Inorganic/Bio-Chemistry)–Vol. 64
14. A Text Book of Quantitative Inorganic Analysis- A.I. Vogel

SEMESTER-I
(COURSE – II)
(ORGANIC CHEMISTRY)
AUMCH1-02
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

.

UNIT-I

Nature of Bonding in Organic Molecules: Delocalized Chemical Bonding: Kinds of molecules with delocalized bond, cross- conjugation, resonance, pπ-dπ bonding (ylides). aromaticity: other systems containing aromatic sextet, Aromatic systems with electron number other than six. Huckel rule, other aromatic compounds, hyperconjugation. **Supramolecular chemistry:** Introduction, Bonding other than covalent bond. Addition compounds, Crown ether complexes and Cryptands, Inclusion compounds, Cyclodextrins, Catenanes and Rotaxenes and their applications.

Reaction Mechanism: Structure and Reactivity: Thermodynamic and kinetic requirements, Kinetic and Thermodynamic control, Hammonds postulate, Curtin-Hammett principle. Potential energy diagrams, transition states and intermediates.

Effect of structure on reactivity: resonance and field effects, steric effect. Quantitative treatment: Hammett equation and linear free energy relationship, Substituent and reaction constants, Taft equation. Methods of determining reaction mechanism.

UNIT-II

Stereochemistry: Conformational analysis of cycloalkanes, decalins, effect of conformation on reactivity in acylic and cyclohexane systems. Steric strain due to unavoidable crowding. Elements of symmetry: chirality, molecules with more than one chiral center, threo and erythro isomers, methods of resolution, optical purity, enantiotopic and diastereotopic atoms, groups and faces, Optical activity due to chiral planes, Optical activity in the absence of chiral carbon (biphenyls, allenes and spiranes), chirality due to helical shape. Asymmetric Synthesis: Principle and categories with specific examples of asymmetric synthesis including newer methods involving enzymatic and catalytic reactions, enantio and diastereoselective synthesis. Stereoselective Reactions: Cyclopropanation, hydroboration, catalytic hydrogenation, and metal ammoni reduction, stereoselective synthesis of (-) ephedrine and (+) φ- ephedrine. Stereospecific Reactions : Elimination of 2,3- dibromobutane densyl chloride(1,2 diphenyl-1-chloroethane), SN2 reactions at chiral carbon.

UNIT-III

Aliphatic Nucleophilic Substitution: The SN2, SN1, mixed SN1 and SN2, SET mechanisms & SNi mechanism. The neighboring group mechanism, neighboring group participation by π and σ bonds, anchimeric assistance. Non-classical carbocations, phenonium ions, norbornyl system, common carbocation rearrangements-Wagner-Meerwein, Pinacol-Pinacolone and Demjanov ring

expansion and ring contraction. Nucleophilic substitution at an allylic, aliphatic trigonal and a vinylic carbon. Esterification of carboxylic acid, transesterification, transetherification and preparation of inorganic esters. Phase-transfer catalysis, and ultrasound, ambident nucleophile, regioselectivity.

UNIT-IV

(A) Aliphatic Electrophilic Substitution: Bimolecular mechanisms- SE2 and SEi. The SE1 mechanism, electrophilic substitution accompanied by double bond shifts, halogenations of aldehydes, ketones, acids and acyl halides. Effect of substrates, leaving group and the solvent system on reactivity. Aliphatic diazonium coupling, Acylation at aliphatic carbon, alkylation of alkene, Stork-enamine reactions

(B) Free radical reactions: Types of free radical reactions, free radical substitution mechanism, mechanism at an aromatic substrate, neighboring group assistance, Reactivity in aliphatic and aromatic substrates at a bridgehead and attacking radicals. Effect of solvents on reactivity. Allylic halogenation (NBS), oxidation of aldehydes to carboxylic acids, auto oxidation, coupling of alkynes and arylation of aromatic compounds by diazonium salts. Gomberg Bachmann reaction, Sandmeyer reaction, Hoffmann -Loffler- Freytag reaction, Hunsdiecker reaction.

Books Recommended:

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice Hall.
6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic and Professional.
8. Pericyclic Reactions, S.M. Mukherji, Macmillan, India.
9. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
10. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.
11. Stereochemistry of Organic Compounds, P.S. Kalsi, New Age International.

SEMESTER-I
(COURSE – III)
(PHYSICAL CHEMISTRY)
AUMCH1-03
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT – I

Spectroscopy – I: Theory of nuclear magnetic resonance NMR phenomenon, the chemical shift and its measurement. The fine structure (spin – spin coupling). Factors influencing chemical – shift and spin – spin coupling. Non - first – order spectra. Relaxation phenomena in NMR: spin – spin and spin – lattice relaxation processes. Line –width and rate processes. The nuclear Overhauser effect. An introduction to Fourier Transform NMR (FTNMR). Theory of Electron Spin Resonance (ESR) phenomenon. Fine and hyperfine structure of ESR. Zero – field splitting of ESR signal. Mapping of charge density on molecule (McConnell relation). Mossbaur spectroscopy: a brief introduction (isomer – shift, quadrupole interaction and magnetic hyperfine interaction).

UNIT - II

Spectroscopy – II: Rotational and vibrational spectra. Moment of inertia and rotational spectra of rigid and non – rigid diatomic molecules. Vibrational excitation effect.. Rotational spectra of symmetric - top molecules. Strak effect. Vibrational energy of diatomic molecules. Anharmonic oscillator, overtones and hot bands. Diatomic vibrator – rotator (P, Q and R – branches of diatomic vibrator – rotator). Rotational – vibrational spectra of symmetric – top molecules. Raman Spectroscopy: qualitative quantum theory of Raman scattering. Rotational Raman spectra of linear and symmetric – top molecules. Vibrational Raman spectra and mutual exclusion principle.

UNIT - III

Kinetics of complex reactions: Reversible / opposing reactions, consecutive / successive reactions, simultaneous side / parallel reactions, chain / free radical reactions viz. thermal (H2 – Br2) and photochemical H2 – Cl2) reactions. Rice – Herzfeld mechanism of dissociation of organic molecules viz. dissociation of ethane, decomposition of acetaldehyde as 3/2 or ½ order reactions. Kinetics of polymerization (molecular and free radical mechanisms). Reaction rates and chemical equilibrium, principle of microscopic reversibility, activation energy and activated complex.

Surface Reactions: Mechanism of surface reactions, unimolecular and bimolecular surface reactions, Langmuir – Hinshelwood mechanism for gases only.

UNIT - IV

Theories of reaction rates: The kinetic theory of collisions, transition state theory, comparison of collisions and transition state theories in simple gas reactions, steric factor, transmission – coefficient, steady – state hypothesis / transient phase theory, Lindmans theory of unimolecular reaction, the thermodynamic formulation of reaction rates.

Fast Reaction in aqueous solutions: Study of fast reactions by Stopped flow method (Principle and Theory). Absolute rate theory applied to fast reactions.

Books Recommended:

1. Chemical Kinetics : K.J. Laidler
2. Kinetics and Mechanism of Reaction Rates: A.Frost and G. Pearson.
3. Modern Chemical Kinetics: H. Eyring
4. Theories of Reaction Rates: K.J. Laidler, H. Eyring and S. Glasston
5. Fast Reactions: J.N. Bradly
6. Fast Reactions in Solutions: Caldin
7. Basic Principles of Spectroscopy: R. Chang
8. NMR and Chemistry: J.W. Akit
9. Introduction to Molecular Spectroscopy: G.M. Barrow
10. Physical Chemistry: P.W. Atkins
11. Fundamentals of Molecular Spectroscopy: C.N. Banwell

SEMESTER-I
(COURSE – IV)
(MATHEMATICS FOR CHEMISTS & APPLICATIONS OF COMPUTER IN CHEMISTRY)
AUMCH1-04
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

Mathematics for Chemists

UNIT - I

Cartesian coordinates: plane polar coordinates, spherical representation of functions, the complex plane, polar coordinates in trigonometric functions. Differential calculus: functions of single and several variables, partial derivatives, the total derivative, maxima and minima theorem, and simple examples related to chemistry. Vectors: representation and simple properties of vectors (addition and subtraction) vector addition by method of triangles, resolution of vectors. Scalar product of vector. Concept of normalization, orthogonality and complete set of unit vectors.

UNIT – II

Integral calculus: general and special methods of integration, geometric interpretation of integral, evaluation of definite and some standard integrals related to chemistry. The significance of 'exponential' equations. Differential equations: simple differential equations, separable variables, homogeneous equations, exact equations, linear equations, and equations of first and second order. Application to simple chemistry problems.

UNIT – III

Matrices and Determinants: Definition of matrix, types of matrices (row, column, null, square, diagonal). Matrix algebra: addition, subtraction, and multiplication by a number, matrix multiplication. Transpose and adjoint of matrix, elementary transformation, representation and applications to solutions of linear equations. Definition of determinant, and its propertie, evaluation of determinants. Application to simple chemistry problems.

Application of Computer in Chemistry

UNIT – IV

Chemistry and FORTRAN Programming: Introductory FORTRAN concepts, character set, constant variables, data types, subscripted variables, and FORTRAN functions. FORTRAN expressions and naming FORTRAN programme, assignment statements, FORTRAN commands. Data transfer and program execution control: Introduction, format specification for READ and WRITE statements, format commands, control commands and transfer commands. Arrays and replitive computation; Introduction, arrays arrange storage, dimension statement, do

comtruel, Nested do – loop continue statement, implied do. Sub – programme (functions and sub – routines): Introduction, sub programme, functions in FORTRAN, function arguments, subroutines, save variable function vs. subroutine programme. Global variables and file manipulation: Introduction, common statement, equivalence declaration, data command, block data subprogramme, declaration external, character expression and assignment, the open and closed statement, internal file, file 'input' and 'output'. Developing Linear Least – Squares fit programs in FORTRAN, as well as for involving simple formulae in organic, inorganic and physical chemistry.

Books Recommended:

1. Mathematical Preparation for Physical Chemistry: F. Daniel
2. Mathematical Methods for Science Students: G. Stephemen
3. Applied Mathematics for Physical Chemistry: T.R. Barrante

SEMESTER I
(COURSE – V)
(INORGANIC CHEMISTRY PRACTICAL)
AUMCH1-05
Credits-03 (L=0,T=0,P=06)

1. Volumetric Analysis:
(a) **Potassium iodate titrations**: Determination of iodide, hydrazine, antimony(III) and arsenic (III)
(b) Potassium bromate titrations
i) Determination of antimony (III) and arsenic (III) Direct Method)
ii) Determination of aluminium, cobalt and zinc (by oxine method)
(c) EDTA titrations
i) Determination of copper, nickel, magnesium
ii) Back titration
iii) Alkalimetric titration
iv) Titration of mixtures using masking and demasking agents
v) Determination of hardness of water

Books Recommended:
1. A text Book of Quantitative Inorganic Analysis: A.I.Vogal.
2. Applied Analytical Chemistry: Vermani.
3. Commercial Methods of Analysis: Shell & Biffen

SEMESTER I
(COURSE – VI)
(ORGANIC CHEMISTRY PRACTICAL)
AUMCH1-06
Credits-03 (L=0,T=0,P=06)

Qualitative Analysis: Separation, purification and identification of binary mixture of organic compounds by chemical tests, TLC, column chromatography and IR spectroscopy.
Books Recommended:
1. Experiments and Techniques in Organic Chemistry, D.Pasto, C. Johnson and M.Miller, Prentice Hall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C.Heath.
3. Systematic Qualitative Organic Analysis, H.Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H.Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

SEMESTER I
(COURSE –VII)
(PHYSICAL CHEMISTRY PRACTICAL)
AUMCH1-07
Credits-03 (L=0,T=0,P=06)

1. Refractive Index (RI) Measurements: Refractive index (RI) measurements of pure solvents, analysis of mixtures of two miscible solvents, molar and atomic refraction determination, polarizability of liquids.
2. Conductometric Measurements: Determination of cell constant, limiting molar conductance of simple electrolytes in water, verification of Ostwald, dilution law for week acetic acid.
3. Surface Tension Measurements: Surface tension of pure solvents, analysis of mixtures of two miscible solvents, verification of Gibb's Thomson Rule of surface tension.
Books Recommended:
1. Senior Practical Physical Chemistry: B.D. Khosla, V.C. Garg and A. Khosla
2. Experimental Physical Chemistry: V. Athawale and P. Mathur.
3. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan.
4. Practical in Physical Chemistry: P.S. Sindhu

SEMESTER-II
(COURSE –VIII)
(INORGANIC CHEMISTRY)
AUMCH1-08
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Metal-Ligand Bonding-I: Recapitulation of Crystal Field Theory including splitting of *d*-orbitals in different environments, Factors affecting the magnitude of crystal field splitting, structural effects (ionic radii, Jahn-Teller effect), Thermodynamic effects of crystal field theory (ligation, hydration and lattice energy), Limitations of crystal field theory, Adjusted Crystal Field Theory (ACFT), Evidences for Metal-Ligand overlap in complexes, *Molecular Orbital Theory* for octahedral, tetrahedral and square planar complexes. (excluding mathematical treatment)

UNIT-II

Atomic Spectroscopy: Energy levels in an atom, coupling of orbital angular momenta, coupling of spin angular momenta, spin orbit coupling, spin orbit coupling *p2* case, Determining the Ground State Terms-Hund's Rule, Hole formulation (derivation of the Term Symbol for a closed sub-shell, derivation of the terms for a *d2* configuration), Calculation of the number of the microstates.

UNIT-III

Electronic Spectra-I: Splitting of spectroscopic terms (S,P,D.F and G,H,I), d1-d9 systems in weak fields (excluding mathematics), strong field configurations, transitions from weak to strong crystalfields.

Electronic Spectra-II: Correlation diagrams (d1-d9) in Oh and Td environments, spin-cross over incoordination compounds. Tanabe Sugano diagrams, Orgel diagrams, evaluation of B,C and βparameters.

UNIT-IV

Magnetochemistry: Origin of Magnetic moment, factors determining paramagnetism, application of magnetochemistry in co-ordination chemistry (spin only moment, Russell Saunder's coupling, quenching of orbital angular moment, orbital contribution to a magnetic moment) in spin free and spin paired octahedral and tetrahedral complexes. Magnetic susceptibility (diamagnetic, paramagnetic), magnetic moments from magnetic susceptibilities, Van Vlecks formula for magnetic susceptibility, temperature dependence of magnetic susceptibility.

Books Recommended:

1 Advanced Inorganic Chemistry – Cotton and Wilkinson
2 Coordination Chemistry- Experimental Methods – K.Burger
3 Theoretical Inorganic Chemistry – Day and Selbin
4 Magnetochemistry – R.L.Carlin
5 Comprehensive Coordination Chemistry – Wilkinson, Gillars and McCleverty.
6 Inorganic Electronic Spectroscopy – A.B.P.Lever
7 Concise Inorganic Chemistry – J.D.Lee
8 Introduction to Ligand Fields – B.N.Figgis
9 Physical Methods in Inorganic Chemistry-R.S.Drago
10 Introduction to Magnetochemistry – A.Earnshaw, Academic Press.

SEMESTER-II
(COURSE –IX)
(ORGANIC CHEMISTRY)
AUMCH1-09
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT – I

(A) Aromatic Electrophilic Substitution: Arenium ion mechanism, orientation and reactivity, energy profile diagrams, The ortho/para ratio, ipso attack, orientation in other ring systems. Quantitative treatment of reactivity in substrates and electrophiles, Diazonium coupling, Vilsmeir reaction, Scholl reaction, Amination reaction, Fries rearrangement, Reversal of Friedel Craft alkylation, Decarboxylation of aromatic acids.

(B) Aromatic Nucleophilic Substitution: SNAr, SN1, benzyne and SRN1 mechanism. Reactivity,effect of substrate structure, leaving group and attacking nucleophile, Von Richter, Sommelet- Hauser, and Smiles rearrangements, Ullman reaction, Ziegler alkylation, Schiemann reaction.

UNIT-II

Common Organic Reactions and Their Mechanisms: Perkin condensation, Michael reaction, Robinson annulation, Diekmann reaction, Stobbe condensation, Mannich reaction, Knoevenagel condensation, Benzoin condensation, Witting reaction, Hydroboration, Hydrocarboxylation, Ester hydrolysis, Epoxidation.

Reagents in Organic Synthesis: Synthesis and applications of BF3, NBS, Diazomethane, Lead tetra-acetate, Osmium tetraoxide, Woodward Prevorst hydroxylation reagent, LiAlH4, Grignard reagent, organozinc and organolithium reagent.

UNIT-III

Elimination Reactions: Discussion of E1, E2, E1cB and E2C Mechanisms and orientation, Reactivity: Effects of substrate structures, attacking base, leaving group and medium. Cis elimination, elimination in cyclic systems, eclipsing effects, Pyrolytic eliminations, cleavage of quaternary ammonium hydroxides, Fragmentations: γ-Amino and γ-hydroxy halides, decarboxylation of β-hydroxy carboxlic acid and β-lactones.

UNIT-IV

Pericyclic Reaction: Molecular orbital symmetry, Frontier orbitals of ethylene, 1,3-butadiene, 1,3,5 hexatrienes and allyl system. Classification of pericyclic reactions, Woodward-Hoffmann correlation diagrams. FMO and PMO approach. Electrocyclic reactions: conrotatory and disrotatory motions, 4n and 4n+2 and allyl systems. Cycloadditions- antarafacial and suprafacial
additions, 4n and 4n+2 systems, 2+2 addition of ketenes, 1,3 dipolar cycloadditions and chelotropic reactions. Sigmatropic rearrangements-Suprafacial and Antarafacial shifts of H, sigmatropic shifts involving carbon moieties, Claisen, Cope and aza-Cope rearrangements, Ene reaction.

Books recommended:

1. Advanced Organic Chemistry-Reactions, Mechanism and Structure, Jerry March, John Wiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry, Peter Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Cornell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice Hall.
6. Modern Organic Reactions, H.O. House, Benjamin.
7. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon, Blackie Academic and Professional.
8. Pericyclic Reactions, S.M. Mukherji, Macmillan, India.
9. Reaction Mechanism in Organic Chemistry, S.M. Mukherji and S.P. Singh, Macmillan.
10. Stereochemistry of Organic Compounds, D. Nasipuri, New Age International.

SEMESTER-II
(COURSE –X)
(PHYSICAL CHEMISTRY)
AUMCH1-10
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT – I

Brief resume of law of thermodynamics. Gibb's and Helmholtz free energy functions and their significance. Partial molal quantities. Partial molal free energy and its variation with temperature and pressure. Determination of partial molar volume. Thermodynamic criteria for the fugacity of the process in terms of entropy change, internal energy change, enthalpy and free energy (Gibb's and Helmholtz) change. Gibb's and Helmholtz equation and its utility in thermodynamics of cell reaction. Thermodynamics of ideal solutions. Fugacity and activity and their variation with temperature and pressure. Graphical method for the determination of fugacity.

UNIT – II

Chemical potential in case of ideal gases. Chemical equilibrium constant and its temperature dependence. Law of chemical equilibrium and its application. Clausius and Clapeyron equation and its application for the determination of colligative properties (depression in freezing point, elevation in boiling point and relative lowering of vapour pressure). Determination of molecular weight of non – volatile solutes from colligative properties. Relationship between relative lowering of vapour pressure and osmotic pressure. Van't Hoff equation for dilute solutions and its application.

UNIT – III

Nernst heat theorem and third law of thermodynamics and its application. Thermodynamic derivation of phase rule and its application to two component systems. Distribution law, its thermodynamic derivation and application. Zeroth law of thermodynamics.

Electrochemistry: Ionic conduction: non – ideal behaviour of electrolytic solutions. Electrolytical potential. Derivation of Debye – Huckel Limiting Law. Extended Debye – Huckel Law. Structure of solutions. Detailed treatment of ion – solvent interactions (ion solvation), solvation number. Energy conduction. Ion – ion interactions (ion – association). Bjerrum's theory of ion – association.

UNIT – IV

Non–Equilibrium Thermodynamics: Basic principles of non – equilibrium thermodynamics: rate laws, second law of thermodynamics for open system, law of conservation of mass, charge and energy. Phenomenological equations for single and coupled flows. Onsager reciprocity relation. Theorm of minimum entropy production. Curie – Prigogine principle. Applications of non – equilibrium thermodynamic: thermoelectricity, electrokinetic phenomena and expressions for streaming potential, electro- osmotic pressure difference, streaming potential using the linear phenomenological equations, and to biological membrane system, a qualitative insight.

Books Recommended:

1. Thermodynamics for Chemists: S. Glasstone
2. Physical Chemistry: G.M. Barrow
3. Non – equilibrium Thermodynamics: C. Kalidas
4. Non – equilibrium Thermodynamics: I. Prigogene
5. Electrochemistry: S. Glasstone
6. Electrochemistry: P.H. Reiger
7. Thermodynamics; R.C. Srivastava, S.K. Saha and A.K. Jain
8. Modern Electrochemistry Vol. I: J.O'M Bockris and A.K.N. Reddy

SEMESTER-II
(COURSE –XI)
(CHEMISTRY OF LIFE & ENVIROMENTAL CHEMISTRY
AUMCH1-11
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Cell structure and function: Overview of metabolic processes (catabolic and anabolic), energy transfer processes, role and significance of ATP (the biological energy currency). Introductory idea of metabolism of proteins and lipids, biosynthesis of proteins and glycerides.

UNIT-II

Nucleic acids: Purine and pyrimidine bases of nucleic acids, base pairing via H-bonding. Structure of ribonucleic acids (RNA) and deoxyribonucleic acids (DNA), double helix model of DNA and forces responsible for holding it. Chemical and enzymatic hydrolysis of nucleic acids. The Chemical basis for heredity, an overview of replication of DNA, transcription, translation and genetic code. Chemical synthesis of mono and trinucleoside.

UNIT-III

Environmental Chemistry: Atmosphere, environmental segments, composition of the atmosphere, earth's radiation balance, particulates, ions and radicals and their formation, chemical and photochemical reactions in the atmosphere, air pollution, oxides of C,N,S and their effects, acid-rain, smog formation, Green house effects (global warming and ozone depletion, air pollution controls and introduction to analytical methods for monitoring air pollution.

UNIT-IV

Hydrosphere: Chemical composition of water bodies-lakes, streams, rivers, sea etc, hydrological cycle, complexation in natural and waste water and microbially mediated redox reactions. Water pollution-inorganic, organic, pesticides, industrial and radioactive materials, oil spills and oil pollutants, eutrophication, acid-mine drainage, waste water treatment, domestic waste water (aerobic and anaerobic treatment), and industrial waste water treatment.

Water quality parameters and standards: Analytical methods for measuring DO, BOD, COD, fluoride, oils and grease and metals (As, Cd, Hg, Pb, Zn,Cu,Cr), Biochemical effects of As, Cd, Hg, Pb, Cr, CN and pesticides. **Lithosphere:** Soil composition, micro and macro nutrients, soil pollution-fertilizers, pesticides.

Books Recommend:

1. Principles of Biochemistry –A.L.Lehringer
2. Introduction to Chemistry of Life-H.J.DeBay
3. Outlines of Biochemistry-Conn and Stumpf
4. Environmental Chemistry-A.K.De
5. Environmental Chemistry-Manaham

SEMESTER II
(COURSE – XII)
(INORGANIC CHEMISTRY PRACTICAL)
AUMCH1-12
Credits-03 (L=0,T=0,P=06)

1. Analysis of mixtures by gravimetric and volumetric methods from the mixture solutions:

1. Copper- Nickel
2. Copper -Magnesium
3. Copper-Zinc
4. Iron-Magnesium
5. Silver-Zinc
6. Copper-Nickel-Zinc
7. Fe(II)-Fe(III)

2. **Green methods of Preparation of the following:**

(i) Bis(acetylacetonato)copper(II)
(ii) Tris(acetylacetonato)iron(III)
(iii) Tris(acetylacetonato)manganese(III)

Books Recommended:

1. A text Book of Quantitative Inorganic Analysis: A.I.Vogal.
2. Applied Analytical Chemistry: Vermani.
3. Commercial Methods of Analysis: Shell & Biffen

SEMESTER II
(COURSE – XIII)
(ORGANIC CHEMISTRY PRACTICAL)
AUMCH1-13
Credits-03 (L=0,T=0,P=06)

Organic Synthesis: Acetylation: - Acetylation of cholesterol and separation of cholesteryl acetate by column chromatography. Oxidation: Adipic acid by chromic acid oxidation of cyclohexanol. Grignard reaction: Synthesis of triphenyl methanol from benzoic acid. Aldol condensation: Dibenzal acetone from benzaldehyde. Sandmeyer reaction: p-chlorotoluene from p-toluidine. Acetoacetic ester condensation: Synthesis of ethyl-n-butylacetoacetate by A.E.E condensation. Preparation of iodoform from acetone (Haloform reaction). Preparation of polystyrene, anthranilic acid, fluorosceine-eosin, and methyl orange

Books Recommended:

1. Experiments and Techniques in Organic Chemistry, D.Pasto, C. Johnson and M.Miller, Prentice Hall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C.Heath.
3. Systematic Qualitative Organic Analysis, H.Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H.Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

SEMESTER II
(COURSE – XIV)
(PHYSICAL CHEMISTRY PRACTICAL)
AUMCH1-14
Credits-03 (L=0,T=0,P=06)

1. Partition – Coefficient: Determination of partition – coefficient for I2 between water and CCl4 and for benzoic acid between water and benzene.
2. Adsorption Measurements: Verification of Freundlich adsorption isotherm for I2, acetic acid and oxalic acid on charcoal.
3. Colloidal Solution: Preparation of sol solution of arsenic sulphide and estimation of flocculation value for NaCl, KCl, BaCl2, AlCl3.
4. Thermochemistry: Determination of water equivalent of thermos flask, and estimation of heat of neutralization for strong acid strong base, weak acid strong base or vice – versa, heat of hydration and solution of salts.
5. Kinetic Measurement: Kinetics of Hydrolysis of methylacetate and ethylacetate in the presence of HCl.

Books Recommended:

1. Senior Practical Physical Chemistry: B.D. Khosla, V.C. Garg and A. Khosla
2. Experimental Physical Chemistry: V. Athawale and P. Mathur.
3. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan.
4. Practical in Physical Chemistry: P.S. Sindhu

SEMESTER-III
(COURSE –XV)
(INORGANIC CHEMISTRY)
AUMCH2-15
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Metal π Complexes: Preparation, reactions, structures and bonding in carbonyl, nitrosyl, phosphine and related complexes, structural evidences from vibrational spectra, bonding and important reactions of metal carbonyls. Structure and bonding in metal cyanides, stabilization of unusual oxidation states of transition metals.

UNIT-II

Introductory Analytical Chemistry: ***Data Analysis*****–** Types and sources of errors, propagation of errors, detection and minimization of various types of errors. Accuracy and precision, average and standard deviation, variance, its analysis and confidence interval, tests of significance (*F*-test, *t*-test and paired t-test), criteria for the rejection of analytical data (4d rule, 2.5d rule, Q-test, average deviation and standard deviation), least-square analysis.

Food and Drug Analysis- General methods for proximate and mineral analysis in food (moisture, ash, crude fiber, nitrogen (proteins) and minerals (iron, calcium, potassium, sodium and phosphorus). Discussion of official (pharmacopea) methods for the determination of following drugs as such: (i) Analgin/oxyphenbutazone, (ii) chloramphenicol and related nitro compounds, (iii) chloroquinine, (iv) phenyl butazone, (v) salicylic acid and (vi) sulphonamides.

UNIT-III

Photoelectron Spectroscopy: Basic principle, photoionization process, ionization energies, Koopman's theorem, ESCA, photoelectron spectra of simple molecules, (N2, O2 and F2) Photoelectron spectra for the isoelectronic sequence Ne, HF, H2O, NH3 and CH4 , chemical information from ESCA, Auger electron spectroscopy – basic idea.

UNIT-IV

Lanthanides and Actinides:- Spectral and magnetic properties, comparison of Inner transition and transition metals, Transuranium elements (formation and colour of ions in aqueous solution),uses of lanthanide compounds as shift reagents, periodicity of translawrencium elements.

Nuclear Chemistry: Nuclear binding energy and stability, nuclear models (nuclear shell model and collective model). Nuclear reactions: types of reactions, nuclear cross-sections, Q-value. Natural and artificial radioactivity, radioactive decay and equilibrium, Nuclear fission-fission product and fission yields, Nuclear fusion.

Radioactive techniques: Tracer technique, (neutron activation analysis), Counting techniques such as G.M. Ionization and proportional counters.

Books Recommended:

1. Advanced Inorganic Chemistry – Cotton and Wilkinson
2. Fundamentals of Analytical Chemistry – Skoog and West
3. Quantitative Inorganic Analysis – Vogel
4. Chemistry of the Elements – Greenwood and Earnshaw
5. Nuclear Chemistry-U.C.Dash
6. Nuclear Chemistry – B.G.Harvey
7. Nuclear Chemistry – Arnikar
8. Techniques in Inorganic Chemistry Vol. II (Nuclear Chemistry-Johnson and Others).
9. Modern Aspects of Inorganic Chemistry-H.J.Emeleus and A.G.Sharpe
10. Inorganic Chemistry, 4th Edition, - J.E.Huheey, E.A.Keiter and R.L.Keiter.
11. Analytical Chemistry-G.D.Christian
12. Chemical Structure and Bonding- Dekock and Gray
13. The Organometallic Chemistry of Transition metals: R.H. Crabtree.
14. Electronic absorption spectroscopy and related techniques: D.N. Sathyanarayan

SEMESTER-III
(COURSE –XVI)
(ORGANIC CHEMISTRY)
AUMCH2-16
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT–1

Spectroscopy:

(A) Ultra Violet and Visible Spectroscopy: Electronic transitions (185-800 nm), Beer-Lambert Law, Effect of solvent on electronic transitions, Ultra Violet bands of carbonyl compounds, unsaturated carbonyl compounds, dienes, conjugated polyenes. Fieser-Woodward rules for conjugated dienes and carbonyl compounds, Ultra- Violet spectra of aromatic and heterocyclic compounds. Steric effect in biphenyls. Applications of UV- visible spectroscopy in organic chemistry.

(B) Infrared Spectroscopy: Instrumentation and sample handling, Characteristic vibrational frequencies of common organic compounds. Effect of hydrogen bonding and solvent effect on vibrational frequencies, overtones, combination bands and Fermi resonance. Introduction to Raman spectroscopy. Applications of IR and Raman Spectroscopy in organic chemistry.

UNIT-II

Nuclear Magnetic Resonance (NMR) Spectroscopy: General introduction, chemical shift, spinspin interaction, shielding mechanism, chemical shift values and correlation of protons present in different groups in organic compounds. chemical exchange, effect of deuteration, complex spinspin interaction between two, three, four and five nuclei, virtual coupling. Stereochemistry, hindered rotation, Karplus- relationship of coupling constant with dihedral angle. Simplification of complex spectra-nuclear magnetic double resonance, spin tickling, INDOR, contact shift reagents, solvent effects. Fourier transform technique, Nuclear Overhauser Effect (NOE). Introduction to resonance of other nuclei –F, P, Principle and introduction to C13 NMR, 2-D and 3-D NMR, Applications of NMR in organic chemistry.

UNIT-III

Mass Spectrometry: Introduction, ion production—EI, CI, FD and FAB, factors affecting fragmentation, ion analysis, and ion abundance. Mass spectral fragmentation of organic compounds, common functional groups, Molecular ion peak, Meta-stable peak, McLafferty rearrangement. Nitrogen Rule. High-resolution mass spectrometry. Examples of mass spectral fragmentation of organic compounds with respect to their structure determination. Introduction to negative ion Mass spectrometry, TOF-MALDI. Problems based upon IR, UV, NMR and mass spectroscopy.

UNIT- IV

Photochemistry – I: Introduction and Basic principles of photochemistry. Interaction of electromagnetic radiations with matter. Types of excitations, fate of excited molecules, quantum yield, transfer of excitation energy, actinometry. Photochemistry of alkenes: cis-trans isomerization, dimerization of alkenes, photochemistry of conjugated olefins, photo-oxidation of alkenes and polyenes Photochemistry of Aromatic compounds: Isomerization, addition and substitution, photo-reduction of aromatic hydrocarbons

Photochemistry – II: Photochemistry of Carbonyl compounds: Norrish Type I and II, Intermolecular and Intramolecular hydrogen abstraction, Paterno-Buchi reaction, α and β-cleavage reactions of cyclic and acyclic carbonyl compounds, Formation of oxetane and cyclobutane from16 α, β unsaturated ketones, Photo-reduction of carbonyl compounds, Photo-rearrangement of enones, dienones, epoxyketones, Photo Fries rearrangement.

Books Recommended:

1. Practical NMR Spectroscopy, M.L. Martin, J.J. Delpeuch and G.J. Martin, Heyden.
2. Spectrometric Identification of Organic Compounds, R. M. Silverstein, G.C.Bassler and T.C.Morrill, John Wiley.
3. Introduction to NMR Spectroscopy, R.J. Abraham, J. Fisher and P. Loftus, Wiley.
4. Application of Spectroscopy of Organic Compounds, J.R. Dyer, Prentice Hall.
5. Spectroscopic Methods in Organic Chemistry, D.H. Williams,I. Fleming, Tata McGraw-Hill.
6. Organic spectroscopy by Jagmohan
7. Organic spectroscopy by W. Kemp.
8. Fundamentals of Photochemistry, K.K.Rohtagi - Mukherji, Wiley-Eastern.
9. Essentials of Molecular Photochemistry, A. Gilbert and J.Baggot, Blackwell Scientific Publication.
10. Molecular Photochemistry, N.J. Turro, W.A. Benjamin.
11. Introductory Photochemistry, A. Cox and T. Camp, McGraw-Hill.
12. Photochemistry, R.P. Kundall and A. Gilbert, Thomson Nelson.
13. Organic Photochemistry, J. Coxon and B. Halton, Cambridge University Press.
14. Organic Photochemistry Vol.I, II, III. Ed. Orville L. Chapman.
15. Organic Photochemistry, Ed. Robert O. Kan.

SEMESTER-III
(COURSE –XVII)
(PHYSICAL CHEMISTRY)
AUMCH2-17
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- syllabus. The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

Statistical Thermodynamics

UNIT – I
Basic Terminology: probability, phase space, micro and macro states, thermodynamic probability, statistical weight, assembly, ensemble, probability considerations and chemistry. The most probable distribution: Maxwell-Boltzmann distribution, Thermodynamic properties from statistical Thermodynamics, The Partition Function for monoatomic gas, State functions in terms of partition function, separating partition function: the nuclear and electronic partition function, for molecules, electronic and vibrational partition function,

UNIT – II
Diatomic molecules: Rotations, Polyatomic molecules: Rotations, The partition function of a system, Thermodynamic properties of molecules from partition function: Total energy, entropy, Helmholtz free energy, pressure, heat content, heat capacity and Gibb's free energy, equilibrium constant and partition function, Heat capacity of crystals and statistical thermodynamics, quantum statistics: The Bose- Einstein statistics and Fermi- Dirac Statistics.

UNIT – III

Basic Quantum Chemistry
Operators in quantum mechanics. Eignvalues and eignfunctions. Hermitian operator and its application. Postulates of quantum mechanics. Angularmomentum of a one – particle system, and its commutative relations. Schreodinger wave equatuion and its formulation as an eignvalue problem. The uncertainty principle. Quantum mechanical treatment of translational motion of a particle, particle in one and three dimensional boxes, harmonic – oscillator, rotational motion of a particle: particle on a ring, particle on a sphere, rigid rotator and hydrogen atom. Graphical presentation of orbitals (s, p and d), radial and angular probability distribution plots.

UNIT – IV
Photochemistry: Photophysical processes of electronically excited molecules. Intensity distribution in the electronic vibrational species. Franck – Condon principle a quantum – mechanical treatment. Excited state dipole moment and acidity constant. Dissociation and pre – dissociation of diatomic molecules. Energy transfer from electronically excited molecules: Stern – Volmer mechanism only. Photophysical pathways: fluorescence, phosphorescence, Etype and P- type delayed fluorescence. Kinetic treatment of excimer and exciplex formation.

Books Recommended:

1. Physical Chemistry: D.W. Ball
2. Theoretical Chemistry by S. Glasston
3. Statistical Chemistry by I. Prigogine
4. Quantum Chemistry An Introduction: H.L. Strauss
5. Introductory Quantum Chemistry: A.K. Chandra
6. Quantum Chemistry: A. Mcquarrie
7. Quantum Chemistry: I.N. Levine

SEMESTER-III
(COURSE –XVIII) A
(INORGANIC CHEMISTRY SPECIAL THEORY - I)
AUMCH2-18
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Inorganic Photochemistry : Basic principles, Basic photochemical processes, Kashia's rule, The xi state, Photochemical behaviour of transition metal complexes, charge transfer spectra of crystalline and gaseous alkali halides, photochemical reactions of coordination compounds, oxidation-reduction reactions, Photo substitution reactions, Adamson's rules and photosubstitution reactions of cobalt(III) complexes i.e. $[Co(NH_3)_5X]^{2+}$, $[Co(en)_3]^{3+}$,and chromium(III) complexes i.e. $[Cr(H_2O)_6]^{3+}$ and $[Cr(NH_3)_6]^{3+}$ and ruthenium (II) polypyridyl complexes.

UNIT-II

Inorganic Reactions and Mechanism: Substitution reactions in octahedral complexes, acid hydrolysis reactions, base hydrolysis and anation reactions, substitution reaction, reactions occurring without rupture of metal-ligand bond. Substitution reactions of square planar complexes. Theories of trans-effect, labile and inert complexes. Mechanism of redox reactions.

UNIT-III

Polymeric Inorganic Compounds: General chemical aspects (synthesis, properties and structure) of phosphazenes, borazines, silicones, sulphur- nitrogen cyclic compounds and condensed phosphates.

Electronic Spectra – III (Electronic spectra of complex ions): Selection rules (Laporte,orbital and spin selection rules), band intensities, band widths, spectra in solids, spectra of aqueous solutions of d1-d9 ions in Oh and Td environments, Evaluation of 10 Dq, Spectrochemical and Nephelauxetic series, charge- transfer spectra.

UNIT-IV

Stability of Coordination Compounds – Stability constants, stepwise formation constants, overall formation constants, relationship between stepwise and overall formation constants, difference between thermodynamic and kinetic stability.
Determination of stability constants by:

(i) Spectrophotometric methods (Job's method, Mole ratio and slope ratio method).
(ii) Bjerrum's method
(iii) Leden's method
(iv) Polarographic method Factors affecting the stability constants (with special reference to metal and ligand ions).

Books Recommended:

1. Instability Constants- Yttermiskii
2. Advanced Inorganic Chemistry- Cotton and Wilkinson
3. Inorganic Chemistry- T.Moeller
4. Concise Inorganic Chemistry- J.D.Lee
5. Introduction to Ligand Fields- B.N.Figgis
6. Modern Aspects of Inorganic Chemistry-H.J.Emeleus and A.G.Sharpe
7. Inorganic chemistry: A Unified Approach W.W.Porterfield
8. Inorganic Reaction Mechanism – Edberg
9. Inorganic Reaction Mechanism – Basoloavd Pearsor

SEMESTER-III
(COURSE –XVIII (B))
(BIO - ORGANIC CHEMISTRY SPECIAL THEORY - I)
AUMCH2-18
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E

.**UNIT-I**
Carbohydrates: Types of naturally occurring sugars: Deoxy-sugars, amino sugars, branched chain sugars. General methods of structure and ring size determination with particular reference to maltose, lactose, sucrose, pectin, starch and cellulose, photosynthesis of carbohydrates, metabolism of glucose, Glycoside- (amygdalin).

UNIT-II
Amino acid, peptides and proteins: General methods of peptide synthesis, sequence determination. Chemistry of insulin and oxytocin. Purines and nucleic acid. Chemistry of uric acid, adenine, protein synthesis.

Kinds of reactions catalyzed by Enzymes: Nucleophilic displacement on a phosphorus atom, multiple displacement reactions and the coupling of ATP cleavage to endergonic processes. Transfer of sulphate addition and elimination reactions, enolic intermediates in isomerization reactions, β- cleavage and condensation, some isomerization and rearrangement reactions. Enzyme catalyzed carboxylation and decarboxylation reactions.

UNIT-III
Vitamins: A general study, detailed study of chemistry of thiamine (Vitamin B1), Ascorbic acid (Vitamin C), Pantothenic acid, biotin (Vitamin H), α-tocopherol (Vitamin E), Biological importance of vitamins.

Coenzyme Chemistry: Cofactors as derived from vitamins, coenzymes, prosthetic groups, and apoenzymes. Structure and biological functions of coenzyme A, thiamine pyrophosphate pyridoxal phosphate, NAD+, NADP+, FMN, FAD, Lipoic acid, vitamin B12. Mechanisms of reactions catalyzed by the above cofactors.

UNIT-IV
Enzymes: Nomenclature and classification, extraction and purification, Remarkable properties of enzymes like catalytic power, specificity and regulation, Proximity effects and molecular adaptation, Chemical and biological catalysis. Mechanism of enzyme action: Transition state theory, orientation and steric effect, acid base catalysis, covalent catalysis, strain or distortion. Examples of some typical enzyme mechanisms (chymotrypsin, ribo nuclease, lysozyme and carboxypetidase A). Fischer's lock and key and Koshland's induced fit hypothesis, concept and

identification of active site by the use of inhibitors affinity labeling and enzyme modification by site directed mutagenesis. Enzyme kinetics, Michaelis-Menten and Lineweaver-Burk plots, reversible and irreversible inhibition.

.

Books recommended:

1. Bioinorganic Chemistry: A Chemical Approach to Enzyme Action, Herman Duags and C. Penny,
and Springer-Verlag.
2. Understanding Enzymes, Trevor Palmer, Prentice Hall.
3. Enzyme Chemistry; Impact and Applications, Ed. Collin J Suckling, Chapman and Hall.
4. Enzyme Mechanisms Ed, M.I. Page and A. Williams, Royal Society Of Chemistry.
5. Fundamentals of Enzymology, N.C. Price and L. Stevens, Oxford Univ. Press.
20
6. Immobilized Enzymes: An Introduction and Applications In Biotechnology, Michael D. Trevan,
John Wiley.
7. Enzymatic Reaction Mechanisms. C. Walsh, W. H, Freeman.
8. Enzyme Structure and Mechanism, A. Fersht, W.H. Freeman.
9. Biochemistry the Chemical Reactions of Living Cells, D.E. Metzler, Academic Press.
10. Carbohydrates by N. Sharon.
11. Carbohydrates by Gutherie.
12. Carbohydrates by Pigman and Wolfrom.
13. The Nucleic Acids (Vol I-III) by Chargoff and Davidson.
14. Protein Structures and Functions by A. Light.
15. Chemistry of Natural Products Vol. I by K. Nakanishi.
16. Peptides and Amino Acids by R.H. Thomson.
17. The chemistry of Natural Products by P.S. Kalsi.

SEMESTER-III
(COURSE –XVIII (C))
(PHYSICAL CHEMISTRY SPECIAL THEORY - I)
AUMCH2-18
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT –I

Adsorption at solid – gas interface: Concept of ideal and non – ideal adsorption. Heat of adsorption. Types of adsorption isotherms. Single – layer adsorption – Langmuir adsorption isotherm and its derivation. Multilayer adsorption – B.E.T. theory and its kinetic derivation. Application of BET theory in its determination of surface area of the solid. Catalytic activities at surfaces: adsorption and catalysis.

Adsorption at solid – liquid interface: Gibbs adsorption equation. Isotherms of concentration and temperature change for the adsorption in solutions. Chromatographic adsorption: column chromatography and its theory. Theory of chromatography involving one solute and several solutes.

UNIT –II

Solution and Interfacial Behaviour of Surfactants: Definition and classification of surfactants. Solution properties of surfactants: micelle and reverse micelle formation, critical micelle concentration (CMC), dependence of CMC on chain length of the surfactant, micelle shape and size. Thermodynamics of micelle formation, hydrophobic effect (a qualitative view only). Aggregation at high surfactant concentration (a qualitative aspect). to micelles. Surface tension and detergent., Practical application of surfactants.

UNIT –III

Electrochemistry: Mechanism of electrolytic conductance, relaxation and electrophoretic effects, Debye – Huckel – Onsager (DHO) equation and its validity in aqueous and non aqueous solutions. Deviations from the Onsager equation, conductance ratio and Onsager equation. Dispersion of conductance at high frequencies (Debye – Falkenhagen effect). Conductance with high potential gradients (Wien effect). Activity and activity coefficient, forms of activity coefficients, activities of electrolytes and mean ion activity coefficient. The Debye – Huckel Limiting law. Electrokinetic phenomena: Electrical double layer and its structure (Stern's theory), Electroosmosis, Streaming potential, Electrophoresis, Influence of ions on electrokinetic phenomena (Qualitative insight).

UNIT –IV

Chemistry of Nano – Materials: Definition and historical perspective. Effect of nanoscience and
nanotechnology in various fields. Synthesis of nanoparticles by chemical routs and their caracterization techniques. Properties of nanostructured material: optical, magnetic and chemical
properties. An overview of applied chemistry of nanometerials.

Books Recommended:

1. Physical Chemistry of Surfaces: A.W. Admson
2. Adsorption from Solutions: J.J. Kipling
3. Micelles (Theoretical and Applied Aspects): Y. Moroi
4. Foundation of Colloid Science Vol. I and II: R.J. Hunter
5. Physical Chemistry: P.W. Atkins
6. Frontiers in Applied Chemistry: A.K. Biswas
7. Introduction to nanotechnology: Charles P.Poole, Jr. Frank, J. Owens: Wiley India

SEMESTER III
(COURSE – XIX)
(INORGANIC CHEMISTRY PRACTICAL)
AUMCH2-19
Credits=03 (L=0,T=0,P=6)

1. Analysis of the given sample (Ores)/Both Qualitative and Quantitative Dolomite, Pyrolusite, Galena.
2. Analysis of the given alloys: Coin, Gunmetal, Brass and Bronze.
3. To prepare a pure and dry sample of the following compounds:

1. Potassium tris(oxalato)aluminate(III)
2. Sodium hexa(nitro)cobaltate(III)
3. Potassium tris(oxalato)cobaltate(III)
4. Hexa(ammine)cobalt (III)chloride
5. Tetrapyridine copper(II)persulphate
6. Dinitrotetrapyridine nickel(II)
7. Lead tetraacetate
8. Mercury (tetraisothiocyanato)cobaltate(II).

and characterize them by the following techniques:

i) Elemental analysis
ii) Molar conductance values
iii) I.R. Spectral interpretation
iv) Thermal analysis
v) UV-Visible Spectra

Books Recommended:

1. A Text Book of Qualitative Inorganic Analysis – A.I. Vogel

SEMESTER III
(COURSE – XX)
(ORGANIC CHEMISTRY PRACTICAL)
AUMCH2-20
Credits=03 (L=0,T=0,P=6)

A. Quantitative Analysis: Determination of the percentage/ number of hydroxyl groups in an organic compound by acetylation method. Estimation of amines/ phenols using bromate – bromide solution/ acetylation method. Determination of iodine and sponification values of an oil sample. Determination of DO, COD and BOD of water sample.

B. Multistep Synthesis: Cannizzaro reaction: 4-chlorobenzaldehyde as substrate. Benzilic Acid Rearrangement: Benzaldehyde à Benzoinà Benzilà Benzilic acid. Hofmann bromamide Rearrangement: Phthalic anhydride-à Phthalimideà Anthranilic acid Beckmann Rearrangement: Benzeneà Benzophenone-à Benzophenone oximeàBenzanilide. Skraup Synthesis: Preparation of quinoline from aniline. Synthesis using Phase Transfer Catalysis: Alkylation of diethyl malonate or ethyl acetoacetate and an alkyl halide.

Books Recommended:

1. Experiments and Techniques in Organic Chemistry, D.Pasto, C. Johnson and M.Miller, Prentice Hall.
2. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C.Heath.
3. Systematic Qualitative Organic Analysis, H.Middleton, Adward Arnold.
4. Handbook of Organic Analysis-Qualitative and Quantitative, H.Clark, Adward Arnold.
5. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

SEMESTER III
(COURSE – XXI)
(PHYSICAL CHEMISTRY PRACTICAL)
AUMCH2-21
Credits=03 (L=0,T=0,P=6)

1. **Solubility Measurements:** Heat of solution of electrolytes by solubility measurements.
2. **Heat of transfer Measurements:** Heat of transfer for benzoic acid between benzene and water and I2 between CCl4 and water.
3. **Conductometric Measurements:** Precipitation titration (AgNO3 – KCl), acid – base neutralization titration, determination of relative strength of acids in the given mixtures, solubility of sparingly soluble salt.
4. **Construction of Phase Diagram:** Phase diagram for liquids, (benzene and methanol, ----) and phase diagram for solids, (benzoic acid and cinnamic acid, benzoic acid and naphthalene and acetamide and salicylic acid).
5. Colorimetric Measurements: Verification of Beer – Lambert's law for aqueous solutions of KMnO4, K2Cr2O7 and CuSO4 and construction of calibration plot to estimate the unknown concentration.
6. Kinetic Measurement: Saponification of ethylacetate by NaOH solution.

Books Recommended:

1. Senior Practical Physical Chemistry: B.D. Khosla, V.C. Garg and A. Khosla
2. Experimental Physical Chemistry: V. Athawale and P. Mathur.
3. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan.
4. Practical in Physical Chemistry: P.S. Sindhu

SEMESTER-IV
(COURSE –XXII)
(INORGANIC CHEMISTRY SPECIAL THEORY - II)
(ADVANCED ORGANOMETALLICS)
AUMCH2-22
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Organometallic Compounds of transition elements: Types of ligands and their classifications in organometallic compounds , 16 and 18 electron rule and its limitations. Hapto-nomenclature, synthesis, structure and bonding aspects of following organometallic compounds with carbon- π donor ligands

a) Two electron donor (olefin and acetylenic complexes of transition metals)
b) Three electron donor (π-allyl complexes of transition metals)
c) Four electron donor (butadiene and cyclobutadiene complexes of transition metals)
d) Five electron donor (cyclopentadienyl complexes of transition metals – metallocenes with special emphasis to ferrocenes)
e) Six electron donor [Benzene (arene) complex] Fluxional and dynamic equillibria in compounds such as η2-olefin, η3- allyl and dienylcomplexes.

UNIT-II

Homogeneous Transition metal catalysis: General considerations, Reason for selecting transition metals in catalysis (bonding ability, ligand effects, variability of oxidation state and coordination number), basic concept of catalysis (molecular activation by coordination and addition), proximity interaction (insertion/inter-ligand migration and elimination, rearrangement). Phase transfer catalysis. Homogeneous hydrogenation of unsaturated compounds (alkenes, alkynes, aldehydes and ketones). Asymmetric hydrogenation.

UNIT-III

Some important homogeneous catalytic reactions:- Ziegler Natta polymerization of ethylene and propylene, oligomerisation of alkenes by aluminumalkyl, Wackers acetaldehyde synthesis, hydroformylation of unsaturated compounds using cobalt and rhodium complexes, Monsanto acetic acid synthesis, carboxylation reactions of alkenes and alkynes using nickel carbonyl and palladium complexes. Carbonylation of alkynes (acetylene) using nickel carbonyls or Palladium Complexes.

UNIT-IV

Metal-metal bonding in carbonyl and halide clusters:- Polyhedral model of metal clusters, effect of electronic configuration and coordination number, Structures of metal carbonyl clusters of

three atoms $M_3(CO)_{12}$ (M=Fe, Ru & Os), Four metal atoms (tetrahedra) [$M_4(CO)_{12}$ {M= Co, Rh &Ir}] and octahedron of type $M_6(CO)_{16}$ [M= Co & Rh], and halide derivatives of Rhenium (III)

Transition Metal-Carbon multiple bonded compounds:-Metal carbenes and carbynes (preparation, reactions, structure and bonding considerations). Biological applications and environmental aspects of organometallic compounds, Organometallic compounds in medicine, agriculture and industry.

Books Recommended:

1. Principles of organometallic compounds – Powell
2. Organometallic chemistry (an Introduction) – Perkin and Pollar
3. Organometallic chemistry – Parison
4. Advanced Inorganic Chemistry – Cotton and Wilkinson
5. Organometallic Chemistry-R.C.Mehrotra
6. Organometallic compounds of Transition Metal-Crabtree
7. Chemistry of the Elements – Greenwood and Earnshaw
8. Inorganic Chemistry – J.E.Huheey
9. Homogeneous transition metal catalysis – Christopher Masters
10. Homogeneous Catalysis – Parshall
11. Principles and Application of HomogeneousCatalysis – Nakamura and Tsutsui
12. Progress in Inorganic Chemistry Vol. 15 – Lipard. (Transition metal clusters – R.B.King)
13. Organotransition metal chemistry by S.G.Davis, Pergamon press 1982.
14. Principles and applications of organotransition metal chemistry by Ccollmen and Hegden

SEMESTER-IV
(COURSE –XXIII)
(INORGANIC CHEMISTRY SPECIAL THEORY - III)
(MODERN TECHNIQUES OF CHEMICAL ANALYSIS)
AUMCH2-23
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Spectrophotometry: i) Introduction, fundamental laws of photometry, the electromagnetic spectrum and spectrochemical methods, UV/Visible instrumentation, absorption spectra, Beer-Lambert's Law, deviation from Beer-Lambert's Beer's Law. ii) *Photometric Titrations:-* Simultaneous spectrophotometric determination, differential spectrophotometry, titration curves and applications to quantitative analysis. iii) *Molecular Fluorescence Spectroscopy:-* Theory, relaxation processes, relationship between excitation spectra and florescence spectra, florescencent species, effect of concentration on florescence intensity, instrumentation and application of florescence methods.

UNIT-II

Atomic Spectroscopy: Theory of flame photometer, intensities of spectral lines, selection of optimal working conditions, applications of flame photometry to quantitative analysis. The Theory of Atomic Absorption Spectroscopy (AAS), Origin of atomic spectra, line width effects in atomic absorption, instrumentation and its application, Atomic emission spectroscopy (AES) and the detailed description of the techniques of inductively coupled plasma AES (ICP-AES) and its instrumentation. Chemical and spectral interferences encountered in both techniques and how to overcome them.

Polarographic Methods: General introduction: Theoretical measurements of classical polarography, polarographic measurements, polarograms, interpretation of polarographic waves, equation for polarographic waves, half-wave potential, effect of complex formation on polarographic waves, dropping mercury electrode (advantages and limitations), current variation with a dropping electrode, polarographic diffusion current, the ilkovic equation, effect of capillary characterization on diffusion current, diffusion coefficient temperature, kinetic and catalytic current, polarograms for mixtures of reactants, anodic waves and mixed anodic and cathodic waves, current maxima and its suppression, residual current, supporting electrolytes, oxygen waves, instrumentation and applications to inorganic and organic analysis.

UNIT-III

Electroanalytical Methods:

a) Electrogravimetric methods:- **i**) Current-voltage relationship during electrolysis, operation of a cell at a fixed applied potential, costant current electrolysis, physical properties of electrolytic precipitates, chemical factors of importance in electrodeposition, anodic deposition.

ii) Spontaneous electrogravimetric analysis (internal electrolysis), apparatus and applications.
iii) Electrolytic method with and without potential control, apparatus and applications.

b) Coulometric Methods**:** i) Controlled potential Coulometry, instrumentation and applications. ii) Coulometric titrations, cell for coulometric titrations, applications of coulometric titrations (neutralization, precipitation, and complex formation titrations), comparison of coulometric and volumetrictitrations.

UNIT-IV

Thermoanalytical methods:

(a) ***Thermogravimatric analysis:*** Introduction, Factors affecting thermogravimetric curves, instrumentation, applications to inorganic compounds (analysis of binary mixtures i.e. Ca and Mg, TG curves of calcium oxalate, determination of Ca, Sr & Ba ions in the mixture, drying of sodium carbonate, analysis of clays and soils, decomposition of potassium hydrogen phthalate, oxidation of nickel sulphide, determination of titanium content of non-stoichiometric sample of titanium carbide).

(b) ***Differential thermal analysis:*** Introduction, Factors effecting DTA curves, instrumentation, applications, to inorganic compounds (thermal decomposition of mixtures of lanthanum-cerium and praseodymium oxalate, DTA curves for $CuSO_4.5H_2O$, sulphur, detection of organic contamination in ammonium nitrate, thermal decomposition for different magnesium carbonate samples, determination of uncalcined gypsum in plaster of paris.

Books Recommended:

1. Instrumental methods of analysis.-H.H.Willard, LL.Marritt and J.A.Dean
2. Fundamental of analytical Chemistry -D.A.Skoog & D.M.West
3. Basic concepts of analytical Chemistry-S.M.Khopkar
4. Instrumental Methods of Chemcial Analysis-G.K.Ewring
5. Quantitative Inorganic Analysis-A.I.Vogel
6. Ion Exchange-AellFerish
7. Modern Polarographic Methods in Analytical Chemistry -A.M.Bond
8. Thermal Methods of Analysis-W.W. Wandlandt.
9. D.A.Skoog, F.J.Holler and T.E.Nieman, Principles of Instrumental analysis, 5th Edition, Saunder's college Pub. 1998.

SEMESTER-IV
(COURSE –XXIV)
(INORGANIC CHEMISTRY SPECIAL THEORY - IV)
(INORGANIC SPECTROSCOPY)
AUMCH2-24
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Infrared Spectroscopy: Theory of IR absorption, Types of vibrations, Observed number of modes of vibrations, Intensity of absorption bands, Theoretical group frequencies, Factors affecting group frequencies and band shapes (Physical state, Vibrational Coupling, Electrical effects, Resonance, Inductive effects, Ring strain) Vibrational-rotational fine-structure. Experimental method. Application of IR to the following:

i) Distinction between a) Ionic and coordinate anions such as NO3 -, SO4 2- and SCNb) Lattice and coordinated water. ii) Mode of bonding of ligands such as urea, dimethylsulphoxide and hexamethylphosphoramide.

UNIT-II

Nuclear Magnetic Resonance Spectroscopy:- Introduction to Nuclear Magnetic Resonance, Chemical shift, Mechanism of electron shielding and factors contributing to the magnitude of chemical shift, Nuclear overhausser effect, Double resonance, Chemical exchange, Lanthanide shift reagents and NMR spectra of paramagnetic complexes. Experimental technique(CW and FT).

Stereochemical non-rigidity and fluxionality: Introduction, use of NMR in its detection, its presence in trigonal bipyramidal molecules(PF5), Systems with coordination number six (Ti(acac)2Cl2, Ti(acac)2Br2, Ta2(OMe)10,).

UNIT-III

Nuclear Quadrupole Resonance Spectroscopy: Basic concepts of NQR (Nuclear electric quadrupole moment, Electric field gradient, Energy levels and NQR frequencies), Effect of magnetic field on spectra, Factors affecting the resonance signal (Line shape, position of resonance signal) Relationship between electric field gradient and molecular structure. Interpretation of NQR data, Structural information of the following: PCl5, TeCl4, Na+GaCl4 -, BrCN, HIO3 and Hexahalometallates

Mössbauer Spectroscopy: Introduction**,** Principle, Conditions for Mössbauer Spectroscopy, parameters from Mössbauer Spectra, Isomer shift, Electric Quadrupole Interactions, Magnetic Interactions MB experiment, Application of MB spectroscopy in structural determination of the following:
i) High spin Fe (II) and Fe (III) halides FeF_2, $FeCl_2.2H_2O$, FeF_3, $FeCl_3.6H_2O$. Low spin Fe(II) and Fe(III) Complexes-Ferrocyanides, Ferricyanides, Prussian Blue.
ii) Iron carbonyls. $Fe(CO)_5$, $Fe_2(CO)_9$ and $Fe_3(CO)_{12}$
iii) Inorganic Sn(II) and Sn(IV) halides.

UNIT-IV
Electron Spin Resonance Spectroscopy:-. Introduction, Similarities between ESR and NMR,Behaviour of a free electron in an external Magnetic Field, Basic Principle of an Electron Spin 30 Resonance Spectrometer, Presentation of the spectrum, Hyperfine coupling in Isotropic Systems (methyl, benzene and Naphthalene radicals). Factors affecting the magnitude of g-values. Zero field splitting and Kramer's Degeneracy, Line width in solid state ESR, Double resonancetechnique in e.s.r. (ENDOR) Experimental method. Applications of ESR to the following:

1. Bis-Salicylaldiimine - Copper –II
2. $CuSiF_6.6H_2O$ & $(NH_3)_5Co\text{-}O.Co(NH_3)_5$

Books Recommended:
1. Physical methods in Inorganic Chemistry - R.S.Drago.
2. Modern Optical methods of Analysis - Eugens D.Olsen
3. Infrared spectra of Inorganic and coordination compounds - Kazuo Nakamoto
4. Introduction to Chemistry –Donald L.Pavia and G.M.Lampman.
5. Fundamentals of Molecular Spectroscopy-C.N.Banwel
6. Spectroscopy in Inorganic Chemistry - Rao & Ferraro Vol I & II
7. Advances in Inorganic and Radiation Chemistry Vol 6 & 8.
8. Quarterly reviews Vol 11 (1957)
9. Progress in Inorganic Chemistry Vol 8
10. Organic Spectroscopy-W. Kemp

SEMESTER-IV
(COURSE –XXV)
(INORGANIC CHEMISTRY SPECIAL THEORY - IV)
(BIO-INORGANIC AND SUPRAMOLECULAR CHEMISTRY)
AUMCH2-25
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

(a) Metalloporphyrins: (ref. Books No. 1,5,6)**:** Porphyrins and their salient features, characteristic absorption spectrum of porphyrins, chlorophyll (structure and its role in photosynthesis). Transport of Iron in microorganisms (sidrophores), types of siderophores (catecholate and Hydroxamato siderophores).

(b) **Metalloenzymes**: (Ref. Book No. 1,2)**:** Definitions: Apoenzyme, Coenzyme, Metalloenzyme, structure and functions of carbonic anhydrase A & B, carboxy peptidases.

UNIT-II

Oxygen Carriers:

a) ***Natural oxygen carriers:*** Structure of hemoglobin and myoglobin, Bohr effect, Models for cooperative interaction in hemoglobin, oxygen Transport in human body (-perutz machanism), Cyanide poisoning and its remedy. Non-heme protiens (Hemerythrin & Hemocyanin).

b) ***Synthetic oxygen carriers:*** Oxygen molecule and its reduction products, model compounds for oxygen carrier (Vaska's Iridium complex, cobalt complexes with dimethyl glyoxime and schiff base ligands).

UNIT-III

Transport and storage of metals: The transport mechanism, transport of alkali and alkaline earth metals, ionophores, transport by neutral macrocycles and anionic carriers, sodium/potassium pump, transport and storage of Iron (Transferrin & Ferritin).

Inorganic compounds as therapeutic Agents):- Introduction chelation therapy, synthetic metal chelates as antimicrobial agents, antiarthritis drugs, antitumor, anticancer drugs (Platinum complexes), Lithium and mental health.

UNIT-IV

Supramolecular Chemistry : Introduction, Some important concepts, Introduction to Recognition, information and complementarity, Principles of molecular receptor designs, Spherical recognition (cryptates of metal cations) Tetrahedral recognition by macrotricyclic cryptands, Recognition of ammonium ions, Recognition of neutral molecules and anionic substrates (anionic coordination)

Books Recommended:

1. The Inorganic Chemistry of Biological processes - M.N.Hughes.
2. Bio Inorganic Chemistry - Robert Wittay
3. Advanced Inorganic Chemistry (4th Edn) - Cotton and Wilkinson.
4. Topics in current chemistry (Inorganic Biochemistry) vol. 64 (1976) – Davison and Coworkers.
5. An Introduction to Biochemcial Reaction Mechanism - James N.Lowe and Lloyalt Ingraham.
6. General Biochemistry - Fruton J.S. and Simmonds S.
7. Plant Physiology - Robeert N.Devtin.
8. Inorganic chemistry – James E. Huheey.
9. Supramolecular Chemistry (Concepts and Perspectives) - Jean Marie Lehn(VCH-1995).

SEMESTER-IV
(COURSE –XXVI)
(ORGANIC CHEMISTRY SPECIAL THEORY - II)
(SYNTHETIC STRATEGIES)
AUMCH2-26
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Organic Reagents: Reagents in organic synthesis: Willkinson catalyst, Lithium dialkyl cuprates (Gilman's reagents), Lithium diisopropylamide (LDA), 1,3-Dithiane (Umpolung) Dicyclohexylcarbobiimide (DCC), and Trimethylsilyliodide, DDQ, SeO2, Baker yeast, Tri nbutyltinhydride, Nickel tetracarbonyl, Trimethylchlorosilane

.

UNIT–II

Oxidations: Introduction, Different oxidative process. Aromatiztion of six membered ring, dehydrogenation yielding C-C double bond, Oxidation of alcohols, Oxidation involving C-C double bond, Oxidative cleavage of ketones, aldehydes and alcohols, double bonds and aromatic rings, Ozonolysis, Oxidative decarboxylation, Bisdecarboxylation, Oxidation of methylene to carbonyl, Oxidation of olefines to aldehydes and ketones.

Reductions: Introduction, Different reductive processes. Reduction of carbonyl to methylene in aldehydes and ketones, Reduction of nitro compounds and oximes, Reductive coupling, bimolecular reduction of aldehydes or ketones to alkenes, metal hydride reduction, acyloin ester condensation, Cannizzaro reaction, Tishchenko reaction, Willgerodt reaction .

UNIT-III

Rearrangements: General mechanistic considerations-nature of migration, migratory aptitude, memory effects. A detailed study of the following rearrangements: Benzil-Benzilic acid, Favorskii, Arndt-Eistert synthesis, Neber, Backmann, Hofmann, Curtius, Schmidt, Benzidine, Baeyer- Villiger, Shapiro reaction, Witting rearrangement and Stevens rearrangement.

UNIT-IV

Disconnection Approach: An introduction to synthons and synthetic equivalents, disconnection approach, functional group inter-conversions, the importance of the order of events in organic synthesis, one group C-X and two group C-X disconnections, chemoselectivity, reversal of polarity cyclisation reactions, amine synthesis. Protecting Groups: Principle of protection of alcohol, amine, carbonyl and carboxyl groups.One Group C-C Disconnection: Alcohols and carbonyl compounds, regioselectivity. Alkene synthesis, use of acetylenes in organic synthesis.

Books Recommended:

1. Designing Organic Synthesis, S. Warren, Wiley.
2. Organic Synthesis- Concept, Methods and Starting Materials, J. Fuhrhop and G. Penzillin, Verlage
VCH.
3. Some Modern Methods of Organic Synthesis, W. Carruthers, Cambridge Univ. Press.
4. Modern Synthetic Reactions, H.O. House, W. A. Benjamin.
5. Advanced Organic Chemistry-Reactions Mechanisms and Structure, J. March, Wiley.
6. Principles of Organic Synthesis, R. Norman and J.M. Coxon, Blakie Academic and Professional.
7. Advanced Organic Chemistry Part-B, F.A. Carey and R. J. Sundburg, Plenum Press.
8. Organomettalic Chemistry-A Unified Approach, R.C. Mehrotra, A. Singh.

SEMESTER-IV
(COURSE –XXVII)
(ORGANIC CHEMISTRY SPECIAL THEORY - III)
(NATURAL PRODUCTS)
AUMCH2-27
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Terpenoids: Classification, nomenclature, occurrence, isolation, general methods of structure determination, isoprene rule. Structure determination, biosynthesis and synthesis of the following representative molecules: Monoterpenoids: Citral, geraniol (acyclic), α-terpeneol, menthol (monocyclic). Sesquiterpenoids: Farnesol (acyclic), zingiberene (monocyclic), santonin (bicyclic), Diterpenoids: Phytol and abietic acid.

UNIT- II

Carotenoids and Xanthophylls: General methods of structure determination of Carotenes: β-carotene, α- carotene, γ- carotene, lycopene and vitamin A. Xanthophylls: Spirilloxanthin, Capsorubin, Fucoxanthin. Carotenoid acids (Apocarotenoids): Bixin and Crocetin. Bio synthesis of carotenoids

UNIT-III

Alkaloids: Definition, nomenclature and physiological action, occurrence, isolation, general methods of structure elucidation, degradation, classification based on nitrogen heterocyclic ring, role of alkaloids in plants. Structure, synthesis and biosynthesis of the following: Ephedrine, Coniine, Nicotine, Atropine, Quinine and Morphine.

Steroids: Occurrence, nomenclature, basic skeleton, Diel's hydrocarbon and stereochemistry. Isolation, structure determination and synthesis of Cholesterol, Androsterone, Testosterone, Estrone, Progestrone. Biosynthesis of steroids

UNIT-IV

Plant Pigments: Occurrence, nomenclature and general methods of structure determination. Isolation and synthesis of Anthocyanins (Cyanin and pelargonidin), polyphenols: Flavones (chrysin), Flavonols (quercitin) and isoflavones (daidzein) coumarin, Quinones (lapachol), Hirsutidin. Biosynthesis of flavonoids: Acetate pathway and Shikimic acid pathway.

Books Recommended:

1. Natural Products- Chemistry and Biological Significance, J. Mann, R.S. Davidson, J. B. Hobbs, D.V. Banthrope and J. B. Harborne, Longman, Essex.
2. Organic Chemistry Vol. II, I.L. Finar, ELBS.
3. Stereo selective synthesis- A Practical Approach, M. Nogradi, VCH.
4. Rodd's Chemistry of Carbon Compounds, Ed. S. Coffey, Elsevier.
5. Chemistry, Biological and Pharmacological Properties of Medicinal Plants From the Americas, Ed.
Kurt Hostettmann, M.P. Gupta and A. Marston, Harwood Academic Publishers.
6. Introduction to Flavonoids, B.A.Bohm, Harwood Academic Publishers.

SEMESTER-IV
(COURSE –XXVIII)
(ORGANIC CHEMISTRY SPECIAL THEORY - IV)
(MEDICINAL CHEMISTRY)
AUMCH2-28
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT-I

Drug Design: Development of new drugs, procedures followed in drug design, concepts of lead compound and lead modification, concepts of prodrugs and soft drugs, structure-activity relationship (SAR), factors affecting bioactivity, resonance, inductive effect, isosterism bioisosterism, spatial considerations. Theories of drug activity: occupancy theory, rate theory, induced fit theory. Quantitative structure activity relationship. History and development of QSAR. Concepts of drug receptors. Elementary treatment of drug receptor interactions. Physico-Chemical parameters: lipophilicity, partition coefficient, electronic ionization constants, steric, Free-Wilson analysis, Hansch analysis relationships between Free-Wilson and Hansch analysis.

UNIT-II

Pharmacokinetics and Pharmacodynamics: Pharmacokinetics: Introduction to drug absorption, disposition, elimination using pharmacokinetics. Important pharmacokinetic parameters in defining drug disposition and in therapeutics. Mention of uses of pharmacokinetics in drug development process.

Pharmacodynamics: Introduction, elementary treatment of enzyme stimulation, enzyme inhibition, sulphonamides, membrane active drugs, drug metabolism, xenobiotics, biotransformation. Significance of drug metabolism in medicinal chemistry.

UNIT-III

Antibiotics and Antiinfective Drugs: Antibiotics: Structure, SAR and biological action of antibiotics. Examples: penicillin: penicillin G, penicillin V, ampicillin, amoxycillin, chloramphenicol, cephalosporin, tetracycline and streptomycin.Sufonanmides: Structure, SAR and mode of action of sulfonamides, sulfonamide inhibition and probable mechanisms of bacterial resistance to sulfonamides. Examples: sulfodiazine, sulfofurazole, acetyl sulfafurazole, Sulfagnanidine, Phthalylsulfo acetamide, Mafenide. Sulphonamide related compounds Dapsone. Local antiinfective drugs: Introduction and general mode of action. Examples: sulphonamides, furazolidone, nalidixic acid, ciprofloxacin, norfloxacin, chloroquin and primaquin

Psychoactive Drugs: Introduction, neurotransmitters, CNS depressants and stimulants. SAR and Mode of actions. Central Nervous System Depressant: General anaesthetics. Sedatives & Hypnotics: Barbiturates and Benzodiazepines. Anticonvulsants: Barbiturates, Oxazolidinediones, Succinimides, Phenacemide and Benzodiazepines. Psycotropic Drugs: The neuroleptics (Phenothiazines and butyrophenones), antidepressants (Monoamine oxidases inhibitors and Tricyclic antidepressants) and anti-anxiety agents (Benzodiazepines). Central Nervous System Stimulants: Strychnine, Purines, Phenylethylamine, analeptics, Indole ethylamine derivatives,

UNIT-IV

Therapeutic Agents, SAR and Their mode of Actions: Antineoplastic Agents: Cancer chemotherapy, role of alkylating agents and antimetabolites in treatment of cancer. Mention of carcinolytic antiobiotics and mitotic inhibitors. Biological action of mechlorethamine, cyclophosphamide, melphalan, uracil, and 6-mercaptopurine. 35 Cardiovascular Drugs: Antihypertensive and hypotensive drugs, antiarrrhythemic agents, vasopressor drug Direct acting arteriolar dilators. Biological action of methyldopa, propranolol hydrochloride, amyl nitrate, sorbitrate, verapamil, Atenolol. Antihistaminic agents: Ethylene diamine derivatives, amino alkyl ether analogues, cyclic basic chain analogues. Antifertility agents: General antifertility agents. Diuretics: Mercurial diuretic, Non mercurial diuretics (Thiazides, carbonic-anhydrase inhibitors, xanthine derivatives, pyrimidine diuretics and osmotic diureteics

Books Recommended:

1. An Introduction to Medicinal Chemistry, Graham L. Patrick.
2. Medicinal Chemistry: Principles and Practice Edited by F.D. King.
3. Textbook of Organic Medicinal and Pharmaceutical Chemistry, Edited by Charles O. Wilson, Ole
Gisvold, Robert F. Doerge.
4. Introduction to Medicinal Chemistry, Alex Gringuage.
5. Principles of Medicinal Chemistry, William O. Foye, Thomas L. Lemice and David A. Williams.
6. Introduction to Drug Design, S.S. Pandeya and J. R. Dimmock, New Age International.
7. Burger's Medicinal Chemistry and Drug Discovery, Vol-1 (Chapter-9 and Ch-14), Ed. M.E. Wolff,
John Wiley.
8. Goodman and Gilman's Pharmacological Basis of Therapeutics, Mc Graw-Hill.
9. The Organic Chemistry of Drug Design and Drug Action, R.B. Silverman, Academic Press.
10. Strategies for Organic Drug Synthesis and Design, D. Lednicer, John Wiley.

SEMESTER-IV
(COURSE –XXIX)
(ORGANIC CHEMISTRY SPECIAL THEORY - V)
(POLYMER CHEMISTRY)
AUMCH2-29
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT -I

Polymers: Macromolecular Concepts, Importance of polymers, Chemical and geometrical structure of polymers, Polymerization: Chain polymerization, step growth polymerization, electrochemical, metathetical polymerization, group transfer polymerization, co-ordination. Concept of copolymerization, copolymer equation, reactivity ratio, Alfrey-price scheme, Polymerization techniques, Kinetics of chain and step growth polymerization.

UNIT- II

Stereoisomerism in Polymers: Types of stereoisomerism in polymers, Monosubstituted ethylenes (Site of steric isomerism, Tacticity), Disubstituted ethylenes (1,1-disubstituted ethylenes, 1,2- disubstituted ethylenes), 1,3- Butadiene and 2-Substituted 1,3-Butadienes (1,2- and 3,4- Polymerizations, 1,4-Polymerizations), 1- Substituted and 1,4- Disubstituted 1,3-Butadienes (1,2- and 3,4- Polymerizations, and 1,4- Polymerizations). Stereoregular polymers: Significance of stereoregularity (isotactic, syndiotactic, and atactic polypropenes), Cis- and trans-1,4-poly-1,3- dienes, Cellulose and amylose. Coordination polymerization: Ziegler Natta catalyst.

UNIT- III

Structure and Properties of Polymers: Morphology and order in crystalline polymersconfigurations of polymer chains. Crystal structures of polymers. Strain-induced morphology, crystallization and melting. Polymer structures and physical properties-crystalline melting point, Tm- melting points of homogeneous series, effect of chain flexibility and other steric factor, entropy and heat of fusion. The glass transition temperature, Tg, relationship between Tm and Tg, Effect of molecular weight, diluents, chemical structure, chain topology, branching and cross linking. Property requirement and polymer utilization.

Polymer Characterization: Average molecular weight concept. Number, weight and viscosity average molecular weights. Polydispersity and molecular weight distribution. The practical significance of molecular weight. Measurement of molecular weights. End group, viscosity, light scattering, osmotic and ultra centrifugation methods. Analysis and testing of polymers-chemicalanalysis, spectroscopic methods, thermal Analysis, XRD and SEM.

UNIT-IV

(A) Commercial Polymers: Polyethylene, Polyvinyl chloride, Polyamides, Polyesters, phenolic resins, epoxy resins and silicone polymers. Functional polymers-Fire retarding polymers and electrically conducting polymers.

(B) Supramolecular polymer chemistry: Supramolecular polymer chemistry: Generation of hydrogen bonded supramolecular molecules polymers and liquid crystals, Basic features of supramolecular polymers, Supramolecular polymers as supramolecular materials. Supramolecular low molecular weight complexes (Liquid-crystalline complexes and nonliquid – crystallne complexes. Supramolecular side chain polymers (Liquid-crystalline polymeric complexes and nonliquid -crystallne polymeric complexes). Functionalization of complexes. Nanochemistry: Basic concepts and Applications.

Books Recommended:

1. Molecular Mechanics, U. Burkert and N.L. Allinger, ACS Monograph 177, 1982.
2. Organic Chemist's Book of Orbitals. L. Salem and W.L. Jorgensen, Academic press.
3. Mechanism and Theory in Organic Chemistry, T.H.Lowry and K.C. Richardson, Harper and Row.
4. Introduction to Theoretical Organic Chemistry and Molecular Modeling, W.B. Smith, VCH, Weinheim.
5. Physical Organic Chemistry, N.S. Isaacs, ELBS/Longman.
6. Supramolecular Chemistry; Concepts and Perspectives, J.M. Lehn, VCH.
7. The Physical Basis of Organic Chemistry, H.Maskill, Oxford Univ. Press.
8. Textbook of Polymer Science, F.W. Billmeyer Jr. Wiley.
9. Polymer Science, V.R. Gowarikar, N.V. Visvanathan and J. Sreedhar, Wiley Eastern.
10. Functional Monomers & Polymers, K. Takemoto, Y. Inaki and R.M. Ottanbrite.
11. Contemporary Polymer Chemistry, H.R. Alcock and F.W. Lambe, Prentice Hall.
12. Physics & Chemistry of Polymers, J.M.G. Cowie, Blakie Academic and Professional.

SEMESTER-IV
(COURSE –XXX)
(PHYSICAL CHEMISTRY SPECIAL THEORY - II)
(ADVANCED QUANTUM CHEMISTRY)
AUMCH2-30
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT - I

Time – independent perturbation theory for non – degenerate states (first order correction to energy and wave function), and its application to particle in a one – dimensional box, ground state helium atom (without spin consideration) and perturbed harmonic – oscillator. Variational method: theory and application to ground state hydrogen and helium atoms and one – dimensional oscillator.

UNIT - II

Theory of time – dependent quantum approximation technique. Fermi Golden Rule. Radiation – Matter interaction (induced emission and absorption of radiation). Einstein's transition probabilities. Determination of selection rules in respect of rigid rotation and harmonic – oscillator approximation.

UNIT - III

Quantum – mechanical of multielectron atoms: Hartree self – consistent method. Hartree – Fock self – Consistent (HFSCF) method. Rootham's method. Correlation energy (CE) and configuration interaction (CI). Koopmann's theorm. Basic idea of Density Functionla Theory (DFT): Kohn – Sham equation.

Quantum – mechanical treatment of diatomic molecules: The Born Oppenheimer approximation and its formulation. The valence – bond treatment of a hydrogen molecule. Heitler – London treatment and ionic contribution. Molecular Orbital Theory (MOT) of H2 +. MOT with configuration interaction (CI). Hybridization (sp, sp2 and sp3) from a quantum – mechnical view – point.

UNIT –I V

Quantum – mechanical treatment of Π - electron systems. The Π - electron approximation . Free electron molecular orbital (FEMO) method and its application to polyenes. The Huckel – Molecular Orbital Theory (HMOT) for conjugated hydrocarbons and cyclic conjugated systems. Huckel calculations for ethylene, allyl systems, cyclobutadiene and benzene. Calculation of electron density, charge distribution and bond orders.

Books Recommended:

1. Quantum Chemistry An Introduction: H.L. Strauss
2. ntroductory Quantum Chemistry: A.K. Chandra
3. Quantum Chemistry: D.A. McQuarri
4. Quantum Chemistry: I.N. Levine
5. Molecular Quantum Mechanics: P.W. Atkins
6. Elementary Quantum Chemistry: F.L. Pilar
7. Introductory Quantum Chemistry: S.R. LaPaglia
8. Fundamental Quantum Chemistry: T.E. Peacock

SEMESTER-IV
(COURSE –XXXI)
(PHYSICAL CHEMISTRY SPECIAL THEORY - III)
(SOLID STATE CHEMISTRY)
AUMCH2-31
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT - I

X- ray diffraction: Indexing of powder and crystal photographs. Determination of Bravais lattice, point group and space group. Determination of space group with examples. Electron diffraction: The scattering of electron by gases (Wierl equation), visual method, radial distribution method and applications. Neutron diffraction: Introduction, differences between neutron and X- ray diffraction. Application to structure modification and magnetic compounds.

UNIT - II

Bonding in crystals: Ionic crystals, lattice energy of ionic crystals, metallic crystals. Band theory. Imperfections: Point defects (Schottky and Frankel defects). Thermodynamic derivation of these defects. Theories of Bonding: Free electro theory; quantum approach, Fermi – Dirac statistics. Zone theory: quantum approach, allowed energy zones , Brillioun zones, k – space, Fermi surfaces and density states.

Properties of crystals: Electrical properties of metals; conductors and non – conductors, conductivity in pure metals. Hall effect. Thermal properties: Theories of specific heat. Electrical properties of semiconductors: Band theory, intrinsic and extrinsic semiconductors. Electrons and holes. Temperature dependence and mobility of charge carriers. Optical properties: Absorption spectrum, photoconductivity, photovoltaic effect and luminescence. Refraction Birefringence and color centre. Dielectric properties: Piezoelectricity, Rerro electricity, Ionic conductivity and electric breakdown.

UNIT – III

Superconductivity: Experimental survey, occurrence of superconductivity, destruction of superconductivity by magnetic fields (Meissner effect). Thermodynamic effects of superconducting species (entropy, thermal conductivity and energy gap). Quantum tunnling. Theoretical survey (thermodynamics of superconducting transition, London equation, coherence length). BCS theory of superconductivity.

UNIT – IV

Solid State Reactions: General principles: experimental procedures, kinetics of solid state reactions, vapour phase transport methods, interaction or ion exchange reaction, electrochemical reduction methods, preparation of t5his films, growth of single crystal, high pressure and hypothetical method.

Books Recommended:

1. Introduction to Solids: Azaroff
2. Solid State Chemistry and its applications: West
3. Solid State Chemistry: Charkrabarty
4. Solid State Chemistry: N.B. Hannay
5. Solid State Physics: Kiittal

SEMESTER-IV
(COURSE –XXXII)
(PHYSICAL CHEMISTRY SPECIAL THEORY - IV)
(BIOPHYSICAL CHEMISTRY)
AUMCH2-32
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus.

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT – I

Cell membrane and its structure: The Cell Membrane, lipids in biological membranes, types and arrangements of proteins in membranes, lipo proteins. Danielli and Davson model, Fluid Mosaic Model, permeability of cell membrane. Bio-Energetics: Thermodynamic Considerations: standard free energy change in bio-chemical reactions, exergonic, endergonic reactions, hydrolysis of ATP and its synthesis from ADP.

UNIT – II

Thermodynamics of Biopolymers Solutions: osmotic pressure, membrane equilibrium, muscular contraction and energy generation in mechanochemical system. Statistical mechanics in biopolymers chain configuration of macromolecules, statistical distribution end – to – end dimensions, calculation of average dimensions for various chain structures. Polypeptide and protein structures and protein folding.

UNIT – III

Mechanism of Membrane Transport: Transport through cell membrane, active and passive transport systems, Ping - pong mechanism for transport of diffusion, Macromolecules across the Plasma Membrane, Role of Intercellular spaces in transport process, Homocellular, Transcellular, Intracellular transport, Irreversible thermodynamic treatment of membrane transport. Nerve conduction, Donnan effect in Osmosis, its dependence on pH difference across the membrane. Semipermeable membrane and Donnan membrane equilibrium.

UNIT – IV

Biomolecular Interactions: Interactions between biomolecules (proteins), Interaction of biomolecules with small ligands, independent ligand binding sites, the Scatchard plot, forces involved in the stability of proteins, hydrophobic interactions, hydrogen bonding, electrostatic interactions, electron delocalization, van der Waal's forces Scope of Genomics, proteomics and bioinformatics, ribosomes: Site and Function of protein synthsis.

Protein molecules: Protein sequence and structure (primary structure), secondary structure:α- Helix, β- Sheet, classification of proteins, torsion angles, tertiary structure, quarternary structure, Protein folding and refolding, computer simulation: thermodynamic-kinetic approach, statistical mechanics approach, Homolog Modelling, De Novo prediction, Protein misfolding, Biological factors (Chaperones) and chemical factors(Intra and intermolecular interactions) leading tfolding/refolding/misfolding. Brain diseases associated with it.

Books Recommended:

1. Physical Chemistry of Macromolecules: S.F.Sun
2. The Enzyme Molecules: W. Ferdinand
3. Outlines of Biochemistry: E.E. Conn and P.K. Stumph
4. Biochemistry: Zubay
5. Principles of Biochemistry: A.I. Leninger
6. Physical Biochemistry: D. Friefelder
7. iophysics: Volkenstein
8. Biophysical Chemistry (Vol. I-III): Schimell and Cantour

SEMESTER-IV
(COURSE –XXXIII)
(PHYSICAL CHEMISTRY SPECIAL THEORY – V)
(CHEMISTRY OF MACROMOLECULES)
AUMCH2-33
Credits-04 (L=3,T=1,P=0)

INSTRUCTIONS:- For Paper Setters:- The question paper will consist of five sections ,A,B,C,D will have two questions from the respective sections of the syllabus whereas section E will have single question covering the whole syllabus .

For Candidates:- Candidates are required to attempt five questions in all selecting one question from each of the sections A,B,C,D,E.

UNIT – I

The science of macromolecules, Importance of macromolecules / polymers, basic concepts of polymers viz. monomers, repeat units, degree of polymerization, classification of polymers on the basis of molecular weight and special arrangement viz. linear, branched and network polymers. Types of macromolecules (synthesized and natural), polymerization by condensation and addition reactions only. Molecular forces and chemical bonding in simple molecules and macromolecules and their effects on the physical properties. Polymer solutions, criteria for polymer solubility, conformations of dissolved polymer chains. Different models for describing the size and shape of dissolved macromolecules, configuration and conformation of macromolecules.

UNIT – II

Thermodynamics of polymer solutions, thermodynamics of simple liquid mixtures, ideal solutions, regular solutions, lattice model of solutions (Flory – Huggins Theory), Flory – Krigbaum theory for dilute polymer solutions. Phase separation in polymer solutions involving binary polymer – solvent systems, ternary systems and multi – component systems. Fractionation of polymers by different techniques, theory of swelling of cross – linked / network polymers.

UNIT – III

Measurements of molecular weights and size of macromolecules by osmotic pressure measurement, light scattering method, diffusion measurement, sedimentation and ultracentrifuge methods and viscosity methods. Molecular weights of macromolecules viz., number average and weight average molecular weights and related numerical problems.

Rheology and Mechanical Properties of Polymers: Brief introduction to rheology and mechanical properties of polymers, phenomena of viscous flow, kinetic theory of ribber elasticity, amorphous polymers and practical importance of their aggregation states, viscoelasticity (experimental and dynamic method), general mechanical models for an amorphous polymer, molecular structure and viscoelasticity. The glassy state and glass transition temperature. The mechanical properties of crystalline polymers.

UNIT – IV

1. **Mechanical strength of polymers:** Mechanical strength and life time of polymer mechanism of polymer fracture, effect of various factors on the mechanical properties of polymers (effect of size and shape, effect of fillers, effect of cross – linked density).

2. **Polyelevtrolytes:** The water soluble charged polymers and their applications. Ionomers (ion containg polymers) conducting polymers solid polymer electrolytes, mechanism of conductivity, polymer colloids and their applications in commercial and industrial formulations (adhesives, coating, paper, pharmaceutical and medical applications), polymer microgels, biomedical polymers. Polymers in combating environmental pollution and as chemical reagents.

Books Recommended:

1. Text Book of Physical Chemistry: G.M. Barrow
2. Text Book of Polymer Chemistry: Billmeyer
3. Polymer Chemistry: P.J. Flory
4. Physical Chemistry of Polymers: A Tagger
5. Physical Chemistry of Macromolecules: C. Tanford
6. Introduction to Polymer Science: V.R. Gowarikar, N.V. Vishwanathan and J. Sridhar
7. Principles of Polymer Science: P. Bhadur and N.V. Sastry

SEMESTER - IV
COURSE – XXXIV
(INORGANIC CHEMISTRY PRACTICAL - SPECIAL)
AUMCH2-34
Credits-09(L=0,T=0,P=18)

Preparation of the following compounds and a study of the important properties *viz*. Molar conductance, magnetic sussceptibility, electronic and infrared spectra.

1. Stannic iodide
2. Bis(acetylacetonate) oxovanadium (IV)
3. Tris (acetylacetonate) siliconchloride.
4. Mercuration of phenol.
5. Hexa ammine nickel (II) chloride.
6. Pyridine perchromate.

INSTRUMENTAL ANALYSIS:

(A) Conductometric Titrations:

i) Differential behaviour of acetic acid to determine the relative acid strength of various acids and basic strength of various bases.

ii) Strong acid-strong base titration in acetic acid.

B) **Potentiometric Titrations**.

1. *Neutralisation reactions*:

i) Sodium hydroxide-hydrolchloric acid.

ii) Sodium hydroxide-Boric acid

iii) Acetic acid and hydrochloric acid-sodium hydroxide.

2. *Oxidation-Reduction Reactions*.

i) Ferrous-dichromate

ii) Ferrous-Ceric

iii) Iodine-Thiosulphate

3. *Precipitation Reactions*:

i) Silver nitrate-sodium halides.

4. Complexation Reactions

i) Potassium cyanide-silver nitrate.

C) **Colorimetric Analysis:**

1) Verification of Beer's law for KMNO4, K2Cr2O7 solutions and determination of the conc. of KMNO4 K2Cr2O7 in the given solution.

2) Colorimetric determination of Iron (III) with potassium thiocyanate reagent or o-Phenanthroline method.

3) Determination of traces of manganese (in steel samples) colorometrically by oxidation to permanganic acid with potassium periodate.

4) Spectrophotometric determination of pK value of an indicator (acid dissociation constt. of methyl red)

(D) pH metric –titrations

1) Copper and cactechol

2) Copper and salicylic acid

3) Acid base titrations

4) Mixtures of acids with a base

E) Polarography:

1) Determination of half wave potentials of cadmium ion in potassium chloride solution.
2) Determination of half wave potentials of zinc and manganous ions in potassium chloride solution.
3) Determination of cadmium in solution
4) Investigation of the influence of dissolved oxygen.

(F) Amperometric Titrations:

1. Zinc with EDTA
2. Lead vs. chromate
3. Nickel as isoquilnoline thiocynate

(G) Flame Photometry:

1) Determination of sodium
2) Determination of potassium
3) Determination of calcium

H) Miscellaneous:

1. Determination of stability constants of complexes.
2. Determination of magnetic susceptibility of complexes
3. Estimation of periodate, iodate and bromate in the same solution.
4. Determination of bromide and chloride in the same solution.
5. Analysis of a solution containing chloride and iodide.

Books Recommended:

1. A Text Book of Quantitative Inorganic Analysis- A.I. Vogel
2. Chemistry Experiments for Instrumental Methods:- D.T. Sawyer, W.R. Heinemanand J.M. Beebe.
3. Inorganic Synthesis- R.A. Rowe and M.M. Jones (1957)5, 113 – 116.

SEMESTER - IV
COURSE – XXXV(B)
(ORGANIC CHEMISTRY PRACTICAL - SPECIAL)
AUMCH2-35
Credits-09 (L=0,T=0,P=18)

(A) Extraction of Organic Compounds from Natural Sources: Isolation of Caffeine from tea leaves, casein from milk (the students are required to try some typical color reactions of proteins), lactose from milk (purity of sugar should be checked by TLC and PC and Rf value reported). lycopene from tomatoes and β- carotene from carrots.

(B) Paper Chromatography: Separation and identification of the sugars present in the given mixture of glucose, fructose and sucrose by paper chromatography and determination of Rf values.

(C) Spectroscopy:
Identification of some organic compounds by the analysis of their spectral data (UV, IR, PMR, CMR and MS)
Multistep Synthesis
Synthesis of Vacor
Synthesis of Indigo
Synthesis of p- nitro aniline

Books Recommended:
4. Experiments and Techniques in Organic Chemistry, D.Pasto, C. Johnson and M.Miller, Prentice Hall.
5. Macroscale and Microscale Organic Experiments, K.L. Williamson, D.C.Heath.
6. Systematic Qualitative Organic Analysis, H.Middleton, Adward Arnold.
7. Handbook of Organic Analysis-Qualitative and Quantitative, H.Clark, Adward Arnold.
8. Vogel's Textbook of Practical Organic Chemistry, A.R. Tatchell, John Wiley.

SEMESTER - IV
COURSE – XXXVI (C)
(PHYSICAL CHEMISTRY PRACTICAL - SPECIAL)
AUMCH2-36
Credits-09 (L=0,T=0,P=18)

1. Viscosity Measurements: Verification of the Jones – Dole equation, determination of viscosity A and B – coefficients for simple electrolytes in water and in aqueous mixtures of organic solvents.

2. Conductometric Measurements: Kinetics of saponification of ethylacetate by NaOH. Solubility of sparingly soluble salts.

3. Potentiometric Titration: Titration of HCl with NaOH, determination of dissociation constant of acetic acid and phosphoric acid. Oxidation – reduction titration (ferrous ammonium sulphate with KMnO4 and K2Cr2O7).

4. Flamephotometric Measurements: Establishing the calibration plots for Na+ and K+ ions and determination of their concentration in the given solution at ppm level.

5. Determination of Molar Mass: Cryoscopic and Rasts's methods. Determination of molar mass of polymer by viscosity measurement.

6. Colometery Measurements: Determination of composition ferric ions – salicylicacid complex using Job's method.

7. Polarimetry Measurements: Determination of specific and molecular rotation, percentage of tow optically active substances, kinetics of acid catalysed inversion of cane sugar, comparison of strengths of two acids.

Books Recommended:

1. Senior Practical Physical Chemistry: B.D. Khosla, V.C. Garg and A. Khosla
2. Experimental Physical Chemistry: V. Athawale and P. Mathur.
3. Practical Physical Chemistry: B. Vishwanathan and P.S. Raghavan.
4. Practical in Physical Chemistry: P.S. Sindhu
5. Senior Practical Physical Chemistry: B.D. Khosla, V.C. Garg and A. Khosla

SEMESTER - IV
(COURSE – XXXVII)
(SEMINARS FOR ALL THREE SPECIALIZATIONS)
AUMCH2-37
Credits-02(L=0,T=0,P=06)

Every candidate will have to deliver a seminar of 30 minutes duration on a topic (not from the syllabus) which will be chosen by him / her in consultation with the teacher of the department. The seminar will be delivered before the students and teachers of the department. A three member committee (one coordinator and two teachers of the department of different branches) duly approved by the departmental council will be constituted to evaluate the seminar. The seminar will be evaluated as per the seminar assessment format given below.

Seminar Assessment Format.

Sr. No.	Name of the Student	Class	Regd. No.	Topic	Topic Contents	Knowledge of the topic	Presentation	Answers to questions	Average	Remarks.

Signature of Assessing Authority

Ph. D Zoology

Duration: **2** Semesters.

Eligibility: M.Sc. in Zoology and having 55% marks (50% for SC/ST) in post Graduation.

Semester- I

Course Code	**Name of Course**	**Internal Assessment Marks**	**End Semester Marks**	**Total marks**	**Credits**
AUZooMP 101	Techniques in Biological Research	40	60	100	4
AUZooMP 102	Recent advances in Zoology	40	60	100	4
AUZooMP 103	Specialization paper	40	60	100	4
AUZooMP 104	Research and Publication ethics	40	60	100	2
	Total Marks	160	240	400	14

Semester- II

Thesis			150	12
Viva voce			50	2
Total Marks (Semester I & II)			**600**	**28**

Note: End Semester Theory Examination
Attempt FIVE questions in all. Question No.1 is compulsory of 20 marks with short - type answers covering the whole syllabus. For others two questions will be set from each unit, one to be attempted. Maximum marks for each theory paper will be 60 and time 3 hours. M.Phil. theory course is same for Ph. D students also who need to undertake theory course as per regulations.

AUZooMP 101- TECHNIQUES IN BIOLOGICAL RESEARCH

UNIT-I

Basic concepts of research: Method of writing Dissertation, Preparation of Abstract, Collecting information for Introduction and definition of the research problems- development and standardization of materials and methods. Defining and formulation of research problem- literature collection using internet and journals- way of interpretation of references cited in the Thesis/ dissertation. Data collection technique Selection of problem- stages in execution of research; preparation of Manuscript for journals

UNIT-II

Laws of photometry, Kinds of photometers-colorimeters, spectrophotometers, single/double beam instrument. Principle of electrophoresis, Agarose gel electrophoresis and its limitations, Polyacrylamide gel electrophoresis, Determination of molecular weights by electrophoresis, Isoelectric Focusing (IEF) and 2-D gel electrophoresis, Western blotting, Northern blotting and Southern blotting. Differences between light and Electron Microscope, Specimen block preparation for Transmission Electron Microscopy, Staining for ultrathin sections, Specimen preparation for scanning Electron Microscopy, Negative staining, Freeze – fracture Etching technique

UNIT-III

Principles of adsorptions, Partition, ion exchange and molecular sieve chromatography Paper chromatography, Thin layer chromatography, column chromatography, gas chromatography, high performance liquid chromatography, ion exchange chromatography, their analytical uses and applications. Principle of Centrifugation, Types of Centrifuges (low speed, high speed and ultracentrifuges) Types of centrifugations (Rate, Density gradient- Isopycnic centrifugation). Preparative and analytical ultracentrifugation

UNIT-IV

Radiotracers, isotopes and applications of tracer techniques Autoradiography: Principle, techniques and applications of autoradiography. Principles, methods and importance of histochemistry in Biological research Historical perspective, Principles of fixation, types of fixative and their application. Radial immunodiffusion, double diffusion, Immunoelectrophoresis, Radioimmunoassay, Haemagglutination, Enzyme Linked Immunosorbent assay (ELISA), Immunofluorescence, Western blotting and Migration inhibition factor assay.

Suggested Reading Materials:

- Wilson, K. And Walker, J (1994), Practical Biochemistry: Principles and Techniques. Cambridge University Press, Cambridge.
- Freiflder, D. (1982), Physical Biochemistry: Applications to Biochemistry and Molecular Biology, WH Freeman and Company, San Francisco.
- Gupta, M. N. (2002), Methods for Affinity- Based separations of Enzymes and Proteins.

- Kelly, R. A. (1971), the use of English for technical students, second edition. ELBS, London.
- Skoog, D. A. (1985), Principles of Instrumental Analysis, 3rd Edition, Saunders College Publishing, New York.
- Kuby, Immunology. W.H. Freeman, USA.
- Paul, W. Fundamentals of Immunology.
- Roitt, I.M. Essensial Immunology. ELBS edition

AUZooMP 102: RECENT ADVANCES IN ZOOLOGY

UNIT-I
Origin and evolution of life
Theories of evolution
Evolutionary time scale
Evolution of man

UNIT-II
Trends in global and Indian aquaculture
Culture of Pearl oyster and pearl production
Integrated Multi Tropic Aquaculture (IMTA)
Recirculation aquaculture system, Sewage fed farming

UNIT-III
Role of insects in Human society for development of Human culture Aspects include health, food production and storage.
Introduction of honey bee biology
Economic importance and control strategies for arthropod pests

UNIT-IV
Zoogeography: Introduction, Speciation and Dispersal
Island Biogeography
Diversity and Diversity gradients
Continental drift and Glaciation

Suggested Reading Materials:

- Origin of Species (1859) by Charles Darwin.
- What Evolution is (2002) by Ernst W. Mayr.
- Principles of Zoology by Hickmann and Hickmann.
- Evolution: The modern synthesis. Julian Huxley.
- H.D. Kumar: Sustanibility & Management of Aquaculture & Fisheries.
- Arugun & Natarajan: Fresh water Aquaculture.
- The Insect-Structure and Function. - by R.F. Chapman.
- Imm's General Text Book of Entomology –by O.W. Richards and R.G. Davies.
- The Insect an outline of Entomology- by P.G. Gullan and P.S. Cranston.
- Carter, G. A. (2004) Beekeeping, Biotech Books, New Delhi.
- Brewer, R. (1994), The science of Ecology, Saunders College of Publishing, New York.
- Beeby, A. (1992), Applying Ecology Chapman and Hall Madras.
- Putmann, R. J. and Wratten, S. D. (1984), Principles of Ecology, Crown Helm, London.

AUZooMP 103 - ADVANCED TOPICS IN PARASITOLOGY

UNIT-I

Pathogenesis due to protozoan and helminth parasites

In vitro culture

UNIT-II

Physiology of helminth parasites (a) feeding, nutrition (b) carbohydrate, lipid and protein metabolism (c) electron transport

Biology of egg and hatching mechanisms in helminth parasites

UNIT-III

Infective stages and variation in life cycles of helminths

Exsheathing mechanism in parasites

UNIT-IV

Identification of helminth parasites

(a) Characters of taxonomic importance
(b) Problems in speciation in dioecious parasites
(c) Rules of zoological nomenclature

Adaptations of parasitism

Suggested Reading Materials:

- Cheng, T.C., General Parasitology, 2nd ed. Academic Press, College Division, London (1986).
- Noble, E.R. and Noble, G.A., Parasitology : The Biology of Animal Parasites V-edition, Lea & Febiger, Philadelphia (1982).
- Chatterjee, K. D., Parasitology: Protozoology and Helminthlogy, 13th ed., CBS publishers and distributors Pvt Ltd (2009)
- James, M.T. and Harwood, R.F., Herins's Medical Entomology, 6th ed., Collier Macmillan Canada Ltd., Don Mills, Qutario, (1969).

AUZooMP 103 - ADVANCED TOPICS IN ENDOCRINOLOGY

UNIT-I
Hormonal control of feeding behaviour
Gastrointestinal tract functioning
Blood – testis barrier

UNIT-II
Steroid hormone receptor interactions
Signal transductions
Biological aspects of vasectomy

UNIT-III
Autocrine, paracrine and Juxtacrine regulations of hormones
Pineal-hypothalmo-hypophyseal-gonadial axis and Circadian rhythms
Placental hormones and their significance

UNIT-IV
Stress physiology and adaptation
Prostaglandin structure, type, synthesis and biological activities
Genetic basis of hormonal disorders

Suggested Reading Materials:

- Hadley, M.E. Endocrinology
- Greep, R.O. Handbook of Physiology Vol. 6: Male Reproduction. American Physiological Society, Washington.
- Greep, R.O. Handbook of Physiology Vol. 7: Female Reproduction. American Physiological Society, Washington.
- Hall, J. E., Guyton and Hall Text Book of Medical Physiology, 12th edition, Saunders Company (2010)
- Rhoades, R.A. and Tanner, G.A., Medical Physiology, 2nd edition, Lippincott Williams and Wilkins (2003).
- Hoar, W.S. General and Comparative Physiology, Adaptation and Environment, 3rd edition, Cambridge University, Press (1985).
- Turner, C.D. and Bagnars, W.B., General Endocrinology, Saunders Company (1976).
- Golds Worthy, G.J. Robinson, J. and Mordue, W., Endocrinology, John Wiley and Sons, New York (1981)
- Bentley, P.J., Comparative Vertebrate Endocrinology, Cambridge Univ. Press (1998).

AUZooMP 103- ADVANCED TOPICS IN ENTOMOLOGY

UNIT I

Insect sociobiology:

Forms of social life, the organization of higher social communities of insects, mutual communication in search of food

UNIT II

Role of taxonomy, role of dichotomous keys, new frontiers in insect taxonomy

Insect toxicology: classification and mode of action of pesticides, Physiology of insecticidal resistance.

Unit III

Behavioral control: Principles of behavioural control, pheromones, allomones, kairomones. Pest management with pheromones. Hormonal control and chemosterilants.

UNIT IV

Diapause: Endocrine mediation of diapauses, significance of diapauses. Pests of stored products: internal feeders, external feeders, secondary pests and scavengers.

Suggested Reading Materials:

- Kapoor, V.C., Theory and Practice of Animal Taxonomy, 7th ed., Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi (2012).
- Peterson P.G., Elements of Insect Ecology, 1st ed., MEDTECH (2018).
- Chapman R. F., The Insects: Structure and function, 5th ed. Cambridge University Press (2013).
- Gour T.B. and Sriramulu, M., Insect Physiology: Principles and Concepts. 3rd revised ed., kalyani publishers, New Delhi (2017).
- Prakash A., Laboratory Manual of Entomology, 1st ed. New Age International Publishers (2001).
- Bland R.G. and Jaques H.E., How to know the Insects, 3rd ed., MEDTECH (2018)
- Abral D.P., Bees and Beekeeping in India, 2nd revised ed., Kalyani Publishers, New Delhi (2009).
- Ambrose D.P., The Insects: Beneficial and Harmful Aspects, Kalyani Publishers (2007).
- Atwal, A.S. and Dhaliwal G. S., Agricultural Pests of South Asia and Their Management, 5th ed., Kalyani Publishers, New Delhi (2005).
- Kumar and Nigam, Economic and Applied Entomology, Emkay Publications (1991).
- Matheson, R., Medical Entomology, Comstock Publishing Company, Inc. (1950).
- Metcalf and Metcalf, Destructive and Useful Insects, McGraw Hill Book Company, Inc. New York, Toronto, London (1951).

- David D., Integrated Pest Management, Chapman & Hall, London, New York, Tokyo, Madras (1995).
- House,S. J., Insect Pheromones and Their Use in Pest Management, Chapman & Hall, London, New York, Tokyo, Madras (1998).

RESEARCH AND PUBLICATION ETHICS

Name of Course	**Research and Publication Ethics**	
Course Code	**AURPE - 04**	
Total Credits	**04**	
Examination	**External**	**Internal**
Maximum Marks	**60**	**40**

Theory & Practice

Unit-I Philosophy and Ethics

Introduction to philosophy: Definition, nature and scope, concept, branches Ethics: definition, moral philosophy, nature of moral judgments and reactions. Publication Misconduct: Group discussions: subject specific ethical issues, FFP, authorship, conflicts of interest, complaints and appeals: example and fraud from India and abroad

Unit-II Scientific misconduct

Ethics with respect to science and research; Intellectual honesty and research integrity; scientific misconducts: falsification, fabrication, and plagiarism (FFP); redundant publications: duplicate and overlapping publications, salami slicing; selective reporting and misrepresentation of data. Software tools: Use of plagiarism software like Turnitin, Urkund, and other open access software tools.

Unit-III Publication Ethics

Definition, introduction and importance, Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest; publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types; violation of publication ethics, authorship and contributorship; identification of publication misconduct, complaints and appeals; Predatory publishers and journals. Databases and Research Metrics: Databases: Indexing databases, Citation databases, web of science, Scopus, etc.

Unit-IV Open access publications

Open access publications and initiatives; SHERPA/RoMEO online resources to check to check publisher copyright & self-archiving Policies; Software tool to identify predatory publications developed by SPPU; Journal finder/ journal suggestion tools viz. UGC care listed journal, Elsevier Suggested journal finder, Springer journal suggester, Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score; Metrics: h-Index, g-Index, i-10 index, Publons, Google Scholar etc.

References

Bird, A. (2006). *Philosophy of Science*. Routledge.

MacIntyre, Alasdair (1967) *A Short History of Ethics*. London.

P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865

National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.

Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1–10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179–179. https://doi.org/10.1038/489179a

Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance(2019), ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

Useful websites

1. https://shodhganga.inflibnet.ac.in/handle/10603/203204?mode=full
2. https://shodhgangotri.inflibnet.ac.in/
3. https://link.springer.com/
4. https://link.springer.com/books/a/1
5. https://www.elsevier.com/books-and-journals/elsevier
   https://www.emeraldgrouppublishing.com/our-services/authors/research-publishing-ethics

ABHILASHI UNIVERSITY

CHAIL CHOWK, TEHSIL CHACHYOT, DISTT. MANDI (H.P.)

FACULTY OF EDUCATION

Structure and Syllabus for Ph.D. Course work under Faculty of Education

With effect from the Academic Session 2017-18

(Subject to Change from time to time)

Courses of Study in Ph.D. (Course Work)

Sr. No.	Course Code	Name of the Course	Theory Marks	Internal Assessment Marks	Total Marks	Credits
1	**AUPHEDU-101**	**Philosophical and Social Foundations of Education**	60	40	100	4
2	**AUPHEDU-102**	**Methodology of Educational Research**	60	40	100	4
3	**AUPHEDU-103**	**Teacher Education**	60	40	100	4
4	**AURPE-04**	**Research and Publication Ethics**	60	40	100	2
TOTAL			240	160	400	14

INSTRUCTIONS:

1. <u>For Paper Setters</u>: The questions are to be fairly distributed within the Syllabus for Maximum Marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A shall contain four short compulsory questions selected from the entire syllabus carrying 3 marks each. Section B, C, D and E shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus.

2. <u>For Candidates:</u>

Section A includes four Short answer type questions and is compulsory. Attempt one question each from Section B, C, D and E.

COURSE-I (AUPHEDU-101)

PHILOSOPHICAL AND SOCIAL FOUNDATION OF EDUCATION

Course Objectives

- After the completion of this course the students will be able to describe the Philosophical Perspectives of Education.
- Understand Education as the discipline and the aims of Education, basic tenants of varying thoughts of Indian Philosophical Schools and their implication for improving the present system of Education in the country.
- To develop depth understanding about contemporary Indian Education system.
- To develop the knowledge about Indian thought and its contribution to educational practices
- To develop the knowledge about social change.
- To enable the students to understand the concept of Educational Sociology and Sociology in Education.

Unit 1. Education and Philosophy

Concept, Nature and Scope of Education and Philosophy, Relationship of Education and Philosophy, Indian and Western Concept of Education, Philosophical Analysis/Analytical meaning or salient features of Education, Education in the light of Pillars of Education, Aims of Education in Contemporary Indian Society, Characteristics of Philosophy and Branches of Philosophy: Metaphysics, Epistemology, Axiology, Logic and Aesthetics – their meanings, sub-branches and relevance for education. Education as the Dynamic side of Philosophy.

Unit 2. Contribution of Schools of Thought to Educational Practices

Ancient Indian, Buddhist, Medieval and Modern thoughts and its contribution to Education practices. Philosophical Schools of Thought: Idealism, Naturalism, Realism, Pragmatism, Existentialism- meaning, basic postulates/assumptions and educational implications for aims, curriculum, methods of teaching, concept of discipline, the role of teacher and institutional settings.

Unit 3. Indian Philosophy and Constitutional Provisions for Education

Systems of Indian Philosophy (Shad Darshan): Sankhya Philosophy, Nyaya Philosophy, Vaisesika Philosophy, Mimansa Philosophy and Vedanta Philosophy- their chief features, Metaphysics, Epistemology, Axiology and Observations. The Constitution of India, Preamble, Educational Provisions in Indian Constitution, Importance of the articles of the constitutions and their bearing on the National System of Education, Equal Opportunities in Education, access and reservation in Education, Meaning, Nature, Purposes and Analysis of Directive Principles of State Policy.

Unit 4. Sociological Basis of Education

Concept and Nature of Educational Sociology, Difference between Educational Sociology and Sociology of Education, Impact of Educational Sociology on Education and Relationship of Individuals to Society in terms of Norms given by Existing Social Order. Social Change, Factors Affecting Social Change, Role of Education in Social Change, Education as Instrument/Agent for Social Change and Role of Teacher in brining Social Change.

Suggested Readings:

Awasthi, J.P. and Sharma, Mani. (1988). Classical Indian Philosophies and their Practice in Education (First Edition). Agra: National Psychological Corporation.

Brubacher, J. S. (1962). Eclectic Philosophy of Education. New Delhi: Prentice-Hall Publication.

Brubacher, J. S. (1962). Modern Philosophies of Education. N.J. : Prentice-Hall Inc.-Egalewood Cliffs.

Brumbaugh, Robert S. & Lawrence, Nathaniel M. (1963). Philosophers on Education (Six Essays on the Foundations of Western Thought). Boston: Houghton Mifflin Company.

Cahan, Steven, M. (1970). The Philosophical Foundations of Education. USA: Harper Collins College, Div.

Chaube, S.P. and Chaube, Akhilesh (2013). Philosophical and Sociological Foundations of Education. Agra: Vinod Pustak Mandir.

Connor, D J O (1975). An Introduction to the Philosophy of Education. London: Routeledge & Kegan Paul.

Delors, J acques (2010). Learning: The Treasure Within (Second Edition). France: Published by UNESCO 7, Place de Fontenoy.

Delors, Jacques, (2010): Learning: The Treasure within (Second Edition), France:Published by UNESCO 7, Place de Fontenoy.

Gandhi, M.K. (1962). The Problem of Education. Ahmedabad: Navajivan Publishing House.

Ghanta, R. and Dash, B.N. (2006). Foundations of Education (First Edition), New Delhi: Neelkamal Publications PVT. LTD.

Gupta, S. (2007). Education in Emerging India (Second Edition), New, Delhi: Shipra Publications, Vikas Marg.

Jha, Arbind Kumar (2009). Constructivist Epistemology and Pedagogy (Insight into Teaching Learning and Knowing), New Delhi: Atlantic Publishers.

Jha, Arvind Kumar (2005). Nyaya Philosophy (Epistemology and Education). New Delhi: Standard Publishers.

Lavine, T.Z, (1985). From Socrates to Sartre: The Philosophic Quest (The Dramatic Survey that makes Philosophy a Force in our lives, our world, our visions), USA: A Bantam Book.

Magee, John B. (1971). Philosophical Analysis in Education. USA: Harper & Row, Publishers.

Morris L. Bigge, (1982). Educational Philosophies for Teachers, Charles E. Merrill USA: Publishing Company – A Bell & Howell Company.

Ozmon, Howard, A. and Craver, Samuel, M. (1990). Philosophical Foundations of Education, USA: (Fourth Edition), Columbus, Toronto, London, Melbourne, Merrill Publishing Company.

Ozmon, Howard, A. (2012). Philosophical Foundations of Education (Ninth Edition), USA: Pearson Education, Inc., 501 Boyliston Street, Suite 900, Boston, M.A, 02116, USA.

Pachaury, Girish. (2006): Udayman Bharatiye Samaj main Shikshak. Meerut: International Publishing House.

Pandey, K.P. (1983). Perspectives in Social Foundations of Education, Ghaziabad: Amitash Prakashan.

Pandey, K.P. (2005): Shiksha ke Darshnik Evam Samajik Aadhar (First Edition), Vranasi: Vishwavidhayalaya Prakashan, Chowk.

Pandey, Ramshakal, (2005): Teacher in Developing Indian Society, Agra: Vinod Pustak Mandir Dr. Rangeya Raghava Marg, Agra-2.

Pandey, Ramshakal, (2005). Udayman Bharatiye Samaj main Shikshak, Agra: Vinod Pustak Mandir, Agra-2.

Phillips, R.C. and Stalcup, R. J. (1968). Philosophic Systems and Education, USA: Charles E. Merrill Publishing Company, Columbus, Ohio, A Bell and Howell Company, USA.

Saxena, N.R. Swarup and Dutt, N. K. (2008). Philosophical and Sociological Foundation of Education, Meerut: Lal Book Depot.

Sharma, Santosh, (2006). Constructivist Approaches to Teaching and Learning (Hand Book for Teachers of Secondary Stage). New Delhi: National Council of Educational Research and Training.

Sinha, J.N. (2002. Introduction to Philosophy, Calcutta: New Central Book Agency.

Sri Aurobindo (1924). A System of National Education. Calcutta: Arya Publishing House.

Taneja, Vidya Ratna, (1998). Educational Thought and Practice. New Delhi: Sterling Publishers Pvt. Ltd.

Walia, J.S. (2012). Education in Emerging Indian Society (Edition 2012); Ahim Paul Publishers, N.N. 11, Gopal Nagar, Jalandhar City (Punjab).

Wingo, Max G. (1974). Philosophies of Education: An Introduction. New Delhi: Sterling Publishers Pvt. Ltd.

COURSE-II (AUPHEDU-102)
METHODOLOGY OF EDUCATIONAL RESEARCH.

Course Objectives

- After completion of this course the students will be able to understand the basics concept of Educational Research.
- Students will be able to understand various sampling techniques along with sampling errors.
- Students will be able to describe the various types of tools used in research along with their construction, validation, standardization and uses.
- Students will be able to describe the different methods of educational research.
- Students will be able to understand the characteristics of an experiment, concept of experimental designs and different types of experimental designs along with their merits and limitations.
- To make the students to understand the organization, analysis, interpretation and validation of qualitative data.
- Students will be able to understand the theory and computation involved in different types of quantitative data.
- To make the students to know different steps involved in writing a research proposal.

Unit 1. Basics of Educational Research

Concept, Scope, Types and Importance of Educational Research. Ethical Issues in Conducting Educational Research. Purpose and Sources of Review of Related Literature, Procedure of Writing Review of Literature. Research Problem: Selection, Formulation and Delimitations of the Research Problem and Characteristics of Good Research Problem.

Objectives and Hypotheses: Formulation, Significance and Types, Preparation of Research proposal.

Unit 2. Sampling and Data Collection

Concept of Population and Sample along with its types, Sampling, Sampling Unit. Sampling Frame, Sample Size, Techniques of Sampling, Characteristics of Good Sample, Sampling Errors and How to reduce them. Meaning and Characteristics of Good Research Tools, Standardization of Research Tools. Types and Uses of Research Tools (Questionnaire, Rating Scales, Attitude Scales, Observation Schedule and Interview Schedule), Administration of Tools.

Unit 3. Methods of Research

Historical Research: Meaning, nature, importance and steps involved Primary and Secondary Sources of Data, External and Internal Criticism of the data sources. Descriptive Research Method: Meaning, Importance, Steps and Types of Descriptive Research Studies (Survey Studies, Developmental Studies and Case Study). Experimental Research Method: Meaning, Importance, Steps and Components of Experimental research, Methods of Controlling of Extraneous Variables. Experimental Designs: One group Pre test- Post test design; Factorial Design (2x2); Quantitative Vs Qualitative Research, Ethnographical Research, Mixed Method Research, Interdisciplinary Approach to Educational Research.

Unit 4. Data Analysis and Preparation of Research Report

Tabulating Data, Ways of Organizing and Presenting Data, Validation and Interpretation of Qualitative Data. Content Analysis, Discourse Analysis, Documentary Analysis, Analysis of Observation Based and Interview based Data. Parametric and non parametric statistics. Concept of degrees of freedom, levels of significance and their use in interpretation of results. Non-parametric statistics such as Chi Square (χ^2). Univariate and Bivariate Analysis – Analysis of variance (One Way and Two Way Analysis of variance). Parameter Estimation, Correlation, Regression. Multivariate Analysis: Multiple Regression – Multiple R; Canonical R, Factorial MANOVA, MANCOVA. Steps in preparation of Research Report. Style of referencing in APA, Academic Paper Writing.

Suggested Readings:

Aggarwal, L.P. (2007). Modern Educational Research. New Delhi: Dominant Publishers and Distributers.

Best, J.W. & Kahan J.V. (2005). Research in Education. New Delhi: Prentice Hall of India Pvt. Ltd., 9th Edition.

Best, John W. (1995). Research in Education. New Delhi: Prentice Hall.

Bhandarkar, P.L., Wilkinson, T.S. & Laldas, D.K. (2004). Methodology and Techniques of Social Research. Mumbai: Himalayan Publishing House.

Cohen, Louis, Mansion, Lawrence & Morrison, Keith (2011). Research Methods in Education, 7th Edition. India: Cambridge University Press, Private Limited.

Creswell, John W. (2014) Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research, Fourth Edition. Delhi: PHI Learning Private Limited.
Garrette, Henry E. (1966). Statistics in Psychology and Education. Bombay: Vakils, Feffer and Simons Ltd.

George, Darren and Mallery, Paul. SPSS for Windows: Step by Step. New Delhi: Pearson.

Guilford, J. P. (1965). Fundamental Statistics in Psychology and Education. New York: McGraw Hill Book Co.

Gupta, S. P. (1999). Statistical Methods. New Delhi: Sultan Chand and Sons.

Keeves, John. P, (1998). Educational Research Methodology and Measurement. An International Hand Book, Oxford: Pergamon Press.

Kerlinger, C.R. (1986). Foundations of Behavioural Research, 3rd Edition, New York: Holt, Rinehart and Winston.

Kothari, C.R. (1998). Quantitative Techniques. New Delhi: Vikas Publishing House.

Radha, Mohan (2006). Research Methods in Education. Hydrabad: Neelkamal Publications Pvt. Ltd.
Koul, Lokesh, (2013). Methodology of Educational Research (4th Edition). New Delhi: Vikas Publishing House Pvt. Ltd.

Siddu, K.S. (2002). Methodology of Research in Education. New Delhi: Sterling Publications.

Singh, R, (2014). Research Methodology: A Step by Step Guide for Beginners, New Delhi: Sage Publication.

COURSE-III (AUPHEDU-103)

TEACHER EDUCATION

Course Objectives

- After completion of this course the students will be able to understand the concept and scope of Teacher Education in India with the Historical Perspectives.
- Understand the Concept, Development and Agencies of Teacher Education.
- Understand the Aims and Objectives of Teacher Education at Elementary and Secondary Levels.
- Understand the Recommendations of Various Commissions for Teacher Education and Role of NCTE.
- Understand the Different Teacher Education Programmes and their Utility.
- Understand the Current scenario of Teacher Education in India.
- Understand the Problems of Teacher Education in India.
- Understand the Issues, Problems and Innovative Practices in Teacher Education.
- Research and Professionalism in Teacher Education.

Unit 1. Teacher Education – Concept, Development, Agencies

Meaning, Nature, Aims, and Scope of Teacher Education; Objectives of Teacher Education at Elementary and Secondary Level. Changing Context of Teacher Education in Indian as well as Global Scenario. Historical development of Teacher Education in India during (Ancient, Medieval and British). Agencies of Teacher Education: BRC, CRC. DIET's, SCERT, UGC, NCTE, NCERT and University Department of Education, their Role and Functions.

Unit 2. Teacher Education - System and Structure

Structure of Teacher Education at Various Levels as per NCTE Norms. Salient features of Teacher Education – Relevance, Flexibility, Integration and Inter Disciplinary. Recommendations of various Commissions and Committees on Teacher Education in Post-Independence Era. Critical Appraisal of the present system of Teacher Education in India.

Unit 3. Teacher Education Curriculum

National Curriculum Framework for Teacher Education Programme at various levels as Recommended by NCFTE, 2009. Teaching and Training Techniques – Nature, Assumptions, relevance to objectives of the Teacher Training. Various Techniques of Teacher Training– Seminars, Workshops, Brain Storming, ICT, Micro Teaching, Simulation and Duties of Teachers & their Impact in Quality of School Education.

Unit 4. Innovations in Teacher Education

Preparing Teachers for Inclusive Classrooms. Preparing Teachers for Special Schools. Integrating ICT in Teachers Education. Problems of Teacher Education in India. Innovations in Teacher Education. Priorities of Research in Teacher Education.

Suggested Readings:

Report of the Education Commission (1964-66).

Report of the National Commission on Teachers (1983-85).

National Curriculum Frameworks for Teacher education, 2009.

Report of the Delors Commission, UNESCO, 1996.

National Policy of Education 1986/1992.

National Curriculum Framework on School Education, 2005.

Beck, Clive & Clark Kosnik Albany (2006): Innovations in Teacher Education: A Social Constructivist Approach. New York: State University of York.

Cohen Louis, Minion Lawrence & Morrison, Keith (2004). A Guide to Teaching Practice (5th edition). London and New York.: Routledge.

Falmer, Herne Steve, Jessel John & Griffith, Jenny (2000). Study to Teach: A Guide to Studying in Teacher Education. London and New York. Routledge Falmer.

NCTE (1998). Competency Based and Commitment Oriented Teacher Education for Quality School Education: Pre-Service Education.

Rao, Digumarti Bhaskara (1998). Teacher Education in India. New Delhi: Discovery Publishing House.

Loughran, John (2006). Developing a Pedagogy of Teacher Education: Understanding Teaching and Learning about Teaching. New York: Routledge.

Ryan, David, G. (1969). Characteristics of Teachers. Delhi Sterling Publisher (P) Ltd., p. 46.

Sharma, R.A. (2010). Teacher Education and Pedagogical Training. Surya Publication, Near Govt. Inter College, Meerut.

Tibble, J.W. (1971). Future of Teacher Education. London, Roubledge and Kagon, Paul.

Yadav, M.S. & Lakshmi, T.K.S. (2003). Conceptual Inputs for Secondary Teacher Education: The Instructional Role. India: NCTE.

COURSE-IV (AURPE-04)

RESEARCH AND PUBLICATION ETHICS

Theory & Practice

Unit-I Philosophy and Ethics

Introduction to philosophy: Definition, nature and scope, concept, branches
Ethics: definition, moral philosophy, nature of moral judgments and reactions. Publication Misconduct: Group discussions: subject specific ethical issues, FFP, authorship, conflicts of interest, complaints and appeals: example and fraud from India and abroad

Unit-II Scientific misconduct

Ethics with respect to science and research; Intellectual honesty and research integrity; scientific misconducts: falsification, fabrication, and plagiarism (FFP); redundant publications: duplicate and overlapping publications, salami slicing; selective reporting and misrepresentation of data. Software tools: Use of plagiarism software like Turnitin, Urkund, and other open access software tools.

Unit-III Publication Ethics

Definition, introduction and importance, Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest; publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types; violation of publication ethics, authorship and contributorship; identification of publication misconduct, complaints and appeals; Predatory publishers and journals. Databases and Research Metrics: Databases: Indexing databases, Citation databases, web of science, Scopus, etc.

Unit-IV Open access publications

Open access publications and initiatives; SHERPA/RoMEO online resources to check to check publisher copyright & self-archiving Policies; Software tool to identify predatory publications developed by SPPU; Journal finder/ journal suggestion tools viz. UGC care listed journal, Elsevier Suggested journal finder, Springer journal suggester, Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score; Metrics: h-Index, g- Index, i-10 index, Publons, Google Scholar etc.

References

Bird, A. (2006). *Philosophy of Science*. Routledge.

MacIntyre, Alasdair (1967) *A Short History of Ethics*. London.

P. Chaddah, (2018) Ethics in Competitive Research: Do not get scooped; do not get plagiarized, ISBN:978-9387480865

National Academy of Sciences, National Academy of Engineering and Institute of Medicine. (2009). *On Being a Scientist: A Guide to Responsible Conduct in Research: Third Edition*. National Academies Press.

Resnik, D. B. (2011). What is ethics in research & why is it important. *National Institute of Environmental Health Sciences*, 1–10. Retrieved from https://www.niehs.nih.gov/research/resources/bioethics/whatis/index.cfm

Beall, J. (2012). Predatory publishers are corrupting open access. Nature, 489(7415), 179–179. https://doi.org/10.1038/489179a

Indian National Science Academy (INSA), Ethics in Science Education, Research and Governance(2019), ISBN:978-81-939482-1-7. http://www.insaindia.res.in/pdf/Ethics_Book.pdf

Useful websites

1. https://shodhganga.inflibnet.ac.in/handle/10603/203204?mode=full
2. https://shodhgangotri.inflibnet.ac.in/
3. https://link.springer.com/
4. https://link.springer.com/books/a/1
5. https://www.elsevier.com/books-and-journals/elsevier
   https://www.emeraldgrouppublishing.com/our-services/authors/research-publishing-ethics

SYLLABUS

B. PHARMACY

Himachal Pradesh Technical University, Hamirpur

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

SCHEME OF TEACHING AND EVALUATION

SEMESTER I

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical/ Tutorial (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Pharmaceutical Inorganic Chemistry	BP-111	BP-111P	3	3	30	70	50	50
2	Pharmaceutical Organic Chemistry – I	BP-112	BP-112P	3	3	30	70	50	50
3	Anatomy, Physiology and Health Education – I	BP-113	BP-113P	3	3	30	70	50	50
4	Introductory Pharmaceutics	BP-114	BP-114P	3	3	30	70	50	50
5	Pharmacognosy – I	BP-115	BP-115P	3	3	30	70	50	50
6	Remedial Mathematics*	BP-116	---	3	---	30	70	---	---
7	Remedial Biology*	BP-117	BP-117P	3	3	30	70	50	50
	Total			**18**	**15**	**180**	**420**	**250/300**	**250 / 300**
	Grand Total			**33 Hrs / Week**		**1100* / 1200****			

* Students from Medical stream will study Remedial Mathematics and those from non-Medical stream will study Remedial Biology
** Students studying Remedial Mathematics will have 1100 total marks / Students studying Remedial Biology will have 1200 total marks

SEMESTER II

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Pharmaceutical Organic Chemistry – II	BP-121	BP-121P	3	3	30	70	50	50
2	Anatomy, Physiology and Health Education – II	BP-122	BP-122P	3	3	30	70	50	50
3	Unit Operations – I	BP-123	BP-123P	3	3	30	70	50	50
4	Hospital Pharmacy	BP-124	---	3	---	30	70	---	---
5	Pharmacognosy – II	BP-125	BP-125P	3	3	30	70	50	50
6	Environmental Study and Disaster Management	BP-126	---	3	---	30	70	---	---
	Total			**18**	**12**	**180**	**420**	**200**	**200**
	Grand Total			**30 Hrs / Week**		**1000**			

SEMESTER III

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Pharmaceutical Analysis – I	BP-231	BP-231P	3	3	30	70	50	50
2	Unit Operations – II	BP-232	BP-232P	3	3	30	70	50	50
3	Physical Pharmacy – I	BP-233	BP-233P	3	3	30	70	50	50
4	Pharmacognosy – III	BP-234	BP-234P	3	3	30	70	50	50
5	Pharmaceutical Statistics	BP-235	---	3	---	30	70	---	---
6	Computer Science and Applications	BP-236	BP-236P	3	3	30	70	50	50
	Total			**18**	**15**	**180**	**420**	**250**	**250**
	Grand Total			**33 Hrs / Week**		**1100**			

SEMESTER IV

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Pharmaceutical Analysis – II	BP-241	BP-241P	3	3	30	70	50	50
2	Pharmaceutical Microbiology	BP-242	BP-242P	3	3	30	70	50	50
3	Physical Pharmacy – II	BP-243	BP-243P	3	3	30	70	50	50
4	Pharmacognosy – IV	BP-244	BP-244P	3	3	30	70	50	50
5	Pathophysiology	BP-245	---	3	---	30	70	---	---
6	Human Values and Professional Ethics	BP-246	BP-246P	3	3	30	70	50	50
	Total			**18**	**15**	**180**	**420**	**250**	**250**
	Grand Total			**33 Hrs / Week**		**1100**			

SEMESTER V

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Biochemistry	BP-351	BP-351P	3	3	30	70	50	50
2	Medicinal Chemistry – I	BP-352	BP-352P	3	3	30	70	50	50
3	Pharmacology – I	BP-353	BP-353P*	3	3	30	70	50	50
4	Pharmaceutical Biotechnology	BP-354	---	3	---	30	70	---	---
5	Pharmaceutical Industrial Management	BP-355	---	3	---	30	70	---	---
6	Herbal Drug Technology	BP-356	BP-356P	3	3	30	70	50	50
	Total			**18**	**12**	**180**	**420**	**200**	**200**
	Grand Total			**30 Hrs / Week**		**1000**			
***BP-353P:** Software based experiments should be used instead of actual animal experiments wherever possible									

SEMESTER VI

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Medicinal Chemistry – II	BP-361	BP-361P	3	3	30	70	50	50
2	Chemistry of Natural Products	BP-362	BP-362P	3	---	30	70	---	---
3	Pharmacology – II	BP-363	BP-363P*	3	3	30	70	50	50
4	Pharmaceutical Technology – I	BP-364	BP-364P	3	3	30	70	50	50
5	Clinical Pharmacy	BP-365	---	3	---	30	70	---	---
6	Pharmaceutical Jurisprudence and Intellectual Property Rights	BP-366	BP-366P	3	---	30	70	---	---
	Total			**18**	**09**	**180**	**420**	**150**	**150**
	Grand Total			**27 Hrs / Week**		**900**			
7	Industrial Training**	BP-367		1 Month (Total duration)					

***BP-363P:** Software based experiments should be used instead of actual animal experiments wherever possible

****Industrial Training:** The total duration of industrial training is 1 Month. To be attended at the end of 6th and / or 7th Semesters, either in one stretch or two stretches, during end-semester vacations; At the end of 8th Semester, the students have to submit a report and make a presentation, which will be evaluated by the external examiner.

SEMESTER VII

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Medicinal Chemistry – III	BP-471	BP-471P	3	3	30	70	50	50
2	Pharmacology – III	BP-472	BP-472P*	3	3	30	70	50	50
3	Pharmaceutical Technology – II	BP-473	BP-473P	3	3	30	70	50	50
4	Biopharmaceutics and Pharmacokinetics	BP-474	BP-474P	3	3	30	70	50	50
5	Communication Skills	BP-475	BP-475P	3	3	30	70	50	50
6	Project**	BP-476		---	3	---	---	50	50
	Total			**15**	**18**	**150**	**350**	**300**	**300**
	Grand Total			**33 Hrs / Week**		**1100**			
7	Industrial Training***	BP-367		1 Month (Total duration)					

*__BP-472P:__ Software based experiments should be used instead of actual animal experiments wherever possible

**__Project:__ It can be a small project carried out for two semesters and evaluated at the end of VIII Semester. The project is to be carried out in the following areas:

1. Pharmaceutics and Drug Delivery Systems
2. Pharmaceutical Chemistry
3. Phytochemistry and Pharmacognosy
4. Pharmacology
5. Pharmaceutical Analysis
6. Community Pharmacy (Hospital / Drug Store)

The project report should not be less than 20 pages and should not exceed 50 pages excluding tables, figures and references. The project evaluation is based on the project report, presentation made by the student and viva voce.

***__Industrial Training:__ The total duration of industrial training is 1 Month. To be attended at the end of 6th and / or 7th Semesters, either in one stretch or two stretches, during end-semester vacations; At the end of 8th Semester, the students have to submit a report and make a presentation, which will be evaluated by the external examiner.

SEMESTER VIII

S. No.	Subject Name	Subject Code (Theory)	Subject Code (Practical)	Theory (Hrs)	Practical (Hrs)	Marks			
						Theory		Practical	
						Internal	University	Internal	University
1	Instrumental Methods of Analysis	BP-481	BP-481P	3	3	30	70	50	50
2	Novel Drug Delivery Systems	BP-482	BP-482P	3	3	30	70	50	50
3	Quality Control and Quality Assurance	BP-483	BP-483P	3	3	30	70	50	50
4	Industrial Pharmacognosy	BP-484	BP-484P	3	3	30	70	50	50
5	Industrial training Evaluation*	BP-367		---	---	---	---	50	50
6	Project (Continuation from previous Semester)**	BP-476		---	3	---	---	50	50
	Total			**12**	**15**	**120**	**350**	**300**	**300**
	Grand Total			**27 Hrs / Week**		**1000**			

* Industrial training evaluation will be based on the report submitted and presentations made by the students
** The project evaluation is based on the project report, presentation made by the student and viva voce.

INSTRUCTIONS TO QUESTION PAPER SETTERS

The question paper will consist of THREE sections A, B and C.

1. **Section A** will contain THREE ***Essay Type Questions*** of 10 marks each, out of which the student has to answer ANY TWO.

2. **Section B** will contain TEN ***Short Answer Type Questions*** carrying 5 marks each, out of which the student has to answer ANY EIGHT.

3. **Section C** will contain FIVE ***Short Note Type Questions*** carrying 2 marks each. In this section, all the questions are COMPULSORY.

The questions should be normally selected from all the chapters of the subject. The ***weightage*** is based on the ***teaching hours*** specified against each chapter.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-I

PHARMACEUTICAL INORGANIC CHEMISTRY (BP-111)

Course Code	BP-111	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL INORGANIC CHEMISTRY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

1. **Limit Tests:** Limit tests for iron, arsenic, lead, heavy metals chloride, sulphate. **(3 Hrs)**
2. **Gastrointestinal Agents:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Acidifying agents, Antacids, Protectives and Adsorbents, Cathartics.**(4 Hrs)**
3. **Intra- and Extra-cellular Electrolytes:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Physiological ions, Electrolytes used for replacement therapy.**(5 Hrs)**
4. **Essential and Trace Elements:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Transition elements and their compounds of pharmaceutical importance, Iron and haematinics, Mineral supplements.**(5 Hrs)**
5. **Topical Agents:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Protectives, Astringents and Anti-infectives.**(3 Hrs)**
6. **Gases and Vapours:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Oxygen, Anesthetics and Respiratory stimulants.**(4 Hrs)**

7. **Dental Products:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Dentifrices, Anti-caries agents.**(3 Hrs)**
8. **Complexing and Chelating Agents:** Preparations, properties and assay of EDTA.**(2 Hrs)**
9. **Miscellaneous Agents:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Sclerosing agents, expectorants, emetics, poisons and antidotes, sedatives etc. **(5 Hrs)**
10. **Pharmaceutical Aids:** An outline of methods of preparation, uses, sources of impurities, tests for purity and identity of Anti- oxidants, preservatives, filter aids, adsorbents, diluents, excipients, suspending agents, colorants etc.**(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Block JH, Roche E, Soine TO, Wilson CO. Inorganic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lea and Febiger.
2. Vogel. Vogel's Textbook of Micro and Semmicro Qualitative Inorganic Analysis. Hyderabad: Orient Longman.
3. Atherden LM. Bentley and Driver's Textbook of Pharmaceutical Chemistry. New Delhi: Oxford University Press.

PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICAL (BP-111P)

Course Code	BP-111P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL INORGANIC CHEMISTRY PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. The background and systematic qualitative analysis of inorganic mixtures of up to four radicals. Six Mixtures to be analyzed, preferably by semi-micro methods. **(4 Expts)**
2. All identification tests for pharmacopoeial inorganic pharmaceuticals and qualitative tests for cations and anions should be covered.**(2 Expts)**
3. Limit tests for chlorides, sulfates, iron, arsenic, lead, heavy metals. **(4 Expts)**

PHARMACEUTICAL ORGANIC CHEMISTRY – I (BP-112)

Course Code	BP-112	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL ORGANIC CHEMISTRY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Structure and Properties:** Atomic structure, Atomic orbitals, Molecular orbital theory, wave equation, Molecular orbitals, Bonding and Antibonding orbitals, Covalent bond, Hybrid orbitals, Intramolecular forces, Bond dissociation energy, Polarity of bonds, Polarity of molecules, structure and physical properties, Intermolecular forces, Acids and bases. **(7 Hrs)**
2. **Reactive Intermediates:** Carbocations, carbanions, carbenes, nitrene and nitrenium ions.**(3 Hrs)**
3. **Aliphatic Compounds:** Structure, nomenclature, preparation and reactions of alkanes, alkenes, dienes and alkynes. **(4 Hrs)**
4. **Alicyclic Compounds:** Structure, nomenclature, preparation and reactions of cycloalkanes.**(2 Hrs)**
5. **Aromatic Compounds:** Structure, nomenclature, preparation and reactions of benzene, polynuclear aromatic compounds, arenes. **(6 Hrs)**
6. **Alkyl Halides:** Structure, nomenclature, preparation and reactions of aliphatic and aromatic alkyl halides. **(3 Hrs)**
7. **Alcohols:** Structure, nomenclature, preparation and reactions of aliphatic alcohols, aromatic alcohols and phenols.**(4 Hrs)**
8. **Ethers, Esters and Epoxides:** Structure, nomenclature, preparation and reactions of alcohols, ethers, esters and epoxides. **(2 Hrs)**
9. **Amines:** Structure, nomenclature, preparation and reactions of aliphatic and aromatic amines. **(3 Hrs)**
10. **Aldehydes and Ketones:** Structure, nomenclature, preparation and reactions of Aldehydes and ketones. **(3 Hrs)**
11. **Carboxylic Acids:** Structure, nomenclature, preparation and reactions ofcarboxylic acids. Functional derivatives of carboxylic acids.**(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Mann FC, Saunders BC. Practical Organic Chemistry. London: ELBS/ Longman.
2. Morrison TR, Boyd RN. Organic Chemistry. New Delhi: Prentice Hall India.
3. Roberts JD, Caserio MC. Basic Principles of Organic Chemistry. New York: WA. BenjaminInc.
4. Furniss NS, Hannaford AJ, Smith PWG, Tatehell AR. Vogel's Textbook of Practical Organic Chemistry. London: ELBS/Longman.
5. Sykes PA. A Guidebook to Mechanisms in Organic Chemistry. Hyderabad: Orient Longman.

PHARMACEUTICAL ORGANIC CHEMISTRY – I PRACTICAL (BP-112P)

Course Code	BP-112P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL ORGANIC CHEMISTRY – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected organic compounds: Aspirin, anthraquinone from anthracine, beta naphthyl benzoate from beta naphthol, benzyl alcohol and sodium / potassium benzoate from benzaldehyde.**(4 Expts)**
2. Identification of organic compounds: Identification and their derivatization of at least 6 organic compounds of different classes. **(6 Expts)**

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – I (BP-113)

Course Code	BP-113	**Weekly Workload:** L-3, P-0	
Name of the Course	ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction:** Scope of anatomy and physiology and basic terminology used, Structure of cell, its components and their functions. **(4 Hrs)**
2. **Elementary Tissues of the Human Body:** Epithelial, connective, muscular and nervous tissues, their sub-types and their characteristics. **(4 Hrs)**
3. **Osseous System:** Structure, composition and functions of skeleton Classification of joints, types of movements of joints, Disorders of joints.**(4 Hrs)**
4. **Skeletal Muscles:** Gross anatomy; physiology of muscle contraction, physiological properties of skeletal muscles and their disorders.**(4 Hrs)**
5. **Haemopoietic System:** Composition and functions of blood and its elements, their disorders, blood groups and their significance, mechanism of coagulation, disorders of platelets and coagulation. **(7 Hrs)**
6. **Lymph and Lymphatic System:** Composition, formulation and circulation of lymph; disorders of lymph and lymphatic system. Basic physiology and functions of spleen. **(5 Hrs)**
7. **Cardiovascular System:** Basic anatomy of the heart, Physiology of heart, blood vessels and circulation. Basic understanding of Cardiac cycle, heart sounds and understanding of Cardiac cycle, heart sounds and electrocardiogram. Blood pressure and its regulation. Brief outline of cardiovascular disorder like hypertension, hypotension, arteriosclerosis, angina, myocardial infarction, congestive heart failure and cardiac arrhythmias.**(16 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Tortora GJ, Derrickson B. Principles of Anatomy and Physiology. New York: John Wiley & Sons.
2. Ross and Wilson.Anatomy and Physiology in Health and Illness. Sydney: Churchill Livingstone.
3. Guyton AC, Hall JE. Textbook of Medical Physiology. New York: WB Sanders Co.
4. Difore SH. Atlas of Normal Histology. Philadelphia: Lea and Febiger.
5. Chatterjee CC. Human Physiology, Calcutta: Medical Allied Agency.
6. Ghai CL. Textbook of Practical Physiology. New Delhi: Jay Pee Brothers.
7. Vander AJ, Sherman JH, Lucians DS. Human Physiology. New Delhi: Tata McGraw Hill.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – I PRACTICAL (BP-113P)

Course Code	BP-113P	**Weekly Workload:** L-0, P-3	
Name of Course	ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Study of human skeleton. **(1 Expt)**
2. Study of different systems with the help of charts and models. **(1 Expt)**
3. Microscopic study of different tissues. **(2 Expts)**
4. Estimation of haemoglobin in blood. **(1 Expt)**
5. Determination of bleeding time, clotting time. **(1 Expt)**
6. RBC Count, Total leucocyte count, Differential leucocyte count. **(2 Expts)**
7. Erythrocyte sedimentation rate. **(1 Expt)**.
8. Recording of body temperature, pulse rate and blood pressure, basic understanding of Electrocardiogram-PQRST waves and their significance.**(1 Expt)**

INTRODUCTORY PHARMACEUTICS (BP-114)

Course Code	BP-114	**Weekly Workload:** L-3, P-0	
Name of the Course	INTRODUCTORY PHARMACEUTICS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **History of Pharmacy:** History of pharmacy profession in India and the world, Pharmacy as a career, Pharmaceutical education in India and abroad, Pharmacopoeia of India and other Pharmacopoeias, Other official books. **(2 Hrs)**
2. **Dosage Forms:** Introduction to different dosage forms, their classification with examples (official formulations) their applications. **(5 Hrs)**
3. **Extemporaneous Preparations:** Definitions, general formulation, manufacturing procedures and official products of solutions, aromatic waters, syrups, spirits, elixirs, lotions, liniments, Infusion, decoction, tincture and extracts, methods of preparation of dry, soft and liquid extracts of IP., gargles, mouth washes, douches, draught**. (10 Hrs)**
4. **Prescription:** Definition, various parts of prescription, Handling of prescription, sources of errors in prescription, General dispensing procedures including labelling of dispensing products. **(2 Hrs)**
5. **Dispensing:** Typical prescriptions like mixtures, solutions, emulsions, creams, ointments, powders, capsules, pastes, jellies, suppositories, ophthalmic, pastilles, lozenges, pills, lotions, liniments, inhalations, paints, sprays, tablet triturates etc. **(8 Hrs)**
6. **Pharmaceutical Calculations:** Posology, calculation of doses for infants, adults and elderly patients; Enlarging and reducing recipes percentage solutions, alligation, alcohol dilution, proof spirit, isotonic solutions and displacement value. **(5 Hrs)**
7. **Incompatibilities:** Physical, therapeutic and chemical incompatibilities, inorganic incompatibilities including incompatibilities of metals and their salts, non-metals, acids, alkalis, organic incompatibilities. Purine bases, alkaloids, pyrazolone derivatives, aminoacids, quaternary ammonium compounds, carbohydrates, glycosides, anaesthetics, dyes, surface active agents, correction of incompatibilities. Therapeutic incompatibilities. **(4 Hrs)**
8. **Community Pharmacy:** Organization and structure of retail and wholesale drug store types of drug store and design, legal requirements for establishment, maintenance and drug store, dispensing of proprietary products, maintenance of records of retail and wholesale, patient counselling, role of pharmacist in community healthcare and education.**(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Carter SJ. Cooper and Gunn's Tutorial Pharmacy. New Delhi: CBS Publishers.
2. Carter SJ. Cooper and Gunn's Dispensing Pharmacy. New Delhi: CBS Publishers.
3. Indian Pharmacopoeia 1962.New Delhi: Indian Pharmacopoeia Commission.
4. Gaud RS, Gupta GD. Practical Pharmaceutics. New Delhi: CBS Publishers.

INTRODUCTORY PHARMACEUTICS PRACTICAL (BP-114P)

Course Code	BP-114P	**Weekly Workload:** L-0, P-3	
Name of Course	INTRODUCTORY PHARMACEUTICS PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Dispensing of prescription falling under the categories: Mixtures, solutions, emulsions, suspensions, creams, ointments, powders, suppositories, ophthalmic, paste, jellies, lozenges, lotions, liniments, tinctures.**(4 Expts)**
2. Identification of various types of incompatibilities in prescription, correction thereof and dispensing of such prescriptions.**(3 Expts)**
3. Dispensing for paediatric and geriatric patients.**(1 Expt)**
4. Dispensing of prescriptions involving adjustment of tonicity.**(2 Expts)**

PHARMACOGNOSY – I (BP-115)

Course Code	BP-115	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOGNOSY – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

1. **Introduction:** Definition, history, scope and development of Pharmacognosy. **(2 Hrs)**
2. **Microscopy:** Various tools used in microscopy (microscopes, micrometers, camera lucida, microphotography), general use of different reagents used in microscopy. Details of mountants, clearing agents, chemo-microscopic reagents.**(5 Hrs)**
3. **Sources of Drugs:** Biological, marine, mineral and plant tissue culture as source of drugs. **(5 Hrs)**
4. **Classification of Drugs:** Alphabetical, morphological, taxonomical, chemical and pharmacological classification of crude drugs. **(3 Hrs)**
5. **Cultivation, Collection, Processing and Storage of Crude Drugs:** Factors influencing cultivation of medicinal plants. Pest management and natural pest control agents. Plant hormones and their applications. Polyploidy, mutation, hybridization and plant breeding with reference to medicinal plants.**(8Hrs)**
6. **Adulteration:** Adulteration of crude drugs and their detection by organoleptic, microscpic, physical, chemical and biological methods of evaluation.**(7 Hrs)**
7. **Plant Taxonomy:** Study of the following families of plants, with examples of medicinally or economically important plants, Apocynaceae (Vinca, Kurchi, Stropanthus), Solanaceae (Belladonna,Hyoscyamus, Withania), Rutaceae (Orange peel, Lemon peel, Bael), Umbellifereae (Coriander, Fennel, Caraway), Leguminosae (Acacia catechu, Methi, Mulethi), Rubiaceae (Cinchona, Coffee, Pale catechu), Liliaceae (Aloevera, Shatavari, Lahsun), Zingiberaceae (Curcuma, Ginger), Papaveraceae (Opium) and Labiatae (Tulsi, Peppermint).**(10 hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Trease GE, Evans WC.Pharmacognosy. UK: Baillier & Tindall.
2. Wallis TE. Analytical Microscopy. London: J and A Churchill Ltd.
3. Handa SS, Kapoor VK. Textbook of Pharmacognosy. New Delhi: Vallabh Prakashan.
4. Medicinal Plants of India. New Delhi: ICMR.
5. Indian Herbal Pharmacopoeia. Vol. I & II. New Delhi: ICMR & RRL.
6. Quality Standards of Indian Medicinal Plants. New Delhi: ICMR.

PHARMACOGNOSY – I PRACTICAL (BP-115P)

Course Code	BP-115P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOGNOSY – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Types, care and use of microscopes.**(1 Expt)**
2. Morphological characteristics of plant families mentioned in theory.**(3 Expts)**
3. Microscopic measurements of cells and Cell contents: Starch grains, calcium oxalate crystals and phloem fibres.**(3 Expts)**
4. Determination of leaf constants such as stomatal index, stomatal number, vein-islet number, vein-termination number and palisade ratio.**(3 Expts)**

REMEDIAL MATHEMATICS (BP-116)

Course Code	BP-116	**Weekly Workload:** L-3, P-0	
Name of the Course	REMEDIAL MATHEMATICS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Equations Reducible to Quadratic Equations:** Quadratic equations, Nature of roots, Method of solving a quadratic equation and equations reducible to quadratic equations.**(5 Hrs)**
2. **Determinants:** Determinants, Properties of determinants, application of determinants in solving a system of simultaneous linear equations, solution of non-homogenous system by Cramer's rule.**(5 Hrs)**
3. **Matrices:** Matrices, Types of matrices, Addition of matrices, Subtraction and multiplication of matrices, Transpose of matrix, Adjoint of matrix, Inverse of matrix, Unit matrix, solution of systems of linear equations by matrix method.**(6 Hrs)**
4. **Functions, Limit and Continuity:** Type of functions, domain and range of a function, limit of a function, properties of limits, evaluation of limit of a function, continuity of a function at a point, Types of Discontinuity.**(6 Hrs)**
5. **Differentiation:** Definition of Derivatives, formation of Derivatives, Law of derivatives, Delta method, chain rule, repeated derivatives, derivative of implicit functions and explicit functions. **(6 Hrs)**
6. **Integration:** Integration, Graphical representation, Integration of algebraic Functions, logarithmic and exponential functions, integration of functions using substitution method, Integration by parts and partial fractions.(**6 Hrs)**
7. **Trigonometry:** Measurement of angles, trigonometric ratios, Trigonometric functions of standard angles, Trigonometric ratios of complementary angles and supplementary angles, allied angles, compound angles, multiple and sub-multiple angles; Conditional identities. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Schaum's Differential Equations. Singapore: Mc Graw Hill.
2. Grewal BS. Higher Engineering Mathematics. New Delhi: Khanna Publishers.

REMEDIAL BIOLOGY (BP-117)

Course Code	BP-117	**Weekly Workload:** L-3, P-0	
Name of the Course	REMEDIAL BIOLOGY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

1. **Introduction and Scope:** Introduction to biology, scope and significance of biology in pharmaceutical sciences. **(2 Hrs)**
2. **System of Classification:** Preparation and preservation of herbarium sheets, binomial nomenclature, methods of classification of plants. **(2 Hrs)**
3. **Plant cell:** Plant cell, its structure and non-living cell inclusions.**(6 Hrs)**
4. **Cell division:** Mitosis and Meiosis, Cell cycle. **(6 Hrs)**
5. **Plant tissues:** Different types of plant tissues and their functions. **(6 Hrs)**
6. **Plant Morphology:** Morphology, histology and uses of different plant parts such as root, stem, bark, wood, leaf, flower, fruit and seeds. Modification of root and stem. **(13 Hrs)**
7. **Parasites:** Structure and life history of parasites as illustrated by entamoeba, trypanosome, plasmodium, taenia, ascaris. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Sardana S, Sharma OP. Text Book of Pharmaceutical Biology. New Delhi: Birla Publications.
2. Wallis TE. Analytical Microscopy. London: J and A Churchill Ltd.

REMEDIAL BIOLOGY PRACTICAL (BP-117P)

Course Code	BP-117P	**Weekly Workload:** L-0, P-3	
Name of Course	REMEDIAL BIOLOGY PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Study of morphology of various parts of plants studied in theory. **(2 Expts)**
2. Structure of tissues, mentioned in theory with the help of specimen/charts.**(2 Expts)**
3. Preparation of microscopic slides and histological study of roots, stems and leaves of monocot and dicot plants.**(3 Expts)**
4. Preparation of herbarium sheets.**(3 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR
COURSE: B. PHARMACY
DETAILED SYLLABUS
SEMESTER-II
PHARMACEUTICAL ORGANIC CHEMISTRY – II (BP-121)

Course Code	BP-121	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL ORGANIC CHEMISTRY – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Stereochemistry:** Isomerism and nomenclature and associated physicochemical properties, optical activity, stereoisomerism, specification of configuration, Reactions involving stereoisomers, chirality, chiral reagents, conformations. **(6 Hrs)**
2. **Reaction Mechanisms:** Addition reactions, Elimination reactions, Substitution reactions (nucleophilic and electrophilic substitutions). **(5 Hrs)**
3. **Pericyclic Reactions:** Cycloaddition and Sigmatropic reactions, Electrocyclic reactions, Orbital symmetry rules. **(5 Hrs)**
4. **Drug Synthesis:** Catalysis by transition metal complexes, Stereoselective and sterospecific reactions, new organic reagents used in drug synthesis. **(6 Hrs)**
5. **Heterocyclic Compounds:** Chemistry, preparations and properties of some important heterocyclics containing 5 & 6 atoms with one or two heteroatoms like O, N, S. **(6 Hrs)**
6. **Lipids:** Classification, physical properties and chemical reactions of lipids. **(4 Hrs)**
7. **Carbohydrates:** Classification, structure, physical properties, chemical reactions. Synthesis and inter conversions of monosaccharides. **(6 Hrs)**
8. **Proteins:** Classification, structure and chemical reactions. **(4 Hrs)**
9. **Nucleic Acids:** Classification, structure and chemical reactions of nucleic acids. Nucleotides and nucleosides.**(14 Hrs)**

Books Recommended

1. Mann FC, Saunders BC. Practical Organic Chemistry. London: ELBS/ Longman.
2. Morrison TR, Boyd RN. Organic Chemistry. New Delhi: Prentice Hall India.
3. Vogel AI. Textbook of Practical Organic Chemistry. London: ELBS/ Longman.
4. Eliel EL. Stereochemistry of Organic Compounds. New York: McGraw Hill.
5. Finar IL. Organic Chemistry. Vol. I & II. London: ELBS/Longman.
6. Sykes PA. Guidebook to Mechanisms in Organic Chemistry. Hyderabad: Orient Longman.

PHARMACEUTICAL ORGANIC CHEMISTRY – II PRACTICAL (BP-121P)

Course Code	BP-121P	**Weekly Workload:** L-0, P-3	
Name of Course	PHRMACEUTICAL ORGANIC CHEMISTRY – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of at least five compounds involving various heterocyclic ring systems. **(5 Expts)**
2. Stereoselective synthesis of compounds. **(1 Expt)**
3. Resolution of racemic DL-alanine.**(1 Expt)**
4. Determination of physicochemical constants for oils and fats. **(1 Expt)**
5. Workshop on molecular modelling of primary, secondary and tertiary structures of proteins, molecular modelling on double helical structure of nucleic acid showing hydrogen bonding. **(2 Expts)**

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II (BP-122)

Course Code	BP-122	**Weekly Workload:** L-3, P-0	
Name of the Course	ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Digestive System:** Gross anatomy of the gastro-intestinal tract, functions of its different parts including those of liver, pancreas and gall bladder, various gastrointestinal secretions and their role in the absorption and digestion of food, Disorders of digestive system. **(6 Hrs)**
2. **Respiratory System:** Anatomy of respiratory organs and its functions, respiration, mechanism and regulation of respiration, respiratory volumes and vital capacity. **(4 Hrs)**
3. **Central Nervous System:** Functions of different parts of brain and spinal cord. Neurohumoral transmission in the central nervous system, reflex action electroencephalogram, specialized functions of the brain, Cranial nerves and their functions. **(4 Hrs)**
4. **Autonomic Nervous System:** Physiology and functions of the autonomic nervous system. Mechanism of neurohumoral transmission in the ANS. **(3 Hrs)**
5. **Urinary System:** Various parts, structures and functions of the kidney and urinary tract, Physiology of urine formation and acid-base balance, Diseases of the urinary system. **(4 Hrs)**
6. **Reproductive System:** Male and female reproductive systems and their hormones, physiology of menstruation, coitus and fertilization, Spermatogenesis and oogenesis, Pregnancy, its maintenance and parturition.**(4 Hrs)**
7. **Endocrine System:** Basic anatomy and physiology of Pituitary, Thyroid, Parathyroid. Adrenals, Pancreas, Testes and ovary, their hormones and functions. **(4 Hrs)**
8. **Sense Organs:** Basic anatomy and physiology of the eye (vision), ear (hearing), taste buds, nose (smell) and skin (superficial receptors). **(4 Hrs)**
9. **Health Education:** ***Classification of food requirements*****:** Balanced diet, nutritional deficiency disorders, their treatment and prevention, specifications for drinking water.
   Family planning**:** Medical termination of pregnancy.
   Communicable diseases**:** Brief outline, causative agents, modes of transmission and prevention of Chicken pox, diphtheria, tuberculosis, poliomyelitis, malaria, filariasis, rabies, tetanus, leprosy, syphilis, gonorrhoea, and AIDS.
   First aid**:** Emergency treatment of shock, snake bites, burns, poisoning, and resuscitation methods. **(7 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Tortora GJ, Derrickson B. Principles of Anatomy and Physiology. New York: John Wiley & Sons.
2. Ross and Wilson.Anatomy and Physiology in Health and Illness. Sydney: Churchill Livingstone.
3. Guyton AC, Hall JE. Textbook of Medical Physiology. New York: WB Sanders Co.
4. Difore SH. Atlas of Normal Histology. Philadelphia: Lea and Febiger.
5. Chatterjee CC. Human Physiology, Calcutta: Medical Allied Agency.
6. Ghai CL. Textbook of Practical Physiology. New Delhi: Jay Pee Brothers.
7. Vander AJ, Sherman JH, Lucians DS. Human Physiology. New Delhi: Tata McGraw Hill.

ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II PRACTICAL (BP-122P)

Course Code	BP-122P	**Weekly Workload:** L-0, P-3	
Name of Course	ANATOMY, PHYSIOLOGY AND HEALTH EDUCATION – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Simple experiments involved in the analysis of normal and abnormal urine: Collection of specimen, appearance, determination of pH, Sugars, proteins, urea and creatinine. **(3 Expts)**
2. Physiological experiments on nerve-muscle preparations. **(4 Expts)**
3. Determination of vital capacity, experiments on spirometry. **(3 Expts)**

UNIT OPERATIONS – I (BP-123)

Course Code	BP-123	**Weekly Workload:** L-3, P-0	
Name of the Course	UNIT OPERATIONS – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs /Week)

1. **Introduction:** Introduction to unit operations, basic laws. **(3 Hrs)**
2. **Fluid Flow:** Types of flow, Reynold's number, Viscosity, Concept of boundary layer, basic equations of fluid flow, valves, flow meters, manometers and measurement of flow andpressure. **(5 Hrs)**
3. **Material Handling Systems:** Liquid handling - Different types of pumps; Gas handling-Various types of fans, blowers and compressors; Solid handling-Bins, Bunkers, Conveyors, Air transport. **(6 Hrs)**
4. **Filtration and Centrifugation:** Theory of filtration, filter aids, filter media, industrial filters including filter press, rotary filter, edge filter, etc. Factors affecting filtration, optimum cleaning cycle in batch filters. Principles of centrifugation, industrial centrifugal filters, and centrifugal sedimenters. **(5 Hrs)**
5. **Crystallization:** Characteristics of crystals like-purity, size, shape, geometry, habit, forms, size, and factors affecting these properties, solubility curves and calculation of yields. Material and heat balances around Swenson Walker crystallizer. Supersaturation theory and its limitations, Nucleation mechanisms, crystal growth. Study of various types of crystallizer, tanks, agitated batch, Swenson Walker, Single vacuum, and crystal crystallizer, Caking of crystals and its prevention.**(6 Hrs)**
6. **Dehumidification and Humidity Control:** Basic concepts and definition, wet bulb and adiabatic saturation temperatures, Psychrometric chart and measurement of humidity, application of humidity measurement in pharmacy, equipment for dehumidification operations. **(6 Hrs)**
7. **Refrigeration and Air Conditioning:** Principle and applications of refrigeration and air conditioning. **(2 Hrs)**
8. **Material of Construction:** General study of composition, corrosion, resistance, Properties and applications of the materials of construction with special reference to stainless steel and glass.**(4 Hrs)**
9. **Industrial Hazards and Safety Precautions:** Mechanical, Chemical, Electrical, fire and dust hazards. Industrial dermatitis, Accident records etc. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Badger WL, Banchero JT. Introduction to Chemical Engineering. London: McGraw Hill.
2. McCabe WL, Smith JC, Harriolt P. Unit Operations of Chemical Engineering. London: McGraw Hill.
3. Subrahmanyam CVS. Pharmaceutical Engineering. New Delhi: Vallabh Prakashan.
4. Carter SJ. Cooper and Gunn's Tutorial Pharmacy. New Delhi: CBS Publishers.
5. Brown CG. Unit Operations (Indian Ed.). New Delhi: CBS Publishers.
6. Bhatt ND, Panchal VM. Machine Drawing. Anand: Charocar Publishing House.

UNIT OPERATIONS – I PRACTICAL (BP-123P)

Course Code	BP-123P	**Weekly Workload:** L-0, P-3	
Name of Course	UNIT OPERATIONS – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Measurement of flow of fluids and their pressure, determination Reynold's number.**(2 Expts)**
2. Evaluation of filter media, determination of rate of filtration. **(1 Expt)**
3. Experiment to demonstrate application of centrifugation. **(1 Expt)**
4. Thermometers and Psychrometric charts. **(1 Expt)**
5. Determination of humidity - use of Dry Bulb and Wet Bulb. **(1 Expt)**
6. Elementary Knowledge of Engineering Drawing - Concept of orthographic and isometric views of elevation and third angle projection. Notation and abbreviation used in engineering drawing. **(2 Expts)**
7. Basic Engineering Drawing Practice - Bolts, nuts, rivetted fronts, screws, worn screws as per specification. **(1 Expt)**
8. Drawing of simple pharmaceutical machinery parts.**(1 Expt)**

HOSPITAL PHARMACY (BP-124)

Course Code	BP-124	**Weekly Workload:** L-3, P-0	
Name of the Course	HOSPITAL PHARMACY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs /Week)

1. **Organization and Structure:** Organization of a hospital and hospital pharmacy, Responsibilities of pharmacist, Pharmacy and therapeutic committee, Budget preparation and Implementation.**(5 Hrs)**
2. **Hospital Formulary:** Contents, preparation and revision of hospital formulary.**(2 Hrs)**
3. **Drug Store Management and Inventory Control:** Organization of drug store, Types of materials stocked, storage conditions, Purchase and Inventory Control principles, purchase procedures, Purchase order, procurement and stocking. **(6 Hrs)**
4. **Drug distribution Systems in Hospitals:** Out-patient dispensing - methods adopted, Dispensing of drugs to in-patients, Types of drug distribution systems, Charging policy, labelling, Dispensing of drugs to ambulatory patients, Dispensing of controlled drugs.**(6 Hrs)**
5. **Central Sterile Supply Unit and Its Management:** Types of materials forsterilization, packing of materials prior to sterilization, sterilization equipments, Supply of sterile materials. **(4 Hrs)**
6. **Manufacture of Sterile and Nonsterile Products:** Policy making of manufacturable items, demand and costing, personnel requirements, manufacturing practice, master formula card, production control, manufacturing records.**(5 Hrs)**
7. **Drug Information Services:** Sources of Information on drugs, disease, treatment schedules, procurement of information, Computerized services (e.g., MEDLINE), Retrieval of information, Medication error.**(5 Hrs)**
8. **Records and Reports:** Prescription filling, drug profile, patient medication profile, cases on drug interaction and adverse reactions, idiosyncratic cases etc. **(3 Hrs)**
9. **Nuclear Pharmacy:** Introduction to Radio- pharmaceuticals, radio-active half-life, Units of radio-activity Production of radio-pharmaceuticals, methods of isotopic tagging, preparation of radio-isotopes in laboratory using radiation dosimetry, radio-isotope generators, Permissible radiation dose level, Radiation hazards and their prevention, specifications for radio-active laboratory.**(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Hassan WE. Hospital Pharmacy. Philadelphia: Lea & Febiger.
2. Remington's: The Science and Practice of Pharmacy.Easton (PA): Mack Publishing Co.
3. Turco S, King RE. Sterile Dosage Forms. Philadelphia: Lea & Febiger.
4. Allwodd MC, Fell JT. Textbook of Hospital Pharmacy.Oxford: Blackwell.
5. Chittion HM, Witcofski RL. Nuclear Pharmacy. Philadelphia: Lea & Febiger.

PHARMACOGNOSY – II (BP-125)

Course Code	BP-125	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOGNOSY – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Phytoconstituents of Medicinal Importance:** Introduction, classification, isolation, chemical tests, of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins. **(8 Hrs)**
2. **Carbohydrates and Derived Products:** Agar, xanthangum, Guar gum, Acacia, Honey, Isabgol, pectin, starch, sterculia, Tragacanth. **(7 hrs)**
3. **Lipids:** Bees wax, castor oil, cocoa butter, cod-liver oil, hydnocarpus oil, kokum butter, lard, linseed oil, rice-bran oil and wool fat. **(7Hrs)**
4. **Tannins:** Pale catechu, Black catechu, Harde, bahera, Ashoka, Arjuna, Gall. **(6 Hrs)**
5. **Fibres:** Study of fibres used in pharmacy such as cotton, silk, wool, nylon, glass wool, polyester and asbestos. **(5 Hrs)**
6. **Pharmaceutical Aids:** Study of pharmaceutical aids like talc, diatomite, kaolin, bentonite, gelatin and natural colours. **(4 Hrs)**
7. **Pharmacopoeial Studies:** IP, BHP, API, IHP, USP and Chinese Pharmacopoeia.**(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Harborne JB. Phytochemical Methods. London: Chapman & Hall.
2. Trease GE, Evans WC. Pharmacognosy. UK: Baillier &Tindall.
3. Wallis TE. Textbook of Pharmacognosy. London: J & A Churchill Ltd.
4. Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan.
5. Iyengar MA. Pharmacognosy of Powdered Crude Drugs. Manipal.

PHARMACOGNOSY – II PRACTICAL (BP-125P)

Course Code	BP-125P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOGNOSY – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Identification and morphological characterization of crude drugs belonging to tannins.**(2 Expts)**
2. Identification and morphological characterization of crude drugs belonging to carbohydrates.**(2 Expts)**
3. Identification and morphological characterization of crude drugs belonging to lipids.**(2 Expts)**
4. Study of fibres and pharmaceutical aids.**(4 Expts)**

ENVIRONMENTAL STUDY AND DISASTER MANAGEMENT (BP-126)

Course Code	BP-126	**Weekly Workload:** L-3, P-0	
Name of the Course	ENVIRONMENTAL STUDY AND DISASTER MANAGEMENT		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction to Environment:** Definition;natural and manmade environments andinter-relationships amongst and between them, components of environment andrelationship between different components, Relationship between man and environment, impact of technology on environment, environmental degradation. **(5 Hrs)**
2. **Biodiversity:** Introduction, genetic, species and ecosystem diversity, biogeographic classification of India, value and importance of biodiversity, threats to biodiversity, endangered and endemic species in India, conservation of biodiversity. **(4 Hrs)**
3. **Environmental Pollution:** ***AirPollution****:* Composition of air, structure of atmosphere, ambient air quality standards, classification of air pollutants, sources of common air pollutants like SPM, SO_2, NOX, natural andanthropogenic sources, effects of common air pollutants, carbon credit. ***Noise Pollution:*** Introduction, sources of noise pollution, ambient noise levels, effects of noise pollution on human being and wildlife, noise pollution controls, noise standards. ***Water Pollution:*** Introduction, water quality standards, sources of water pollution, classification of water pollutants, effects of water pollutants, eutrophication, measures to control water pollution.**(6 Hrs)**
4. **Energy Resources:** Understanding natural resources, renewable and non-renewable resources, sustainable energyresources, destruction versus conservation, forest resources, water resources, food resources, energy resources and land resources, conventional energy sources and their problems, advantages andlimitations non-conventional energy sources, problems due to overexploitation of energy resources. **(5 Hrs)**
5. **Social Issues and Environment:** Sustainable development and practices of improving environment, laws and acts for environmental protection, waste management.**(6 Hrs)**
6. **Natural Disasters**: Introduction, floods, earthquakes and landslides, cyclones and thunderstorms, tsunami, drought, heat waves, sandstorms. **(2 Hrs)**
7. **Manmade Disasters:** War and terrorism, riots and demonstrations, residential and industrial fires, transportation accidents, nuclear power accidents, hazardous materials and toxic emission, utility failure. **(4 Hrs)**

8. **Problems Regarding Victims:** Saving victims – first 24hours, conducting medical relief operations, managing relief operations, psychological issues, carrying out rehabilitation work. **(4 Hrs)**
9. **Planning for Disaster Management:** Local disaster management cell, preparation of a business recovery plan, government response in disaster. **(2 Hrs)**
10. **Information Technology andEnvironment:** Role of information technology and human health, role of an individual in conservation of natural resources and in disastermanagement. **(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Nebel BJ, Wright RT. Environmental science – the way the world works. New Jersey: Prentice Hall.
2. Botkin DB, Keller EA. Environmental science. New York: John Wiley & Sons.
3. Satish M. Citizen's guide to disaster management. New Delhi: Macmillan Publishers.
4. Duggal KN. Elements of public health engineering. New Delhi: S Chand & Co.
5. Trivedi RK, Goel PK. Introduction to air pollution. Hyderabad: BS Publications.
6. Rao CS. Environmental pollution control engineering. New Delhi: Wiley Eastern.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-III

PHARMACEUTICAL ANALYSIS - I (BP-231)

Course Code	BP-231	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL ANALYSIS – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

1. **Introduction:** Significance of quantitative analysis in quality control, Different techniques of analysis, Preliminaries and definitions. **(2 Hrs)**
2. **Volumetric Analysis:** Fundamentals of volumetric analysis, methods of expressing concentration, primary and secondary standards.Significant figures, Rules for retaining significant digits, types of errors, Mean, Standard deviation, StatisticalTreatment of small data sets, Selection of sample, Precision and accuracy. **(7 Hrs)**
3. **Acid Base Titrations:** Concept of acid-base, Role of solvent, Ionization, Law ofmass action, Ionic product of water, pH, Relative strengths of acids and bases, Common-ion effect, Hydrolysis of salts. **(5 Hrs)**
4. **Buffers and Indicators:** Buffer solutions, Henderson-Hasselbalchequation, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, Mixed indicators, Polyprotic system, Polyamine and amino acid systems, Amino acid titration, applications in assayof H_3PO_4, NaOH, $CaCO_3$ etc.**(4 Hrs)**
5. **Oxidation-Reduction Titrations:** Concepts of Oxidation and reduction, Redox reactions, Strengths and equivalent weights of oxidizing and reducing agents, Theory of Redox titrations, Redox indicators. **(4 Hrs)**

6. **Iodometry, Iodimetry and Electrochemical Techniques:** Cell representations, Measurement of electrode potential, Oxidation-reduction curves, Iodimetry and Iodometry, Titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate; titanouschloride and Sodium 2, 6-dichlorophenol indophenol.**(5 Hrs)**
7. **Precipitation Titrations:** Precipitation reactions, Solubility products, Effects of acids, temperature and solvent upon thesolubility of a precipitate. Argentometric titrations and titrations involving ammonium or potassiumthiocyanate, mercuric nitrate, and barium sulphate indicators, Gay-Lussac method; Mohr's method, Volhard's methodand Fajan's method.**(6 Hrs)**
8. **Gravimetric Analysis:** Precipitation techniques, Solubility products; the colloidal state, Supersaturation coprecipitation, Post-precipitation, Digestional washing of the precipitate, Filtration, Filter papers and crucibles, Ignition, Thermogravimetric curves, Specific examples like barium sulphate, aluminium as aluminium oxide, calcium ascalcium oxalate and magnesium as magnesium pyrophosphate, Organic precipitants.**(7 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Beckett AH, Stenlake JB. Practical Pharmaceutical Chemistry, London: Athilone Press.
2. Jeffery GH, Bessett J, Mendham J, Denney RC. Vogel's Textbook of Quantitative Inorganic Analysis including Elementary Instrumental Analysis. London: ELBS and Longman.
3. Atherden LM. Bentley and Driver's Textbook of Pharmaceutical Chemistry. New Delhi: Oxford University Press.
4. Gary DC. Analytical Chemistry. New York: John Wiley and Sons.
5. Connors KA. Textbook of Pharmaceutical Analysis. New York: John Wiley and Sons.
6. Kalthoff IM, Stenger VA. Volumetric Analysis – Titration Methods. Vol.2. New York: Wiley Interscience.
7. Indian Pharmacopoeia. Ghaziabad: The Indian Pharmacopoeia Commission.

PHARMACEUTICAL ANALYSIS - I PRACTICAL (BP-231P)

Course Code	BP-231P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL ANALYSIS – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Standardization of analytical weights and calibration of volumetric apparatus.**(1 Expt)**
2. Preparation and standardization of acids and bases; exercises related with determination of acids and bases separately or in mixture form.**(3 Expts)**
3. Preparation and standardization of redox titrants potassium permanganate, potassium dichromate, iodine, and sodium thiosulphate. Determination of oxidizing and reducingagents in given samples. Exercises involving potassium iodate, potassium bromate, iodine solution, titanouschloride, sodium 2, 6- dichlorophenol indophenol, and ceric ammonium sulphate.**(3 Expts)**
4. Preparation and standardization of titrants like silver nitrate and, ammonium thiocyanate. Titrations according to Mohr's, Volhard's and Fajan's methods.**(2 Expts)**
5. Preparation of gooch crucible for filtration and use of sintered glass crucible. Determination of water of hydration. **(1 Expt)**

UNIT OPERATIONS – II (BP-232)

Course Code	BP-232	**Weekly Workload:** L-3, P-0	
Name of the Course	UNIT OPERATIONS – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Stoichiometry:** Unit processes material and energy balances, molecular units, mole fraction, gas laws, mole volume, primary and secondary quantities, equilibrium state, rate process, steady and unsteady states, dimensionless equations, dimensionless formulae, dimensionless groups, different types of graphic representation.**(6 Hrs)**
2. **Heat Transfer:** Source of heat, heat transfer, steam and electricity as heating media, determination of requirement of amount of steam/electrical energy, steam pressure, Boiler capacity.**(6 Hrs)**
3. **Evaporation:** Basic concept of phase equilibria, factor affecting evaporation, evaporators, film evaporators, single effect and multiple effect evaporators.**(4 Hrs)**
4. **Distillation:** Rault's law, phase diagrams, volatility; simple steam and flash distillations, principles of rectification, McCabe Thiele method for calculations of number of theoretical plates, Azeotropic and extractive distillation.**(6 Hrs)**
5. **Drying:** Moisture content and mechanism of drying, rate of drying and time of drying calculations; classification and types of dryers, dryers used in pharmaceutical industries.**(4 Hrs)**
6. **Size Reduction and Size Separation:** Definition, objectives of size reduction, factors affecting size reduction, laws governing energy and power requirements of a mills including ball mill, hammer mill, fluid energy mill etc.**(6 Hrs)**
7. **Mixing:** Theory of mixing, solid-solid, solid-liquid and liquid-liquid mixing equipments.**(3 Hrs)**
8. **Automated Process Control Systems:** Process variables, temperature, pressure, flow, level and vacuum and their measurements. Elements of automatic process control and introduction to automatic process control systems. Elements of computer aided manufacturing (CAM).**(3 Hrs)**
9. **Reactors:** Fundamentals of reactors design for chemical reactions.**(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Badger WL, Banchero JT. Introduction to Chemical Engineering. London: McGraw Hill.
2. Subrahmanyam CVS. Pharmaceutical Engineering. New Delhi: Vallabh Prakashan.
3. Brown CG. Unit Operations. New Delhi: CBS Publishers.
4. McCabe WL, Smith JC, Harriolt P. Unit Operations of Chemical Engineering. London: McGraw Hill.

UNIT OPERATIONS – II PRACTICAL (BP-232P)

Course Code	BP-232P	**Weekly Workload:** L-0, P-3	
Name of Course	UNIT OPERATIONS – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Determination of overall heat transfer coefficient. **(1 Expt)**
2. Determination of rate of evaporation. **(1 Expt)**
3. Experiments based on steam, extractive and azeotropic distillations. **(2 Expts)**
4. Determination of rate of drying, free moisture content and bound moisture content. **(1 Expt)**
5. Experiments to illustrate the influence of various parameters on the rate of drying. **(2 Expts)**
6. Experiments to illustrate principles of size reduction, Laws governing energy and power requirements of size Reduction. **(2 Expts)**
7. Experiments to illustrate solid-solid mixing, determination of mixing efficiency using different types of mixers. **(1 Expt)**

PHYSICAL PHARMACY – I (BP-233)

Course Code	BP-233	**Weekly Workload:** L-3, P-0	
Name of the Course	PHYSICAL PHARMACY – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Matter and Properties of Matter:** States of matter, change in the state of matter, latent heats and vapor pressure, sublimation-critical point, Eutectic mixtures, gases, aerosol-inhalers, relative humidity, liquid complexes, liquid crystals, glassy state, crystalline and amorphous solids, polymorphism. **(10 Hrs)**
2. **The Liquid State and solutions:** Physical properties (surface tension, parachor, viscosity, refractive index, optical rotation, dipole moments and chemical constituents), Ideal and real solutions, solutions of gases in liquids, colligative properties, partition coefficient, conductance and its measurement, Debye Huckel theory.**(10 Hrs)**
3. **Thermodynamics**: First law, thermochemistry, second law, Entropy and disorder, third law, free energy functions and applications, absolute temperature scale, thermochemical equations.**(8 Hrs)**
4. **Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.**(5 Hrs)**
5. **Kinetics:** General considerations and concepts, law of mass action, rate and order of reaction, molecularity of reaction, study of zero, pseudo zero and first order kinetics, half-life determination, determination of order of reaction.**(3 Hrs)**
6. **Drug Stability:** Physical degradation of drugs, chemical decomposition of drugs – modes and preventive measures, influence of temperature, light, solvent, catalytic species and other factors on reaction rate.Stability testing of dosage forms by conventional Arrhenius approach. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Martin A, Bustamante P, Chun AHC. Physical Pharmacy. New Delhi: B.I. Waverly Pvt. Ltd.
2. Brey WS. Physical Chemistry and Biological Applications. London: Academic Press.
3. Shoemaker DP, Garland CW. Experiments in Physical Chemistry. New York: McGraw Hill.
4. Subramanyam CVS. Principles of Physical Pharmacy. New Delhi: Vallabh Prakashan.
5. Subramanyam CVS. Text book of Physical Pharmacy. New Delhi: Vallabh Prakashan.
6. Puri BR, Sharma LR, Pathania MS. Principles of Physical Chemistry. New Delhi: Chand and Co.
7. Kitckner JA.Findley's Physical Chemistry. London: Green & Co.
8. Williams, V.R. and Williams, H.S.Basic Physical Chemistry for the Life Sciences. W.H. Freeman

PHYSICAL PHARMACY – I PRACTICAL (BP-233P)

Course Code	BP-233P	**Weekly Workload:** L-0, P-3	
Name of Course	PHYSICAL PHARMACY – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Determination of refractive index of given liquids.**(1 Expt)**
2. Determination of specific rotation of sucrose at various concentrations and determine the intrinsic rotation.**(1 Expt)**
3. Determination of heat of solution, heat of hydration and heat of neutralization.**(1 Expt)**
4. Determination of cell constant and perform conductometric titration.**(2 Expts)**
5. Determination of rate constant of simple reaction like hydrolysis of ethyl acetate / aspirin.**(1 Expt)**
6. Determination of effect of temperature on rate of reaction. **(1 Expt)**
7. Preparation of some pharmaceutical buffers. **(2 Expts)**
8. Determination of partition coefficient of given drugs. **(1 Expt)**

PHARMACOGNOSY – III (BP-234)

Course Code	BP-234	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOGNOSY – III		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Volatile Oils:** Mentha, Coriander, Cinnamon, Lemon peel, Orange peel, Lemon grass, Citronella, Caraway, Dill, Clove, Fennel, Nutmeg, Eucalyptus, Chenopodium, Cardamom, Sandal wood. **(10 Hrs)**
2. **Resins and Resin Combinations:** Colophony, Podophyllum, Cannabis, Ginger, Turmeric, Jalap, Storax, Benzoin, Asafoetida, Capsicum, Balsam Tolu, Balsam Peru. **(8 Hrs)**
3. **Glycosides:** Study of the biological sources, cultivation, collection, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following groups of drugs containing glycosides: **(11 Hrs)**
    a. ***Saponins:*** Liquorice, ginseng, dioscorea, and senega,
    b. ***Cardioactive sterols:*** Digitalis, squill, strophanthus and thevetia.
    c. ***Anthraquinone cathartics:*** Aloe, senna, rhubarb and cascara.
    d. ***Others:*** Psoralea, gentian, saffron, chirata, quassia.
4. **Phytochemical Screening:** Screening of alkaloids, saponins, cardenolides and bufadienolides, flavonoids and leucoanthocyanidins, tannins and polyphenols, anthraquinones, cynogenetic glycosides, amino acids in plant extracts. **(4 Hrs)**
5. **Enzymes:** Biological sources, preparation, identification tests and uses of the following enzymes: Diastase, papain, pepsin, trypsin, pancreatin. **(4 Hrs)**
6. **Bitters and Sweetners:** Plant bitters (Chirata, Gentian, Kalmegh, Piccorhiza) and non-carbohydrate sweeteners (Liquorice, Gymnema).**(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Harborne JB. Phytochemical Methods. London: Chapman & Hall.
2. Trease GE, Evans WC. Pharmacognosy. UK: Baillier &Tindall.
3. Wallis TE. Textbook of Pharmacognosy. London: J &AChurchill Ltd.
4. Kokate CK. Practical Pharmacognosy. New Delhi: VallabhPrakashan.
5. Iyengar MA. Pharmacognosy of Powdered Crude Drugs. Manipal.
6. Khandelwal KR. Practical Pharmacognosy. Pune: Nirali Prakashan.
7. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. Pune: Nirali Prakashan.

PHARMACOGNOSY – III PRACTICAL (BP-234P)

Course Code	BP-234P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOGNOSY – III PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Identification of crude drugs listed in theory. **(2 Expts)**
2. Microscopic studies of sevenselected crude drugs and their powders mentioned under the category of volatile oils in theory and their chemical tests. **(2 Expts)**
3. Diagnostic macroscopic and Microscopic study of some important glycoside containing crude drugs as outlined above. Study of powdered drugs. **(2 Expts)**
4. Study of fibres and pharmaceutical aids. **(2 Expts)**
5. General chemical tests for alkaloids, glycosides, steroids, flavonoids and tannins. **(2 Expts)**

PHARMACEUTICAL STATISTICS (BP-235)

Course Code	BP-235	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL STATISTICS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Biometrics:** Data collection, Random and non-random sampling methods, significant digits and rounding of numbers; Measures of central tendency (mean, mode, median), Histograms. **(6 Hrs)**
2. **Measures of Dispersion:** Methods of studying variation (range, quadratic deviation, mean deviation, standard deviation), Coefficient of variation, confidence limits. **(6 Hrs)**
3. **Measurement of Skewness:** Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness, Kelly's coefficient of skewness. **(6 Hrs)**
4. **Correlation Analysis:** Types of correlation, Methods of studying correlation. **(6 Hrs)**
5. **Regression Analysis:** Regression lines, regression equations. **(6 Hrs)**
6. **Test of Hypothesis:** Setting of hypotheses (test for successes) Test for hypothesis, standard error and sampling distribution estimation, test of significance for large and small samples. Chi square test, t-test, F- test and analysis of variance. **(10 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Bolton S. Pharmaceutical Statistics: Practical and Clinical Applications. New York: Informa Healthcare.
2. Meier PC, Zund RE. Statistical Methods in Analytical Chemistry. Wiley-Interscience.
3. Sundar Rao PSS, Richard J. An Introduction to Biostatistics: A Manual for Students in Health Sciences. New Delhi: Prentice-Hall.
4. Gupta SP. Statistical Methods. New Delhi: Sultan Publications.

COMPUTER SCIENCE AND APPLICATIONS (BP-236)

Course Code	BP-236	**Weekly Workload:** L-3, P-0	
Name of the Course	COMPUTER SCIENCE AND APPLICATIONS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Fundamentals of Computer:** Introduction to computers, Characteristics of computers, Historical perspective of computers, Computer generations, Types of computers and uses, Software and Hardware, Basic organization of a computer system and functions performed by each unit. Various Input devices like Keyboard, Mouse, Joystick, Electronic pen, Trackball etc. and output devices Printers, Monitors. Memory storage: Memory Cells, Semiconductor and Magnetic core memory, ROM and its types, RAM, Cache and Virtual Memory. Secondary Storage devices and their organization (Hard disk, Floppy disk, CD and DVD). **(10 Hrs)**
2. **Operating System:** Definition, Need and organization of OS, Functions performed by operating system. Type of Operating System. DOS, windows, Directories and files. Commands (internal & external). Icons, Clipboard. Folders, Major differences between a DOS and Windows. **(4 Hrs)**
3. **Data Communication and Networks:** Basic elements of a commutation system, Data transmission mode, Network Topologies (ring, star, fully connected and Bus), LAN and WAN, Bounded and unbounded communication media, Internet, Services provided by internet, Potential uses and abuses of internet, terminologies and tools used for internet. **(6 Hrs)**
4. **Programming Languages:** Classifications, Low level and high level languages, merits and pitfalls of languages, object oriented languages. Syntax and semantics. Basic steps involved in software development, Compiler and interpreter. **(5 Hrs)**
5. **Computer Virus:** Definition, Causes and symptoms of virus, Types of viruses, Detections, prevention and cure against viruses using antivirus software packages. **(2 Hrs)**
6. **Role of Computers in Pharmacy:** Use of computer in various pharmaceutical and clinical applications like drug information services hospital and community pharmacy, drug design, pharmacokinetics and data analysis. **(2 Hrs)**
7. **Ms Office Package:**
   Word Processing Package: Features and uses of MS -Word processing, File handling(opening, creating, saving printing and editing), Formatting, Printing setups, Table Handling, Mail Marge, Spell check, file protection etc. in MS-Word.**(3 Hrs)**

Spreadsheet Package: Basics of spreadsheet, feature and uses of Excel, Worksheet , formatting Sheets, Data(Sort and Filter), Calculation and graphing using formulae and function, Goal seek, scenario etc. **(3 Hrs)**

Presentation Package: Introduction to power point, features and uses of PowerPoint, creating a new presentation, editing and formatting, working with slides in different views, Animation, Transitions, Action buttons, Macros, Insert (text, slide, picture). **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Sinha PK, Sinha P. Computer Fundamentals. New Delhi: BPB Publications.
2. Rajaraman V. Fundamental of Computers. New Delhi: Prentice Hall (India).

COMPUTER SCIENCE AND APPLICATIONS (BP-236)

Course Code	BP-236	**Weekly Workload:** L-0, P-3	
Name of Course	COMPUTER SCIENCE AND APPLICATIONS		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/Week)

Note: Minimum of 10 experiments to be carried out

1. Basics of operating system, MS-DOS(Internal and External DOS commands), MS Windows(my computer, recycle bin, accessories etc.). **(3 Expts)**
2. Word-processing using MS Word. **(2 Expts)**
3. Spreadsheet calculations using MS Excel. **(3 Expts)**
4. Graphic applications using MS Power Point. **(2 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-IV

PHARMACEUTICAL ANALYSIS – II (BP-241)

Course Code	BP-241	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL ANALYSIS – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Non-aqueous Titrations:** Theoretical considerations, scope and limitations, Acid base equilibria in non-aqueous media, titration of weak bases, titration of weak acids, indicators (Note: Pharmaceutical products should be selected for illustrating application in drug analysis and quality control). **(4 Hrs)**
2. **Complexometric Titrations:** Concept of complexation and chelations, Werner's coordination number, electronic structure of some complex ions, stability constants, titration curves, masking and demasking agents, types of complexometric titrations, metal ion indicators and application in drug analysis. **(4 Hrs)**
3. **Miscellaneous Methods of Analysis:** Diazotisation titrations, Kjeldahl method ofnitrogen estimation, Karl-Fischer titration, Oxygen flask combustion, gasometry. **(6 Hrs)**
4. **Potentiometry:** Theoretical consideration, ion-selective electrodes, measurement of potential, location of the end-point, instrumentation, analytical application, pH meter, definition of pH, relationship between pH and potential, equipment and applications. **(3 Hrs)**

5. **Conductometry:** Ohm's law, specific resistance, specific conductance, conductivity cell, ionic conductivity, change of conductivity during titration, change in volume during conductometric titration, method and instrumentation. **(2 Hrs)**
6. **Coulometry:** Principles and application controlled potential coulometry, cell design, instrumentation, method, electrode selection and advantages and limitations. **(2 Hrs)**
7. **Polarography:** Theory, mass transport processes, current potential relationship, polarization choice of electrode, effect of oxygen, instrumentation and calculation of concentration. **(3 Hrs)**
8. **Amperometry:** Principle, instrumentation and pharmaceutical applications. **(3 Hrs)**
9. **Chromatography:** Fundamentals of the TLC, HPTLC, GLC, Paper chromatography and column chromatography with relevant examples of pharmaceutical and/or natural products. **(8 Hrs)**
10. **Extraction procedures:** Liquid-solid extraction, Liquid-Liquid extraction, separation of mixtures by extraction, distribution law, successive extraction separation of drugs from excipients. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Beckett AH, Stenlake JB. Practical Pharmaceutical Chemistry. London: Athlone Press.
2. Chatten LG. (Editor). Pharmaceutical Chemistry. Vol. I & II. New York: Marcel Dekker.
3. Connors KA. Textbook of Pharmaceutical Analysis. New York: John Wiley & Sons.
4. Kolthoff IM, Stenger VA. Volumetric Analysis. Vol.II. Titration Methods. New York: Interscience.

PHARMACEUTICAL ANALYSIS – II PRACTICAL (BP-241P)

Course Code	BP-241P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL ANALYSIS – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Non-aqueous Titrations: Preparation and standardization of perchloric acid and sodium/potassium/lithium methoxide solutions; Estimations of some pharmacopoeial products. **(2 Expts)**
2. Complexometric Titrations: Preparations and standardization of EDTA solution, exercises related to pharmacopoeial assays by complexometric titrations. **(2 Expts)**
3. Miscellaneous Determinations: Exercises involving diazotisation, Kjeldahl, Karl-Fischer, Oxygen flask combustion and gasometry methods. Determination of alcohol content in liquid galenicals, procedure (BPC) shall be covered. **(2 Expts)**
4. Exercises based on acid base titration in aqueous and nonaqueous media, oxidation-reduction titrations using potentiometric technique, Determination of acid-base disassociation constants and plotting of titration curves using pH meter. **(2 Expts)**
5. Exercises involving polarimetry. **(1 Expt)**
6. Exercises involving conductometric and polarographic techniques.**(1 Expt)**

PHARMACEUTICAL MICROBIOLOGY(BP-242)

Course Code	BP-242	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL MICROBIOLOGY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction:** Introduction to microbiology, Scope of microbiology in medicine, health care and pharmacy. **(2 Hrs)**
2. **Microbial Structure:** Structure of bacteria, fungi, and viruses. **(6 Hrs)**
3. **Microbial Taxonomy:** Classification and taxonomy ofbacteria, fungi and viruses. **(4 Hrs)**
4. **Identification of Microbes:** Microscopy and staining techniques, colony characterization, electron microscopy. **(6 Hrs)**
5. **Microbial Cultivation:** Nutrition requirements, isolation and cultivation of bacteria, fungi and viruses. **(4 Hrs)**
6. **Microbial Genetics:** Introduction to genes, transformation, transduction, conjugation, gene mutation and mutagenesis. **(3 Hrs)**
7. **Disinfection and Sterilization:** Disinfection, factors influencing disinfectant action, dynamics of disinfection, disinfectants and antiseptics and their evaluation, sterilizationmethods, sterility testing of pharmaceutical products. **(8 Hrs)**
8. **Immunology:** Antigens, haptens, immunoglobulins, humoral and cellular immunity, antigen-antibody reactions, hypersensitivity, Active and passive immunity, primary and secondary defensive mechanisms of body. **(5 Hrs)**
9. **Microbial Assays:** Microbial assays of antibiotics and vitamins. **(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Hugo and Russel. Pharmaceutical Microbiology. Oxford: Balckwell.
2. Pelczar PC. Microbiology. New Delhi: Tata McGraw Hill.
3. Ananthanarayan A, Panickar J. Textbook of Microbiology. Hyderabad: Orient Longman.
4. Prescott LM, Harley GP, Klein DA. Microbiology. Oxford: VC Brown Publishers.
5. Indian Pharmacopoeia. New Delhi: Controller of Publications.
6. Stainer RY, Adelberg EA, Ingraham JL. General Microbiology. London: Macmillan Press.
7. Rawlins. Bentley's Pharmaceutics. New Delhi: CBS Publishers.

PHARMACEUTICAL MICROBIOLOGY PRACTICAL (BP-242P)

Course Code	BP-242P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL MICROBIOLOGY PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Preparation of culture media, sub-culturing of common aerobic and anaerobic bacteria, fungus and yeast. **(2 Expts)**
2. Staining methods – Gram's Staining, Acid fast staining, bacterial motility testing. **(2 Expts)**
3. Isolation and identification of microbes. **(1 Expt)**
4. Sterilization techniques and their validation. **(2 Expts)**
5. Evaluation of antiseptics and disinfectants, testing the sterility of pharmaceutical products as per I.P. requirements. **(2 Expts)**
6. Microbial assay of antibiotics or vitamins. **(1 Expt)**

PHYSICAL PHARMACY – II (BP-243)

Course Code	BP-243	**Weekly Workload:** L-3, P-0	
Name of the Course	PHYSICAL PHARMACY – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Surface and Interfacial Phenomenon:** Liquid interface, surface and interfacial tensions, surface free energy, measurement of surface and interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surfaceactive agents, concept of HLB, solubilization, detergency, adsorption at solid interfaces, solid-gas and solid-liquid interfaces, complex films, electrical properties of interface. **(6 Hrs)**
2. **Viscosity and Rheology:** Newtonian systems, Law of flow, kinematic viscosity, effect of temperature; Non-Newtonian systems: plastic, pseudoplastic, dilatant; thixotropy, thixotropic systems in formulation, determination of viscosity;Viscometers: capillary, falling sphere, rotational. **(6 Hrs)**
3. **Colloidal Dispersions:** Definition, types, properties of colloids, protective colloids, applicationsof colloids in pharmacy. **(7 Hrs)**
4. **Suspensions and Emulsions:** Interfacial properties of suspended particles, settling insuspensions, theory of sedimentation, effect of Brownian movement, sedimentation parameters, wetting of particles, controlled flocculation, flocculation in structured vehicles, sedimentation behavior of flocculated suspensions, rheological considerations; Emulsions-types, theories, physical stability. **(8 Hrs)**
5. **Micromeretics and Powder Rheology:** Particle size and distribution, average particle size, number and weightdistribution, particle number, methods for determining particle size: optical microscopy, sieving, sedimentation, measurement of particle volume, specific surface, methods of determining surface area: permeability, adsorption, Derived properties of powders: porosity, packing arrangement, densities, bulkiness and flow properties. **(9 Hrs)**
6. **Complexationand Protein Binding:** Classification of complexes, methods of preparation and anlaysis, applications. Significance of protein binding, kinetics of protein binding. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Martin A, Cammarata A, Swarbrick J. Physical Pharmacy. Mumbai: Varghese & Co.
2. Martin A, Bustamante P, Chun AHC. Physical Pharmacy. 4th Edition. New Delhi: BI Waverley Ltd.
3. Shotton E, Ridgaway K. Physical Pharmaceutics. London: Oxford University Press.
4. Subhramanyam. C.V.S. Textbook of Physical Pharmaceutics. Vallabh Prakashan, New Delhi.
5. Gennaro AR. Remington's Pharmaceutical Sciences. Pennsylvania: Mack Publishing Co.

PHYSICAL PHARMACY – II PRACTICAL (BP-243P)

Course Code	BP-243P	**Weekly Workload:** L-0, P-3	
Name of Course	PHYSICAL PHARMACY – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Determination of particle size, particle size distribution using microscopy, sieve analysis and Anderson pipette methods. **(3 Expts)**
2. Determination of derived properties of powders like True density, Bulk density, Porosity, Compressibility andAngle of repose. **(3 Expts)**
3. Determination of surface/interfacial tension, spreading coefficient, HLB value and critical micellar concentration ofsurfactants. **(3 Expts)**
4. Preparation and stability studies of suspensions / emulsions. **(1 Expt)**
5. Study of rheological properties of various types of systems using different Viscometers. **(1 Expt – desirable)**

PHARMACOGNOSY – IV (BP-244)

Course Code	BP-244	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOGNOSY – IV		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Alkaloids:** Systematic study of source, cultivation, collection, processing, commercial varieties, chemical constituents, substitutes, adulterants, uses, diagnostic macroscopic and microscopic features and specific chemical tests of following drugs: **(12 Hrs)**
    a. Pyridine - piperidine: Tobacco, areca and lobelia.
    b. Tropane: Belladonna, hyoscyamus, datura, duboisia, coca and withania
    c. Quinoline and isoquinoline: Cinchona, ipecac, opium.
    d. Indole : Ergot, rauwolfia, catharanthus, nux-vomica and physostigma
    e. Imidazole: Pilocarpus
    f. Steroidal: Veratrum and kurchi
    g. Alkaloidal amine: Ephedra and colchicum.
    h. Glycoalkaloid: Solanum.
    i. Purines: Coffee, tea and cola.
2. **Biosynthesis of Phyto-constituents:** General techniques of biosynthetic studies for formation of primary and secondary plant metabolites and basic metabolic pathways like Shikimic acid pathway, Mevalonate pathway, Acetate pathway. General biosynthetic pathways of natural products like alkaloids, glycosides, terpenoids and flavonoids. **(9 Hrs)**
3. **Traditional Crude Drugs:** Studies of traditional drugs, common vernacular names, botanical sources, morphology, chemical nature of chief constituents, pharmacology, categories and common uses and marketed formulations of following indigenous drugs: Amla, Satavari, Giloe, Bhilawa, Kalijiri, Bach, Rasna, Punarnava, Chitrack, Apamarg, Gokhru, Shankhapushpi, Brahmi, Adusa, Methi, Lahsun, Palash, Shilajit, Nagarmotha, Neem, Malkangni, Tulsi, Vidang, Banafsha. **(10 Hrs)**
4. **Basic Principles of Alternative System of Medicine:** Ayurveda, Siddha, Unani, Chinese, and Homeopathy. Introduction to ayurvedic preparations like Arishtas, Asvas, Gutikas, Tailas, Churnas, Lehyas and Bhasmas. **(8 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Harborne JB. Phytochemical Methods. London: Chapman & Hall.
2. Trease GE, Evans WC. Pharmacognosy. UK: Baillier &Tindall.
3. Wallis TE. Textbook of Pharmacognosy. London: J &AChurchill Ltd.
4. Kokate CK. Practical Pharmacognosy. New Delhi: Vallabh Prakashan.
5. Iyengar MA. Pharmacognosy of Powdered Crude Drugs. Manipal.
6. Khandelwal KR. Practical Pharmacognosy. Pune: Nirali Prakashan.
7. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. Pune: Nirali Prakashan.

PHARMACOGNOSY – IV PRACTICAL (BP-244P)

Course Code	BP-244P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOGNOSY –IV PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Identification of crude drugs listed in the theory.**(2 Expts)**
2. Diagnostic macroscopic and microscopic study of characters of eight- selected drugsgiven in theory in entire and powdered form.**(4 Expts)**
3. Standardization of some traditional drug formulations.**(2 Expts)**
4. Evaluation of Marketed Herbal Formulations. **(2 Expts)**

PATHOPHYSIOLOGY (BP-245)

Course Code	BP-245	**Weekly Workload:** L-3, P-0	
Name of the Course	PATHOPHYSIOLOGY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

Note: In pathophysiology of different diseases, the molecular basis should be discussed, wherever applicable.

1. **Basic Principles of Cell Injury and Adaptation:** Causes of Cellular injury, pathogenesis, morphology of cell injury. Intercellular alterations in lipids, proteins and carbohydrates, Cellular adaptation, atrophy, hypertrophy. **(10 Hrs)**
2. **Basic Mechanisms Involved in Inflammation and Repair:** Alterations in vascular permeability and blood flow, migration of WBCS, acute and chronic inflammation, mediators of inflammation, brief outline of the process of repair. **(10 Hrs)**
3. **Pathophysiology of Joint Disorders:** Rheumatoid arthritis, gout. **(1 Hr)**
4. **Pathophysiology of CNS Disorders:** Epilepsy, psychosis, depression. **(1 Hr)**
5. **Pathophysiology of Disorders of CVS:** Hypertension, angina, congestive heart failure, atherosclerosis, myocardial infarction and different types of anemias. **(2 Hrs)**
6. **Pathophysiology of Endocrine Disorders:** Diabetes, thyroid disorders. **(1 Hr)**
7. **Pathophysiology of Disorders of GIT:** Peptic ulcer, ulcerative colitis, hepatic disorders. **(1 Hr)**
8. **Pathophysiology of Urinogenital Disorders:** Acute and chronic renal failure, urinary tract infections, sexually transmitted diseases. **(1 Hr)**
9. **Pathophysiology of Neoplasms:** Common types of neoplasms. **(2 Hrs)**
10. **Pathophysiology of Respiratory Diseases:** Asthma and tuberculosis. **(1 Hr)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Cotran RS, Kumar V, Collins T. Robbins' Pathological Basis of Disease.
2. Gennaro A. Remington's: The Science and Practice of Pharmacy. Pennsylvania: Mack Publishing.
3. Wilson JD. Harrison's Principles of Internal Medicine. New York: McGraw Hill.
4. Dipiro JT. Pharmacotherapy. A Pathological Approach. Stanford: Appleton & Lange.
5. Gilman AG, Goodman LS, Rall TW, Murad F. The Pharmacological Basis of Therapeutics. New York: McMillan.

HUMAN VALUES AND PROFESSIONAL ETHICS (BP-246)

Course Code	BP-246	**Weekly Workload:** L-3, P-0	
Name of the Course	HUMAN VALUES AND PROFESSIONAL ETHICS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Course Objectives

This introductory course input is intended:

a. To help the students appreciate the essential complementarily between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity which are the core aspirations of all human beings.

b. To facilitate the development of a Holistic perspective among students towards life, profession and happiness, based on a correct understanding of the Human reality and the rest of Existence. Such a holistic perspective forms the basis of Value based living in a natural way.

c. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior and mutually enriching interaction with Nature.

Course Methodology

a. The methodology of this course is universally adaptable, involving a systematic and rational study of the human being vis-à-vis the rest of existence.

b. It is free from any dogma or value prescriptions.

c. It is a process of self-investigation and self-exploration, and not of giving sermons.

d. Whatever is found as truth or reality is stated as proposal and the students are facilitated to verify it in their own right based on their Natural Acceptance and Experiential Validation.

e. This process of self-exploration takes the form of a dialogue between the teacher and the students to begin with, and within the student himself/herself finally.

f. This self-exploration also enables them to evaluate their pre-conditionings and present beliefs.

Theory (26 Hrs: 2 Hrs / Week)

1. Need, Basic Guidelines, Content and Process for Value Education (6 Hrs)

a. Understanding the need, basic guidelines, content and process for Value Education
b. Self-exploration–what is it? - its content and process; 'Natural Acceptance' and Experiential Validation- as the mechanism for self-exploration
c. Continuous Happiness and Prosperity- A look at basic Human Aspirations

d. Right understanding, Relationship and Physical Facilities- the basic requirements for fulfillment of aspirations of every human being with their correct priority
e. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario
f. Method to fulfill the above human aspirations: understanding and living in **harmony** at various levels

2. Understanding Harmony in the Human Being - Harmony in Myself! (6 Hrs)

a. Understanding human being as a co-existence of the sentient 'I' and the material 'Body'
b. Understanding the needs of Self ('I') and 'Body' - *Sukh* and *Suvidha*
c. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer)
d. Understanding the characteristics and activities of 'I' and harmony in 'I'
e. Understanding the harmony of I with the Body: *Sanyam* and *Swasthya*; correct appraisal of Physical needs, meaning of Prosperity in detail
f. Programs to ensure *Sanyam* and *Swasthya*

3. Understanding Harmony in the Family and Society- Harmony in Human- Human Relationship (6 Hrs)

a. Understanding harmony in the Family- the basic unit of human interaction
b. Understanding values in human-human relationship; meaning of *Nyaya* and program for its fulfillment to ensure *Ubhay-tripti*; Trust (*Vishwas)* and Respect (*Samman)* as the foundational values of relationship
c. Understanding the meaning of *Vishwas*; Difference between intention and competence
d. Understanding the meaning of *Samman*, Difference between respect and differentiation; the other salient values in relationship
e. Understanding the harmony in the society (society being an extension of family): *Samadhan, Samridhi, Abhay, Sah-astitva* as comprehensive Human Goals
f. Visualizing a universal harmonious order in society- Undivided Society (*Akhand Samaj),* Universal Order (*Sarvabhaum Vyawastha)*- from family to world family!

4. Understanding Harmony in the Nature and Existence - Whole existence as Co-existence (4 Hrs)

a. Understanding the harmony in the Nature
b. Interconnectedness and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature
c. Understanding Existence as Co-existence (*Sah-astitva*) of mutually interacting units in all-pervasive space
d. Holistic perception of harmony at all levels of existence

5. Implications of the above Holistic Understanding of Harmony on Professional Ethics (6 Hrs)

a. Natural acceptance of human values
b. Definitiveness of Ethical Human Conduct
c. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order
d. Competence in professional ethics:

i) Ability to utilize the professional competence for augmenting universal human order,
ii) Ability to identify the scope and characteristics of people-friendly and ecofriendly production systems,

iii) Ability to identify and develop appropriate technologies and management patterns for above production systems.

e. Case studies of typical holistic technologies, management models and production systems
f. Strategy for transition from the present state to Universal Human Order:
    i) At the level of individual: as socially and ecologically responsible engineers, technologists and managers
    ii) At the level of society: as mutually enriching institutions and organizations

Books Recommended

Note: Recent editions of the following books to be referred

1. Illich I. Energy & Equity. Worcester: The Trinity Press.
2. George S. How the Other Half Dies. New Delhi: Penguin.
3. Dhar PL, Gaur RR. Science and Humanism. New Delhi: Commonwealth Publishers.
4. Seebauer EG, Berry RL. Fundamentals of Ethics for Scientists & Engineers. Oxford: Oxford University Press.

HUMAN VALUES AND PROFESSIONAL ETHICS PRACTICAL (BP-246P)

Course Code	BP-246P	**Weekly Workload:** L-0, P-3	
Name of Course	HUMAN VALUES AND PROFESSIONAL ETHICS PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

Practice Session (2 Hrs/Week)

PS 1: Introduce yourself in detail. What are the goals in your life? How do you set your goals in your life? How do you differentiate between right and wrong? What have been your achievements and shortcomings in your life? Observe and analyze them.

PS 2: Now-a-days, there is a lot of voice about many techno-genic maladies such as energy and natural resource depletion, environmental pollution, global warming, ozone depletion, deforestation, soil degradation, etc. – all these seem to be man-made problems threatening the survival of life on Earth – What is the root cause of these maladies & what is the way out in your opinion?
On the other hand, there is rapidly growing danger because of nuclear proliferation, arms race, terrorism, criminalization of politics, large scale corruption, scams, breakdown of relationships, generation gap, depression & suicidal attempts, etc – what do you think, is the root cause of these threats to human happiness and peace – what could be the way out in your opinion?

PS 3: Observe that each one of us has Natural Acceptance, based on which one can verify right or not right for him. Verify this in case of:
What is Naturally Acceptable to you in relationship- Feeling of respect or disrespect?
What is Naturally Acceptable to you – to nurture or to exploit others?
Is your living the same as your natural acceptance or different?
Out of the three basic requirements for fulfillment of your aspirations- right understanding, relationship and physical facilities, observe how the problems in your family are related to each. Also observe how much time & effort you devote for each in your daily routine.

PS 4: List down all your desires. Observe whether the desire is related to Self (I) or Body. If it appears to be related to both, see which part of it is related to Self (I) and which part is related to Body.

PS 5: Observe that any physical facility you use, follows the given sequence with time:
Necessary & tasteful→ unnecessary & tasteful → unnecessary & tasteless → intolerable
In contrast, observe that any feeling in you is either naturally acceptable or not acceptable at all. If naturally acceptable, you want it continuously and if not acceptable, you do not want it any moment!
List down all your activities. Observe whether the activity is of 'I' or of Body or with the participation of both 'I' and Body.

Observe the activities within 'I'. Identify the object of your attention for different moments (over a period of say 5 to 10 minutes) and draw a line diagram connecting these points. Try to observe the link between any two nodes.

PS 6: Chalk out programs to ensure that you are responsible to your body- for the nurturing, protection and right utilization of the body. Find out the plants and shrubs growing in and around your campus. Find out their use for curing different diseases.

PS 7: Form small groups in the class and in that group initiate dialogue and ask the eight questions related to trust. The eight questions are:

1a. Do I want to make myself happy?	1b. Am I able to make myself always happy?
2a. Do I want to make the other happy?	2b. Am I able to make the other always happy?
3a. Does the other want to make him happy?	3b. Is the other able to make him always happy?
4a. Does the other want to make me happy	4b. Is the other able to make me always happy?
What is the answer?	*What is the answer?*
Intention (Natural Acceptance)	Competence

Let each student answer the questions for himself and everyone else. Discuss the difference between intention and competence. Observe whether you evaluate your intention & competence as well as the others' intention & competence.

PS 8: Observe on how many occasions you are respecting your related ones (by doing the right evaluation) and on how many occasions you are disrespecting by way of under-evaluation, over-evaluation or otherwise evaluation.
Also observe whether your feeling of respect is based on treating the other as yourself or on differentiations based on body, physical facilities or beliefs.

PS 9: Write a note in the form of story, poem, skit, essay, narration, dialogue to educate a child. Evaluate it in a group.
Develop three chapters to introduce 'social science- its need, scope and content' in the primary education of children

PS 10: List down units (things) around you. Classify them in four orders. Observe and explain the mutual fulfillment of each unit with other orders.

PS 11: Make a chart for the whole existence. List down different courses of studies and relate them to different units or levels in the existence.
Choose any one subject being taught today. Evaluate it and suggest suitable modifications to make it appropriate and holistic.

PS 12: Choose any two current problems of different kind in the society and suggest how they can be solved on the basis of natural acceptance of human values. Suggest steps you will take in present conditions.

PS 13: Suggest ways in which you can use your knowledge of Technology/Engineering/ Management for universal human order, from your family to the world family.
Suggest one format of humanistic constitution at the level of nation from your side.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-V

BIOCHEMISTRY (BP-351)

Course Code	BP-351	**Weekly Workload:** L-3, P-0	
Name of the Course	BIOCHEMISTRY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

1. **Biochemical Organization of Cell:** Biochemical organization of the cell and transport process across cell membrane. **(2 Hrs)**
2. **Biological Oxidation:** The concept of free energy, bioenergetics, production of ATP and its biological significance, Enzymes and co-enzymes involved in oxidation reduction & its control, respiratory chain, its role in energy capture and its control, Inhibitors of respiratory chain and oxidative phosphorylation, Mechanism of oxidative phosphorylation. **(5 Hrs)**
3. **Enzymes and Co-enzymes:** Nomenclature, enzyme kinetics and its mechanism of action, mechanism of inhibition, enzymes and iso-enzymes in clinical diagnosis. **(3 Hrs)**
4. **Carbohydrate Metabolism:** Glycolysis and fermentation, Gluconeogenesis and glycogenolysis, Metabolism of galactose and galactosemia and Pentosephosphate pathway. **(6 Hrs)**
5. **The Citric Acid Cycle:** Significance, reactions and energetic of the cycle, Amphibolic role of the cycle, and Glyoxalic acid cycle.(**2 hrs)**
6. **Lipid Metabolism:** Oxidation of fatty acids, beta-oxidation and energetics, alpha-oxidation, omega-oxidation, Biosynthesis of ketone bodies and their utilization, Biosynthesis of saturated and

unsaturated fatty acids, Control of lipid metabolism, Essential fatty acids and eicosanoids (prostaglandins, thromboxanes and leukotrienes), phospholipids and sphingolipids. **(8Hrs)**

7. **Metabolism of Ammonia and Nitrogen Containing Monomers:** Nitrogen balance, Biosynthesis of amino acids, Catabolism of amino acids, Conversion of amino acids to specialized products, Assimilation of ammonia, Urea cycle, metabolic disorders of urea cycle, Metabolism of sulphur containing amino acids, Porphyrin biosynthesis, formation of bile pigments, hyperbilirubinemia, Purine biosynthesis and Pyrimidine biosynthesis. **(9 Hrs)**
8. **Biosynthesis of Nucleic Acids:** Biosynthesis of DNA and RNA. **(2 Hrs)**
9. **Genetic Code and Protein Synthesis:** Genetic code, Components of protein synthesis, and Inhibition of protein synthesis. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Conn EE, Stumpf PK. Outlines of Biochemistry. New York: John Wiley & Sons.
2. Lehninger AL. Principles of Biochemistry. New Delhi: CBS Publishers.
3. Plumer DT. An Intoduction to Practical Biochemistry. New Delhi: Tata McGraw Hill.
4. Berg JM, Tymoczko JL, Stryer L. Stryer's Biochemistry. New York: WH Freeman & Co.
5. Jayaraman J. Laboratory Manual in Biochemistry. New Delhi: Wiley Eastern Ltd.
6. Murray RK, Granner DK, Mayes PA, Rodwell VW. Harper's Illustrated Biochemistry. New York: Lange / McGraw Hill.

BIOCHEMISTRY PRACTICAL (BP-351)

Course Code	BP-351P	**Weekly Workload:** L-0, P-3	
Name of Course	BIOCHEMISTRY PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Preparation of standard buffers (citrate, phosphate and carbonate) and measurement of pH.**(1 Expt)**
2. Separation of amino acids by two-dimensional paper chromatography or gel electrophoresis.**(1 Expt)**
3. Separation of lipids by TLC. **(1 Expt)**
4. Quantitative estimation of amino acids / proteins. **(1 Expt)**
5. Identification of C-terminal amino acids of a protein. **(1 Expt)**
6. Determination of glucose by using glucose oxidase. **(1 Expt)**
7. Enzymatic hydrolysis of glycogen by alpha- and beta-amylases. **(1 Expt)**
8. The isolation and determination of RNA and DNA. **(1 Expt)**
9. Effect of temperature on the activity of alpha - amylase. **(1 Expt)**
10. Estimation of SGOT, SGPT, ALP and BRN in the serum. **(1 Expt)**

MEDICINAL CHEMISTRY – I (BP-352)

Course Code	BP-352	**Weekly Workload:** L-3, P-0	
Name of the Course	MEDICINAL CHEMISTRY – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Basic Principles of Medicinal Chemistry:** Physico-chemical aspects (Optical, geometric and bioisosterism) of drug molecules and biological action. **(2 Hrs)**
2. **Drug-receptor Interactions:** Theory of receptors, Structure of receptors, Drug-receptor interaction including transduction mechanisms. **(2Hrs)**
3. **Drug Metabolism:** Metabolic pathways, metabolic reactions, phase I and II biotransformations, Concept of pro-drugs, synthesis, applications of pro-drugs in pharmacy including pharmaceutical and pharmacokinetic applications. **(5 Hrs)**
4. **Quantitative Structure-Activity Relationships (QSAR):** Brief account of various descriptors, (Lipophilic, Electronics, Steric, Topological) Hansch and Free-Wilson approaches. **(4 Hrs)**
5. **Computer-Aided Drug Designing:** Fundamentals of computer-aided Drug Design (CADD) and Molecular modelling.Advantages of CADD, Software used for molecular modelling. **(4Hrs)**
6. **Drug Design:** Introduction, Concept of lead compound, Rational approaches for drug design – Quantum mechanical, molecular orbital, molecular connectivity, Methods of variation, Drug Design and development. **(3 Hrs)**
7. **Chemistry of Drugs:** Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship including physicochemical properties of the following classes of drugs:

a. ***Drugs acting at Synaptic and neuro-effector junction sites:*** Cholinergics and Anticholinesterases, Adrenergic drugs, Antispasmodic and antiadrenergic drugs, Neuromuscular blocking agents. **(11Hrs)**

b. ***Drugs acting on the Central Nervous System:*** General Anesthetics, Local Anesthetics, Hypnotics and Sedatives,Opioid analgesics, antitussives, aniconvulsants, antiparkinsonism drugs, CNS stimulants, Psychopharmacological agents (neuroleptics, antidepressants, anxiolytics). **(9Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Foye WC. Principles of Medicinal Chemistry. Philadelphia: Lea & Febiger.
2. Beale JM, Block JH. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lippincott Williams and Wilkins.
3. Hansh C. Comprehensive Medicinal Chemistry -Quantitative Drug Design. Vol. IV. Oxford: Pergamon Press.
4. Jurs PC. Computer Software Application in Chemistry. New York: John Wiley & Sons.
5. Pops and Perruns. Computer Aided Drug Design. New York: Academic Press.
6. Wolff ME. Burger's Medicinal Chemistry. New York: John Wiley & Sons.

MEDICINAL CHEMISTRY – I PRACTICAL (BP-352P)

Course Code	BP-352P	**Weekly Workload:** L-0, P-3	
Name of Course	MEDICINAL CHEMISTRY – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected drugs from the course content. **(4 Expts)**
2. Spectral analysis of the drugs synthesized. **(2 Expts)**
3. Establishing the pharmacopoeial standards of the drugs synthesized. **(3 Expts)**
4. Determination of partition coefficients and dissociation constants of synthesized drugs. **(1 Expt)**

PHARMACOLOGY –I(BP-353)

Course Code	BP-353	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOLOGY – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **General Pharmacology:** Introduction to Pharmacology, Sources of drugs, Dosage forms and routes of administration, mechanism of action, Combined effect of drugs, Factors modifying drug action, tolerance and dependence, Pharmacogenetics. Absorption, Distribution, Metabolism and Excretion of drugs, Principles of Basic and Clinical pharmacokinetics, Adverse Drug Reactions and treatment of poisoning, ADME drug interactions.**(10 Hrs)**
2. **Pharmacology of Peripheral Nervous System:** Neurohumoral transmission (autonomic and Somatic), Parasympathomimetics, Parasympatholytics, Sympathomimetics, Adrenergic Receptor and neuron blocking agents, Ganglionic, stimulants and blocking agents, Neuromuscular blocking Agents, Local anesthetic Agents. **(12 Hrs)**
3. **Pharmacology of Central Nervous System:** Neurohumoral transmission in the CNS, General Anesthetics, Alcohols and disulfiram, Sedatives, hypnotics, Anti-anxiety agents and Centrally acting muscle relaxants, Psychopharmacological agents (anti-psychotics) antidepressants anti maniacs and hallucinogens.**(6 Hrs)**
4. **Antiepileptic / Anti-Parkinsonian Drugs:** Classification, mechanism of action, pharmacological action, adverse reactions and applications of anti-epileptics drugs and anti-Parkinsonian drugs.**(6 Hrs)**
5. **Analgesics / Antipyretics:** Classification, mechanism of action, pharmacological action, adverse reactions and applications of Analgesics, Antipyretics, Anti-inflammatory and Anti-gout drugs, Narcotic analgesics and antagonists. (**4 Hrs)**
6. **CNS Stimulants:** Classification, mechanism of action, pharmacological action, adverse reactions and applications of CNS stimulants. Drug Addiction and Drug Abuse.**(2 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Rang MP, Dale MM, Riter JM. Pharmacology. New York: Churchill Livingstone.
2. Brunton LL, Lazo JS, Parker KL. Goodman and Gilman's The Pharmacological Basis of Therapeutics. New York: McGraw Hill.
3. Mycek MJ, Harvey RA, Champe PC. Lipponcott's Illustrated Reviews -Pharmacology. Philadelphia: Lippincott Williams & Wilkins.
4. Tripathi KD. Essential of medical Pharmacology, New Delhi: Jaypee Brothers Medical Publishers,
5. Ghosh MN. Fundamentals of Experimental Pharmacology. Kolkata: Scientific Book Agency.
6. Kulkarni SK. Handbook of Experimental Pharmacology. New Delhi: Vallabh Prakashan.

PHARMACOLOGY –I PRACTICAL (BP-353P)

Course Code	BP-353P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOLOGY – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs / Week)

Note: Minimum of 10 experiments to be carried out

** Software based experiments should be used instead of actual animal experiments wherever possible

1. Preparation of different solutions for experiments. Drug dilutions, use of molar and w/v solutions in experimental pharmacology. **(1 Expt)**
2. Study of commonly used instruments in experimental pharmacology. **(1 Expt)**
3. Study of common laboratory animals and anesthetics used in animal studies. Bleeding and intravenous injection, intragastric administration. Procedures for rendering animals unconscious-stunning of rodents, pithing of frogs, chemical euthanasia. **(1 Expt)**
4. Experiments on intact preparations Study of different routes of administration of drugs in mice/rats. To study the effect of hepatic microsomal enzyme inhibitors and induction on the pentobarbitone sleeping time in mice. **(2 Expts)**
5. Experiments on Central Nervous system: Recording of spontaneous motor activity, stereotypy, analgesia, anticonvulsant activity, anti- inflammatory activity, and muscle relaxant activity of drugs using simple experiments. **(2 Expts)**
6. Effects of autonomic drugs on rabbit's eye. **(1 Expt)**
7. Effects of various agonists and antagonists and their characterization using isolated preparations like frog's rectus abdominis muscle and isolated ileum preparations of rat / guinea pig. **(2 Expts)**

PHARMACEUTICAL BIOTECHNOLOGY (BP-354)

Course Code	BP-354	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL BIOTECHNOLOGY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction to Biotechnology:** Historical development of biotechnology, areas of biotechnology research, therapeutic and pharmaceutical applications of biotechnology. **(3 Hrs)**
2. **Genetic Engineering:** Enzymes and other molecular tools used in genetic engineering, technique of gene cloning, medical and pharmaceutical applications. **(7 Hrs)**
3. **Hybridoma Technology:** Introduction to monoclonal antibodies, principle and production of monoclonal antibodies by hybridoma technology, medicinal applications of monoclonal antibodies, monoclonal antibody engineering. **(8 Hrs)**
4. **Fermentation :** Introduction to fermentation, microorganisms used, types of cultures used in fermentation, design of fermenters, Production of antibiotics (Penicillin, streptomycin), Vitamins (Vitamin B2 and B12), Solvents (Ethanol) by fermentation. **(12 Hrs)**
5. **Microbial Biotransformations:** Introduction, types of reactions mediated by microorganisms, design of biotransformation processes, selection of organisms, biotransformation process and its improvements with special reference to steroids.**(5 Hrs)**
6. **Enzyme Immobilization:** Advantages of immobilization, techniques of immobilization, factors affecting immobilized enzyme kinetics, applications of immobilized enzymes, immobilization of bacteria and plant cells. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Smith JE. Biotechnology. Cambridge: Cambridge University Press.
2. Trevan MD, Boffey S, Goulding KH, Stanbury P. (Eds). Biotechnology – The Biological Principles. New Delhi: Tata McGraw Hill.
3. Prescot LM, Harley JP, Klein DA. Microbiology. Oxford: WMCBrown Publications.
4. Crueger W, Crueger A. Biotechnology – A Textbook of Industrial Microbiology. New Delhi: Panima Publishing.
5. Reed G. (Ed). Prescott & Dunn's Industrial Microbiology. New Delhi: CBS Publishers.
6. Stanbury P, Whitaker A. Principles of Fermentation Technology. Oxford: Pergamon Press.

PHARMACEUTICAL INDUSTRIAL MANAGEMENT (BP-355)

Course Code	BP-355	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL INDUSTRIAL MANAGEMENT		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

1. **Concept of Management:** Administrative Management (Planning, Organizing, Staffing, Directing and Controlling), Entrepreneurship development, Operative Management (Personnel, Materials, Production, Financial, Marketing, Time/space, Margin/Morale). Principles of Management (Co-ordination, Communication, Motivation, Decision-making, leadership, Innovation, Creativity, Delegation of Authority / Responsibility, Record Keeping). Identification of key points to give maximum thrust for development and perfection.**(6 Hrs)**

2. **Accountancy:** Principles of Accountancy, Ledger posting and book entries, preparation of trial balance, columns of a cash book, Bank reconciliation statement, rectification of errors, Profits and loss account, balance sheet, purchase, keeping and pricing of stocks, treatment of cheques, bills of exchange, promissory notes and hundies, documentary bills. **(6 Hrs)**

3. **Economics:** Principles of economics with special reference to the laws of demand and supply, demand schedule, demand curves, labor welfare, general principles of insurance and inland and foreign trade, procedure of exporting and importing goods.**(6 Hrs)**

4. **Pharmaceutical Marketing:** Functions, buying, selling, transportation, storage, finance, feedback, information, channels of distribution, wholesale, retail, departmental store, multiple shop and mail order business. **(6 Hrs)**

5. **Salesmanship:** Principles of sales promotion, advertising, ethics of sales, merchandising, literature, detailing. Recruitment, training, evaluation, compensation to the pharmacist. **(2 Hrs)**

6. **Market Research:** Measuring & Forecasting Market Demands-Major concept in demand measurement, Estimating current demand, Geodemographic analysis, Estimating industry sales, Market share & Future demand, Market Segmentation & Market Targeting. **(4 Hrs)**

7. **Materials Management:** A brief exposure or basic principles of materials management- major areas, scope, purchase, stores, inventory control and evaluation of materials management. **(4 Hrs)**

8. **Production Management:** A brief exposure of the different aspects of Production Management- Visible and Invisible inputs, Methodology of Activities, Performance Evaluation. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Koontz, O'Donnel. Principles of Management. New Delhi: Tata McGraw Hill.
2. Kotler P. Marketing Management. New Delhi: Pearson Hall.
3. Kotler P, Armstrong. Principles of Marketing. New Delhi: PHI Learning Pvt Ltd.
4. Gennaro AD. Remington's: The Science & Practice of Pharmacy, New York: Mack Publishing.
5. Subrahmanyam CVS. Pharmaceutical Production and Management. New Delhi: Vallabh Prakashan.
6. Mehta RM. Pharmaceutical Production Management. New Delhi: Vallabh Prakashan.

HERBAL DRUG TECHNOLOGY (BP-356)

Course Code	BP-356	**Weekly Workload:** L-3, P-0	
Name of the Course	HERBAL DRUG TECHNOLOGY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction:** Definition of Herbal drug, Importance of Herbal therapies, Herbal versus conventional drugs, Efficacy and Safety in herbal drugs, Toxicity in Herbals and their interactions. Adverse reactions and safety in herbal medicine, Assessment by drug regulators, Herbal drugs regulations in India. **(6 Hrs)**
2. **Extraction Techniques:** Extraction of Plant Material, Soxhlet extraction, Droplet-Counter-Current (DCC) extraction, Supercritical fluid extraction, Preparation and type of extracts. **(4 Hrs)**
3. **Chromatography of Herbal Drugs:** Application of chromatographic techniques such as Paper, TLC, HPTLC, GLC, HPLC, Column, DCCC in the isolation, purification and evaluation of herbal drugs. Role of marker compounds. **(8 Hrs)**
4. **Phytochemical Screening of Crude Drugs:** Extraction, isolation, purification, analytical profiles of following phytoconstituents. Vasaka, kalmegh, Aswagandha, Ginger, Liquorice, Brahmi, Curcuma, Methi, Giloe and Gymnema. **(10 Hrs)**
5. **Regulatory Requirements:** Regulatory requirements of herbal medicines, infrastructure, quality control and evaluation parameters, WHO guidelines for regulatory control for import and export of herbal products. **(6 Hrs)**
6. **Standardization and Quality control of Herbal Drugs:** Standardization parameters, quality assurance and stability testing of Herbal drugs as per WHO / ICH guidelines applicable to the various herbal drugs. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Chaudhari RD. Herbal Drug Industry. New Delhi: Eastern publication
2. Mukherjee PK. Quality control Herbal Drugs. New Delhi: Business Horizons,
3. Mukherjee PK, Verpoorte R. GMP for Botanicals. New Delhi: Business Horizons.
4. Rajpal V. Standardization of Botanicals. New Delhi: Eastern Publications.
5. Wagner H, Bladt S. Plant Drug Analysis – A Thin Layer Chromatography Atlas. New York: Springer.
6. WHO. Quality Control Methods for Medicinal Plant Materials. Geneva: World Health Organization.

HERBAL DRUG TECHNOLOGY PRACTICAL (BP-356P)

Course Code	BP-356P	**Weekly Workload:** L-0, P-3	
Name of Course	HERBAL DRUG TECHNOLOGY PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Isolation, separation, and purification of various groups of chemical constituents of pharmaceutical significance. **(3 Expts)**
2. Paper and thin layer chromatographic evaluations of herbal drug constituents. **(2 Expts)**
3. Column Chromatography for separation of phytoconstituents (Demonstration).**(1 Expt)**
4. Standardization of drugs – determination of foreign matter, total ash, acid insoluble ash, alcohol soluble extractive, water soluble extractives, moisture content (loss on drying), swelling index, foaming index. **(4 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-VI

MEDICINAL CHEMISTRY – II (BP-361)

Course Code	BP-361	**Weekly Workload:** L-3, P-0	
Name of the Course	MEDICINAL CHEMISTRY – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Cardiovascular Agents:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physicochemical properties of cardiovascular drugs like cardiac glycosides, antihypertensives, antianginal drugs, antiarrhythmics and vasodilators. **(5 Hrs)**

2. **Drugs acting on Hemopoietic System:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physicochemical properties of anticoagulants and anti-platelet drugs. **(3 Hrs)**

3. **Drugs Acting on Urinary System:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of Diuretics. **(2 Hrs)**

4. **Autocoids:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of antihistaminic drugs, eicosanoids. **(5 Hrs)**

5. **Anti-inflammatory Drugs:** Nomenclature, stereochemistry, Synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of opoid analgesics and non-steroidal anti-inflammatory agents. **(7 Hrs)**

6. **Steroids and Related Drugs:** Nomenclature of steroids, stereochemistry, synthesis, mode of action, uses, structure activity relationship, physico-chemical properties of androgens, anabolic steroids, estrogens, progestational agents, adrenocorticoids. **(8 Hrs)**

7. **Drugs Affecting Uterine Motility:** Oxytocics (including oxytocin, ergot alkaloids and prostaglandins). **(7 Hrs)**

8. **Antidiabetic Drugs:** Insulin and oral hypoglycaemic agents. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Foye WC. Principles of Medicinal Chemistry. Philadelphia: Lea & Febiger.
2. Beale JM, Block JH. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lippincott Williams and Wilkins.
3. Hansh C. Comprehensive Medicinal Chemistry - Quantitative Drug Design. Vol. IV. Oxford: Pergamon Press.
4. Wolff ME. Burger's Medicinal Chemistry. New York: John Wiley & Sons.
5. Nogrady T. Medicinal Chemistry – A Biochemical Approach. Oxford: Oxford University Press.
6. Lednicer D, Mitscher LA. The Organic Chemistry of Drug Synthesis. Vol. 1. New York: John Wiley & Sons.

MEDICINAL CHEMISTRY – II PRACTICAL (BP-361P)

Course Code	BP-361P	**Weekly Workload:** L-0, P-3	
Name of Course	MEDICINAL CHEMISTRY – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected drugs from the course content involving two or more steps and their spectral analysis. **(6 Expts)**
2. Establishing the Pharmacopoeial standards of the drugs synthesized. **(3 Expts)**
3. Workshop on stereo model use of some selected drugs. **(1 Expt)**

CHEMISTRY OF NATURAL PRODUCTS (BP-362)

Course Code	BP-362	**Weekly Workload:** L-3, P-0	
Name of the Course	CHEMISTRY OF NATURAL PRODUCTS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Terpenoids:** Chemistry, and pharmacological activity of medicinally important monoterpenes (Citral, Camphor, Menthol), sesquiterpenes (Faniol), diterpenes (Abietic Acid), and triterpenoids (Amyrins). **(8 Hrs)**
2. **Carotenoids:** α-carotenoids, β-carotenes, vitamin A, and xanthophylls of medicinal importance. **(6 Hrs)**
3. **Glycosides:** Chemistry, pharmacological activity of digitoxin, digoxin, sennosides and diosgenin. **(6 Hrs)**
4. **Alkaloids:** Chemistry, and pharmacological activity of atropine and related compounds, quinine, reserpine, morphine, papaverine, ephedrine, ergot and vinca alkaloids. **(10 Hrs)**
5. **Antibiotics:** Chemistry and therapeutic activity of penicillin, streptomycin and tetracycline. **(5 Hrs)**
6. **Flavonoids:** Chemistry and pharmacological activity of medicinally important flavonoids such as flavones, flavonols, quercetin, isoflavones. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Finar IL. Organic Chemistry. Vol.II. London: ELBS/Longman.
2. Harborne JB. Phytochemical Methods. London: Chapman & Hall.
3. Manitto P. The Biosynthesis of Natural Products. Chichester: Ellis Horwood.
4. De Mayo P. The Chemistry of Natural Products. New York: Wiley Interscience.
5. Pridham JB. Terpenoids in Plants. New York: Academic Press.
6. Pridham JB, Swain T. Biosynthetic Pathways in Higher Plants. New York: Academic Press.
7. Rabinson T. The Biochemistry of Alkaloids, Springer Verlag, New York.

PHARMACOLOGY – II (BP-363)

Course Code	BP-363	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOLOGY – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Pharmacology of Cardiovascular System:** Digitalis and cardiac glycosides, Antihypertensive drugs, Antianginal and Vasodilator drugs including calcium channel blockers and beta adrenergic antagonists, Antiarrhythmic drugs, Antihyperlipedemic drugs, Drugs used in the therapy of shock. **(12 Hrs)**
2. **Drugs Acting on Hemopoietic System:** Hematinics, Anticoagulants, Vitamin K and hemostatic agents, Fibrinolytic and anti-platelet drugs, Blood and plasma volume expanders. **(6 Hrs)**
3. **Drugs Acting on Urinary System:** Fluid and electrolyte balance, Diuretics. **(5 Hrs)**
4. **Autocoids:** Histamine, 5-HT and their antagonists, Prostaglandins, thromboxanes and leukotrienes, Pentagastrin, Cholecystokinin, Angiotensin, Bradykinin. **(5 Hrs)**
5. **Pharmacology of Endocrine System:** Hypothalamic and pituitary hormones, Thyroid hormones and anti-thyroid drugs, parathormone, calcitonin and Vitamin D. **(5 Hrs)**
6. **Antidiabetic Agents:** Insulin, oral hypoglycaemic agents and glucagon. **(3 Hrs)**
7. **Steroids and Related Drugs:** ACTH, corticosteroids, Androgens and anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Rang MP, Dale MM, Riter JM. Pharmacology. New York: Churchill Livingstone.
2. Brunton LL, Lazo JS, Parker KL. Goodman and Gilman's The Pharmacological Basis of Therapeutics. New York: McGraw Hill.
3. Mycek MJ, Harvey RA, Champe PC. Lipponcott's Illustrated Reviews - Pharmacology. Philadelphia: Lippincott Williams & Wilkins.
4. Tripathi KD. Essential of medical Pharmacology, New Delhi: Jaypee Brothers Medical Publishers.
5. Ghosh MN. Fundamentals of Experimental Pharmacology. Scientific Book Agency, Kolkatta.
6. Kulkarni SK. Handbook of Experimental Pharmacology. Vallabh Prakashan, Delhi.

PHARMACOLOGY – II PRACTICAL (BP-363P)

Course Code	BP-363P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOLOGY – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

** Software based experiments should be used instead of actual animal experiments wherever possible

1. Experiments on Isolated Preparations: **(6 Expts)**
    a) To record the concentration response curve (CRC) of acetylcholine using rectus abdominis muscle preparation of frog.
    b) To study the effects of physostigmine and d-tubocurarine on the CRC of acetylcholine using rectus abdominis muscle preparation of frog.
    c) To record the CRC of 5-HT on rat fundus preparation.
    d) To record the CRC of histamine on guinea pig ileum preparation.
    e) To record the CRC of noraderenaline on rat anococcygeus muscle preparation.
    f) To record the CRC of oxytocin using rat uterus preparation.
2. Pharmacology of Cardiovascular System: **(2 Expts)**
    a) To study the ionotropic and chronotropic effects of drugs on isolated frog heart.
    b) To study the effects of drugs on normal and hypodynamic frog heart.
3. Blood Pressure of anaesthetized Dog/Cat/Rat: To demonstrate the effects of various drugs on the B.P. and respiration including the Vasomotor Reversal of Dale and nicotinic action of acetylcholine. **(2 Expts)**

PHARMACEUTICAL TECHNOLOGY – I (BP-364)

Course Code	BP-364	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL TECHNOLOGY – I		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Preformulation:** Introduction to preformulation, study of physical properties of drugs like organoleptic properties, physical form, particle size, shape, density, wetting, dielectric constant, solubility, dissolution and their effect on formulation, stability and bioavailability. **(8 Hrs)**

2. **Stability:** Stability testing of various pharmaceutical products as per international guidelines such as ICH, WHO, CPMP and USFDA. Stabilization of pharmaceutical products. Pro-drug approach for solving stability problems. **(5 Hrs)**

3. **Liquid Dosage Forms:** Introduction, Types of additives used in formulations -vehicles, stabilizers, preservatives, suspending agents, emulsifying agents, solubilizer, colors, flavours and others, manufacturing, packaging and evaluation of clear liquids, suspensions and emulsions official in pharmacopoeia. **(5 Hrs)**

4. **Semisolid Dosage Forms:** Definition, types, mechanisms of drug penetration, factors influencing penetration, semisolid bases and their selection. General formulation of semisolids, clear gels manufacturing procedure, evaluation and packaging. **(4 Hrs)**

5. **Suppositories:** Ideal requirements, bases, manufacturing procedure, packaging and evaluation. **(2 Hrs)**

6. **Extraction and Galenical Products:** Principle and method of extraction, preparation of infusion, tinctures, dry and soft liquid extracts. **(3 Hrs)**

7. **Blood Products and Plasma Substitutes:** Collection, processing and storage of whole human blood, concentrated human RBCs, dried human plasma, human fibrinogen, human thrombin, human normal immunoglobulin, human fibrin, foam plasma substitutes -ideal requirements, properties of plasma substitutes like PVP, dextran, etc. **(3 Hrs)**

8. **Cosmeticology and Cosmetic Preparations:** Fundamentals of cosmetic science, structure and functions of skin and hair. Formulation, preparation and packaging of cosmetics for skin, hair, dentifrice and manicure preparations like nail polish, Lipsticks, eye lashes, baby care products. **(10 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Aulton ME. Pharmaceutics-The Science of Dosage Form Design. London: ELBS/Churchill Livingstone.
2. Lachman L, Lieberman HA, Kanig JL. The Theory and Practice of Industrial Pharmacy. Philadelphia: Lea & Febiger.
3. Ansel HC. Introduction to Pharmaceutical Dosage Forms. Mumbai: Verghese & Co.
4. Banker GS, Rhodes CT. Modern Pharmaceutics. New York: Marcel Dekker.
5. Jellinek JS. Formulation and Function of Cosmetics. New York: John Wiley & Sons.
6. Rawlins EA. Bentley's Textbook of Pharmaceutics. London: ELBS.
7. Thomssen SG. Modern Cosmetics, Mumbai: Universal Publishing.

PHARMACEUTICAL TECHNOLOGY – I PRACTICAL (BP-364P)

Course Code	BP-364P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL TECHNOLOGY – I PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Preparation, evaluation and packaging of liquid orals (solutions, suspensions and emulsions), ointments, suppositories, eye drops, eye ointments, galenicals, extracts. **(6 Expts)**
2. Formulation of various types of cosmetics for skin, hair, dentifrices and manicure preparations. **(4 Expts)**

CLINICAL PHARMACY (BP-365)

Course Code	BP-365	**Weekly Workload:** L-3, P-0	
Name of the Course	CLINICAL PHARMACY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction:** Introduction to Clinical Pharmacy, drug-drug and drug-food interactions. **(2 Hrs)**
2. **Basic Concepts of Pharmacotherapy:** Clinical Pharmacokinetics and individualization of Drug Therapy; Drug Delivery Systems and their Biopharmaceutic & Therapeutic Considerations; Drug Use During Infancy and in the Elderly (Pediatries & Geriatrics); Drug use during Pregnancy; Drug induced Diseases; The Basics of Drug Interactions; General Principles of Clinical Toxicology; Interpretation of Clinical Laboratory Tests. **(10 Hrs)**
3. **Cardiovascular and Hematopoietic Disorders:** Management of Hypertension, Congestive Heart Failure, Angina, Acute Myocardial Infarction, Cardiac arrhythmias, different types of anemias. **(4 Hrs)**
4. **Management of CNS Disorders:** Epilepsy, Parkinsonism, Schizophrenia, Depression. **(2 Hrs)**
5. **Management of Respiratory Diseases:** Asthma, tuberculosis and other Upper Respiratory Infections. **(3 Hrs)**
6. **Management of Gastrointestinal Disorders:** Pepticulcer, Ulcerative colitis, Hepatitis, Cirrhosis, Enteric Infections. **(3 Hrs)**
7. **Endocrine Disorders:** Diabetesmellitus, Thyroid Disorders. **(2 Hrs)**
8. **Urinogenital Infections:** Management of Urinary Tract Infections.**(2 Hrs)**
9. **Joint and Connective Tissue Disorders:** Rheumatic Diseases, Gout and Hyper-uricemia. **(2 Hrs)**
10. **Neoplastic Diseases:** AcuteLeukaemias, Hodgkin's disease.**(2 Hrs)**
11. **Therapeutic Drug Monitoring:** Introduction to therapeutic drug monitoring, its significance and methods of monitoring. **(5Hrs)**

12. **Essential Drugs and Rational Drug Use:** Definitions, Concept of essential drugs and rational use of drugs, List of essential drugs by WHO, WHO guidelines on rational use of drugs and their combinations. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Herfindel ET, Hirshman JL. Clinical Pharmacy and Therapeutics.New York: Lippincott Williams & Wilkins.
2. Gennaro AD. Remington's: The Science and Practice of Pharmacy. Pennsylvania: Mack Publishing Co.
3. Dipiro JL. Pharmacotherapy: A Pathophysiological Approach. Elsevier.
4. Katzung BG. Basic and Clinical Pharmacology.New York: Prentice Hall.
5. Laurence DR, Bennet PN. Clinical Pharmacology.London: Churchil Livingstone.
6. Rowland M, Tozer TN. Clinical Pharmacokinetics.New York: Lea and Febiger.
7. Winter M.E. Basic Clinical Pharmacokinetics.San Francisco: Applied Therapeutics Inc.

PHARMACEUTICAL JURISPRUDENCE AND INTELLECTUAL PROPERTY RIGHTS (BP-366)

Course Code	BP-366	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL JURISPRUDNCE AND INTELLECTUAL PROPERTY RIGHTS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

Note: The teaching of all the below acts should cover the latest amendments.

1. **Introduction:** Brief review of Pharmaceutical Legislations, Drugs & Pharmaceutical Industry, and Pharmaceutical Education. **(3 Hrs)**
2. **An elaborate study of thefollowing: (7 Hrs)**
    a. Pharmaceutical Ethics
    b. Pharmacy Act 1948.
    c. Drugs and Cosmetics Act 1940 and Rules 1945.
    d. Medicinal & Toilet Preparations (Excise Duties) Act 1955.
    e. Narcotic Drugs & Psychotropic Substances Act 1985 & Rules.
    f. Drugs Price Control Order.
3. **A brief study of the following with special reference to the main provisions: (10 Hrs)**
    a. Poisons Act 1919
    b. Drugs and Magic Remedies (Objectionable Advertisements) Act 1954
    c. Medical Termination of Pregnancy Act 1970 & Rules 1975.
    d. Prevention of Cruelty to Animals Act 1960.
    e. States Shops & Establishments Act & Rules.
    f. Insecticides Act 1968.
    g. AICTE Act 1987.
    h. Factories Act 1948.
    i. Minimum Wages Act 1948.
9. **Intellectual Property-Concepts and Fundamentals:** The emergence and growth of the concepts regarding intellectual property (IP), intellectual property protection (IPP) and intellectual property rights (IPR); economic importance, mechanism for protection of intellectual property-patents. **(5 Hrs)**

10. **Patenting:** Copyright and trade mark protection, criteria for patentability, Indian Patent Act 1970 and amendments to Indian Patent Act 1970, basic considerations, filing of a patent application, grant of patent. **(5 Hrs)**

11. **Trade Related Aspects of Intellectual Property Rights:** Intellectual property and international trade, concept behind WTO (World Trade Organization), WIPO (World Intellectual Property Organization), GATT (General Agreement on Tariff and Trade), TRIPs (Trade Related Intellectual Property Rights), TRIMS (Trade Related Investment Measures) and GATS (General Agreement on Trades in Services), status in India and other developing countries. **(10 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Jain, NK. Textbook of Forensic Pharmacy. New Delhi: Vallabh Prakashan.
2. Mithal BM. Textbook of Forensic Pharmacy. Kolkatta: National Book Depot.
3. Bharti HK. Drugs & Pharmacy Laws in India. Indore: Sadhna Mandir.
4. Wadedhra BL. Law Relating to Patents, Trademarks, Copyright Design and Geographical Indications. New Delhi: Universal Law Publishing.
5. Bansal P. IPR Handbook for Pharma Students and Researchers. Hyderabad: Pharma Book Syndicate.
6. Trivedi PR. Encylcopedia of Intellectual Property Rights. New Delhi: Jnanada Prakashan.
7. Acts related to Pharmacy Education and Practice: AICTE Act 1987, Drug and Cosmetics Act, 1940 and Rules 1945, Drugs and Magic Remedies (Objectionable Advertisements) Act 1954, Drugs Price Control Order (DPCO), Factories Act 1948, Insecticides Act 1968, Medicinal & Toilet Preparations (Excise Duties) Act 1955, Medical Termination of Pregnancy Act (MTPA) 1970 & Rules 1975, Minimum Wages Act 1948, Narcotic Drugs & Psychotropic Substances Act 1985 & Rules, Pharmacy Act 1948, Poisons Act 1919.

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-VII

MEDICINAL CHEMISTRY– III(BP-471)

Course Code	BP-471	**Weekly Workload:** L-3, P-0	
Name of the Course	MEDICINAL CHEMISTRY – III		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs/ Week)

1. **Anticancer Chemotherapy:** Synthesis of selected drugs, mode of action, uses, structure activity relationship of anticancer agents including antimetabolites. **(6 Hrs)**
2. **Anti-infective Agents:** Synthesis of selected drugs, mode of action, uses, structure activity relationship of different classes of antibiotics, chemotherapeutic agents used in protozoal, parasitic and other infections, including antimetabolites like sulfonamides.**(8 Hrs)**
3. **Antiviral Drugs:** Synthetic procedures of selected drugs, mode of action, uses, structure activity relationship (including physicochemical aspects; biochemical approaches in drug designing to be discussed wherever applicable) of anti-viral agents including anti-HIV drugs. **(4 Hrs)**
4. **Immunomodulators:** Synthesis, mode of action, uses, structure activity relationship of immunosuppressives and immunostimulants.**(4 Hrs)**
5. **Amino Acids, Peptide, Nucleotides and Related Drugs:** Synthesis, mode of action, uses, structure activity relationship of thyroid and anti-thyroid drugs, peptidomimetics and nucleotidomimetics.**(5 Hrs)**

6. **Drugs Acting on GIT:** Synthesis, mode of action, uses, structure activity relationship of antiulcer agents, emetics and anti-emetics. **(4 Hrs)**
7. **Drugs acting on Respiratory System:** Synthesis, mode of action, uses, structure activity relationship of anti-asthmatics, expectorants and antitussives. **(4 Hrs)**
8. **Diagnostic agents and Pharmaceutical Aids:** Synthesis, mode of action and usesof radiographic contrast media, iodinated organic compounds, diagnostic dyes, miscellaneous diagnostic agents, coloring agents, flavoring agents and antioxidants. **(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Foye WC. Principles of Medicinal Chemistry. Philadelphia: Lea & Febiger.
2. Beale JM, Block JH. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry. Philadelphia: Lippincott Williams and Wilkins.
3. Hansh C. Comprehensive Medicinal Chemistry -Quantitative Drug Design. Vol. IV. Oxford: Pergamon Press.
4. Jurs PC. Computer Software Application in Chemistry. New York: John Wiley & Sons.
5. Pops and Perruns. Computer Aided Drug Design. New York: Academic Press.
6. Wolff ME. Burger's Medicinal Chemistry. New York: John Wiley & Sons.

MEDICINAL CHEMISTRY– III PRACTICAL (BP-471P)

Course Code	BP-471P	**Weekly Workload:** L-0, P-3	
Name of Course	MEDICINAL CHEMISTRY – III PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Synthesis of selected four drugs from the theory syllabus. **(4 Expts)**
2. Determination of Pharmacopoeal standards for the synthesized drugs. **(4 Expts)**
3. Spectral studies of synthesized synthesized drugs. **(2 Expts)**

PHARMACOLOGY – III (BP-472)

Course Code	BP-472	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACOLOGY – III		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Drugs Acting on Gastrointestinal Tract:** Antacids, Anti Secretory and Anti-ulcer drugs; Laxatives and anti-diarrhoeal drugs; Appetite Stimulants and Suppressants; Emetics and anti-emetics; Miscellaneous-Carminatives, demulcents, protectives, adsorbents, astringents, digestants, enzymes and mucolytics. **(8 Hrs)**
2. **Drugs acting on Respiratory System:** Anti-asthmatic drugs including bronchodilators; Anti-tussives and expectorants, Respiratory stimulants. **(10 Hrs)**
3. **Chemotherapy:** Introduction and General Principles of Chemotherapy. Antimetabolites like Sulfonamides. **(1 Hr)**
4. **Chemotherapy Using Antibiotics:** Introduction to antibiotics, Penicillins, Cephalosporins, Chloramphenicol, Erythromycin, Quinolones and Miscellaneous Antibiotics. **(4 Hrs)**
5. **Chemotherapy of Mycobacterial Infections:** Chemotherapy of tuberculosis and leprosy. **(2 Hrs)**
6. **Chemotherapy of Fungal / Viral Infections:** Fungal diseases, clotrimoxazole, viral diseases and antiviral drugs. **(3 Hrs)**
7. **Chemotherapy of Urinogenital Infections:** Urinary tract infections, sexually transmitted diseases. **(2 Hrs)**
8. **Chemotherapy of Cancer:** Drugs used for the chemotherapy of different types of cancers. **(3 Hrs)**
9. **Immunomodulators:** Immunosuppressive agents and immunostimulants. **(2 Hrs)**
10. **Principles of Toxicology:** Definition of poison, general principles of treatment of poisoning with particular reference to barbiturates, opioids, organophosphorous and atropine poisoning.Heavy metals and heavy metal antagonists.**(5 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Rang MP, Dale MM, Riter JM. Pharmacology. New York: Churchill Livingstone.
2. Brunton LL, Lazo JS, Parker KL. Goodman and Gilman's The Pharmacological Basis of Therapeutics. New York: McGraw Hill.
3. Mycek MJ, Harvey RA, Champe PC. Lipponcott's Illustrated Reviews -Pharmacology. Philadelphia: Lippincott Williams & Wilkins.
4. Tripathi KD. Essential of medical Pharmacology, New Delhi: Jaypee Brothers Medical Publishers.
5. Ghosh MN. Fundamentals of Experimental Pharmacology. Kolkata: Scientific Book Agency.
6. Kulkarni SK. Handbook of Experimental Pharmacology. Vallabh Prakashan, Delhi.

PHARMACOLOGY – III PRACTICAL (BP-472P)

Course Code	BP-472P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACOLOGY – III PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. To calculate the pA2 value of atropine using acetylcholine as an agonist on rat ileum preparation. **(1 Expt)**
2. To calculate the pA2 value of mepyramine or chlorpheniramine using histamine as agonist on guinea pig ileum. **(2 Expts)**
3. To estimate the strength of the test sample of agonist/drug (e.g. Acetylcholine, Histamine, 5 -HT, Oxytocin) using a suitable isolated muscle preparation employing Matching bioassay, Bracketing assay, Three point assay and Four point bioassay. **(5 Expts)**
4. To study the anti-secretory and anti-ulcer activity using pylorus ligation technique. **(2 Expts)**

PHARMACEUTICAL TECHNOLOGY – II (BP-473)

Course Code	BP-473	**Weekly Workload:** L-3, P-0	
Name of the Course	PHARMACEUTICAL TECHNOLOGY – II		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Capsules:** Advantages and disadvantages of capsule dosage form, material for production of hard gelatin capsules, size of capsules, method of capsule filling, soft gelatin, capsule shell and capsule content, importance of base adsorption factor, minim per gram factor in soft gelatin capsules, quality control, stability testing and storage of capsule dosage forms. **(6 Hrs)**

2. **Microencapsulation:** Types of microcapsules, importance of microencapsulation in pharmacy, microencapsulation by phase separation, coacervation, multi orifice, spray drying, spray congealing, polymerisation complex emulsion, air suspension technique, coating pan and other techniques, evaluation of micro capsules. **(3 Hrs)**

3. **Tablets:** Formulation of different types of tablets, granulation, technology on large-scale by various techniques, physics of tablets making, different types of tablet compression machinery and the equipments employed, evaluation of tablets. ***Coating of Tablets:*** Types of coating, film forming materials, formulation of coating solution, equipments for coating, coating process, evaluation of coated tablets. Stability kinetics and quality assurance of tablets. **(10 Hrs)**

4. **Parenteral Products:** Routes of administration, water for injection, pyrogenicity, non-aqueous vehicles, isotonicity and methods of its adjustment; Formulation details, containers and closures - selection, prefilling treatment, washing, preparation of solution and suspensions, filling and sealing of ampoules, vials, intravenous infusion fluids, lyophillization and preparation of sterile powders, equipment for large scale manufacture and evaluation of parenteral products;Aseptic techniques-source of contamination and methods of prevention, design of aseptic area, laminar flow bench services and maintenance; Sterility testing of parenterals. **(10 Hrs)**

5. **Pharmaceutical Aerosols:** Definition, propellants, general formulation, manufacturing' and packaging methods, pharmaceutical applications. **(4 Hrs)**

6. **Ophthalmic Preparations:** Requirements, formulation, methods of preparation, containers, evaluation. **(4 Hrs)**

7. **Surgical Products:** Definition, primary wound dressing, absorbents, surgical cotton, surgical gauzes etc., bandages, adhesive tape, protective cellulosic hemostastics, official dressings, absorbable and nonabsorbable sutures, ligatures and catguts. Medical prosthetics and organ replacement materials. **(5 Hrs)**

8. **Packaging of Pharmaceutical Products:** Packaging components, types, specifications and methods of evaluation, stability aspects of packaging. Packaging equipments, factors influencing choice of containers, legal and other official requirements for containers, package testing. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Aulton ME. Pharmaceutics: The Science of Dosage Form Design.London: ELBS/Churchill Livingstone.
2. Lachman L, Lieberman HA, Kanig JL. The Theory and Practice of Industrial Pharmacy. Philadelphia: Lea & Febiger.
3. Ansel HC. Introduction to Pharmaceutical Dosage Forms. Mumbai: VM Verghese & Co.
4. Banker GS, Rhodes CT. Modern Pharmaceutics. New York: Marcel Dekker.
5. Carter SJ. Cooper & Gunn's Tutorial Pharmacy. New Delhi: CBS Publishers.
6. Rawlins EA. Bentley's Textbook of Pharmaceutics. London: Churchill Livingstone / ELBS.

PHARMACEUTICAL TECHNOLOGY – II PRACTICAL (BP-473P)

Course Code	BP-473P	**Weekly Workload:** L-0, P-3	
Name of Course	PHARMACEUTICAL TECHNOLOGY – II PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Experiments to illustrate preparation, stabilization, physical and biological evaluation of pharmaceutical products like:
    a. Powders.**(1 Expt)**
    b. Capsules.**(2 Expts)**
    c. Tablets. **(2 Expts)**
    d. Parenterals.**(2 Expts)**
    e. Micro capsules.**(1 Expt)**
2. Evaluation of materials used in pharmaceutical packaging. **(2 Expts)**

BIOPHARMACEUTICS AND PHARMACOKINETICS (BP-474)

Course Code	BP-474	**Weekly Workload:** L-3, P-0	
Name of the Course	BIOPHARMACEUTICS AND PHARMACOKINETICS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40Hrs: 3 Hrs / Week)

1. **Introduction:** Introduction to biopharmaceutics and pharmacokinetics and their role in formulation development and clinical setting. **(2 Hrs)**

2. **Absorption of Drugs:** Passage of drugs across biological barrier (passive diffusion, active transport, facilitated diffusion and pinocytosis), factors influencing absorption – physicochemical, physiological and pharmaceutical. **(4 Hrs)**

3. **Drug Distribution:** Drug distribution in the body, apparent volume of distribution, plasma proteinbinding, kinetics of plasma protein binding. **(4 Hrs)**

4. **Drug Excretion:** Concept of clearance, mechanism of renal clearance, clearance ratio, determination of renal clearance, extraction ratio, hepatic clearance, biliary excretion, extra hepatic circulation.**(5Hrs)**

5. **Pharmacokinetics:** Significance of plasma drug concentration measurement. Compartment model – definition and scope, pharmacokinetics of drug absorption - zero order and first order absorption rate constant using Wagner-Nelson and Loo-Reigelman method, volume of distribution and distribution coefficient. **(6Hrs)**

6. **Compartment Modelling:** One compartment and two compartment models, determination of pharmacokinetic parameters from plasma and urine data after drug administration by intravascular andoral route, curve fitting, method of residuals, regression procedures. **(8 Hrs)**

7. **Non-Linear Pharmacokinetics:** Causes of non-linearity, Michaelis-Menten equation, determination of V_{max} and T_{max}, detection of non-linearity (saturation mechanism). **(3 Hrs)**

8. **Clinical Pharmacokinetics:** Definition and scope, dose adjustment in patient with and without renal and hepatic failure, Pharmacokinetic drug interaction and their signification in combination therapy.**(4 Hrs)**

9. **Bioavailability and Bioequivalence:** Measures of bioavailability, C_{max}, t_{max} and Area Under Curve (AUC). Design of single dose bioequivalence studies and relevant statistics. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Rowland M and Tozer TN. Clinical Pharmacokinetics: Concept& Application. New York: Lea & Febiger.
2. Shargel L. Applied Biopharmaceutics & Pharmacokinetics. Singaproe: McGraw Hill.
3. Gibaldi M. Biopharmaceutics & Pharmacokinetics. New York: Lea & Febiger.
4. Swarbrick J. Biopharmaceutics. New York: Lea & Febiger.
5. Brahmankar DM, Jaiswal SB. Biopharmaceutics and Pharmacokinetics - A Treatise. New Delhi: Vallbah Prakashan.

BIOPHARMACEUTICS AND PHARMACOKINETICS PRACTICAL (BP-474P)

Course Code	BP-474P	**Weekly Workload:** L-0, P-3	
Name of Course	BIOPHARMACEUTICS AND PHARMACOKINETICS PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Experiments designed for the estimation of various pharmacokinetic parameters with given data. **(2 Expts)**
2. Analysis of biological specimens for drug content and estimation of the pharmacokinetic parameters. **(2 Expts)**
3. *In vitro* evaluation of different dosage forms for drug release. **(2 Expts)**
4. Absorption studies: *in vitro* and *in situ*. **(2 Expts)**
5. Statistical treatment of pharmaceutical data. **(2 Expts)**

COMMUNICATION SKILLS (BP-475)

Course Code	BP-475	**Weekly Workload:** L-3, P-0	
Name of the Course	COMMUNICATION SKILLS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Reading Skills:** The skill of effective reading-eye movements, fixations, regression, and visual wandering, the right approach to reading, factors, affecting the style of reading – reader related material related and environmental, Memory, retention, association of read material.**(4 Hrs)**

2. **Kinds of Reading:** Introduction to phonetics- familiarization with speech sounds and their symbols – articulation of speech sounds- stress and intonation.**(3 Hrs)**

3. **Grammar:** word building use of punctuation marks, articles, tenses, abbreviations, prepositions, idioms, and phrase transformation of sentences, incorrect to correct English, single word for a group of words.**(7 Hrs)**

4. **Business Letter-Writing:** Principles, structure and style of writing business letters i.e., sales letters, claim and adjustment letters, inviting quotations/tenders, writing a memo, job application letters, preparing personal resume. **(4 Hrs)**

5. **Effective Meetings:** Qualities i.e. planning, processing the discussion, conducting a meeting , use of different type of questions, summaries, handling problem situations and problem people, writing notices, agenda and minutes of meeting. **(3 Hrs)**

6. **Report Writing:** Characteristics, types of reports, structure of technical/research reports, preparatory steps to report writing. **(2 Hrs)**

7. **Elements of Style:** Definition of style, characteristics of good technical style- practical hints to improve the style of writing; precise writing; Comprehension of passages(May be picked up from the books recommended for reading).**(5 Hrs)**

8. **Listening Skills:** Barriers to listening, effective listening and feedback skills; Telephone techniques- Considerations of listening and voice, developing telephone skills- preparing for the call, follow up action. Handling difficult calls and difficult callers.**(5 Hrs)**

9. **Skills of Effective Speaking:** Preparation i.e., deciding the objective, preparing the environment, organizing the material, selection of words, voice modulation, speed, expression, body language, dealing with questions, dealing with nervousness, presentation of audio-visual aids.**(4 Hrs)**

10. **Group Discussion Skills:** The art of participating in group discussion i.e., initiative, cooperation with group members, analysis of the issue, putting one's views effectively, establishing leadership.**(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Vikram K Das, Kalyani Samantray. Introduction to Professional English and Soft Skills. New Delhi: Cambridge Press.
2. Technical Report Writing. London: British Association for Commercial and Industrial Education.
3. Wright C. (Ed). Handbook of Practical Communication Skills. New Delhi: JAICO Books.
4. Sinha KK. Business Communication. New Delhi: Galgotia Publishing Company.
5. Common Errors in English. New Delhi: Sudha Publications.
6. Hashem A. Common Errors in English. New Delhi: Ramesh Publishing House.
7. Objective English. New Delhi: Tata McGraw Hill Publishing Co.
8. Bansal RK, Harrison JB. Spoken English for India, Hyderabad: Orient Longman.
9. Kumar V. The Sounds of English. New Delhi: Makaav Education Software.
10. Sharma RC, Krishna Mohan. Business Correspondence and Report Writing. New Delhi: Tata McGraw Hill.
11. Group Discussion. New Delhi: Sudha Publications.

COMMUNICATION SKILLS PRACTICAL (BP-475P)

Course Code	BP-475P	**Weekly Workload:** L-0, P-3	
Name of Course	COMMUNICATION SKILLS PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Word processing of documents. **(1 Expt)**
2. Report writing. **(1 Expt)**
3. Preparing agenda for meeting. **(1 Expt)**
4. Preparing minutes of the meetings/seminars. **(1 Expt)**
5. Preparing press releases / advertisements. **(1 Expt)**
6. Preparing a brochure. **(1 Expt)**
7. Preparing a power point slide show on a PC. **(1 Expt)**
8. Group discussion tasks / Seminars. **(3 Expts)**

HIMACHAL PRADESH TECHNICAL UNIVERSITY, HAMIRPUR

COURSE: B. PHARMACY

DETAILED SYLLABUS

SEMESTER-VIII

INSTRUMENTAL METHODS OF ANALYSIS (BP-481)

Course Code	BP-481	**Weekly Workload:** L-3, P-0	
Name of the Course	INSTRUMENTAL METHODS OF ANALYSIS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **UV-Visible Spectroscopy:** Brief review of electromagnetic spectrum, UV-Visual range, Interaction of electro-magnetic radiation (UV-Vis) and matter and its effects, Instrumentation, Pharmaceutical applications.**(6 Hrs)**
2. **Infra-Red Spectroscopy:** Nature of Infra-red radiation, Interaction of IR radiation with organic molecules and effects on bonds, principle, brief outline of classical IR instrumentation, applications. **(6 Hrs)**
3. **Nuclear Magnetic Resonance Spectroscopy (NMR):** Principles of NMR, Instrumentation, Applications. **(6 Hrs)**
4. **Mass Spectrometry:** Principle, instrumentation, mass spectrum, types of peaks and its characteristics, applications of mass spectrometry. **(6 Hrs)**
5. **Emission Spectroscopy:** Principle, basic instrumentation, interpretation of spectra and pharmaceutical applications of fluorimetry and flame photometry. **(4 Hrs)**

6. **Atomic Absorption Spectroscopy:** The theoretical aspects, instrumentation, interpretation of spectra, and applications of atomic absorption spectroscopy.**(2 Hrs)**
7. **X-Ray Diffraction:** The theoretical aspects, instrumentation, interpretation of spectra, and applications of X-ray diffraction in pharmacy. **(3 Hrs)**
8. **Radio Immuno Assay (RIA):** The theoretical aspects, instrumentation, and diagnostic, medical and pharmaceutical applications of RIA. **(3 Hrs)**
9. **Analytical Validation and Quality Management:** Interpretation of analytical data, validation of analytical procedures, TQM, quality review, regulatory control. **(4 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Lee, DC. Pharmaceutical Analysis. London: Blackwell.
2. Indian Pharmacopoeia. New Delhi: Ministry of Health and Family Welfare.
3. Willard HH, Merritt LL, Dean JA. Instrumental Methods of Analysis. New Delhi: CBS Publishers.
4. Ewing GW. Instrumental Methods of Chemical Analysis. Singapore: McGraw Hill.
5. Schirmer RE. Modern Methods of Pharmaceutical Analysis. Vol 1 & 2. Pennsylvania: Franklin Book Co.
6. Kemp W. Organic Sepctroscopy: London: ELBS / WH Freeman & Co.
7. Munson JW. Pharmaceutical Analysis: Modern Methods. Part A & B. New York: Marcel Dekker.

INSTRUMENTAL METHODS OF ANALYSIS PRACTICAL (BP-481P)

Course Code	BP-481P	**Weekly Workload:** L-0, P-3	
Name of Course	INSTRUMENTAL METHODS OF ANALYSIS PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Quantitative estimation of formulations containing single / multiple drugs by UV Visible spectrophotometry. **(4 Expts)**
2. Estimation of Na^+, K^+, Ca^+ ions by flame photometry. **(2 Expts)**
3. Interpretation of IR spectra of compounds with different functional groups such as –COOH, -COOR, -CONHR, $-NH_2$, -OH. **(2 Expts)**
4. Interpretation of structure of 3-4 simple organic compounds using UV, IR, NMR and MS. **(2 Expts)**

NOVEL DRUG DELIVERY SYSTEMS (BP-482)

Course Code	BP-482	**Weekly Workload:** L-3, P-0	
Name of the Course	NOVEL DRUG DELIVERY SYSTEMS		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Introduction:** Fundamental concepts of controlled release. **(3 Hrs)**
2. **Modified Release Oral Drug Delivery Systems:** Principle, formulation, evaluation of osmotic pumps, pH controlled, ion exchange controlled and diffusion controlled systems. **(7 Hrs)**
3. **Ocular Drug Delivery:** Factors affecting ocular drug absorption, development of ocular drug delivery systems andevaluation with special reference to ocular inserts. **(6 Hrs)**
4. **Buccal Drug Delivery:** Mechanism of mucoadhesion, Bioadhesive polymers, Development of buccaldrug delivery systems, Evaluation techniques. **(7 Hrs)**
5. **Transdermal Drug Delivery:** Permeation through skin, physicochemical factors in drug permeation, permeation enhancers, approaches and technologies for developing transdermal drug delivery systems and their evaluation, Ionotphoresis. **(6 Hrs)**
6. **Particulate Drug Delivery Systems:** Formulation, evaluation and pharmaceutical applications of Liposomes, Niosomes, Resealed Erythrocytes, Microspheres and Nanoparticles.**(11 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Osborne DW, Amann AH. Topical Drug Delivery Formulations. New York: Marcel Dekker.
2. Tyle P. Drug Delivery Devices: Fundamental Applications, New York: Marcel Dekker.
3. Robinson R, Lee VHL. Novel Drug Delivery Systems. New York: Marcel Dekker.
4. Jain NK. Novel and Drug Delivery Systems, New Delhi: CBS Publishers.
5. Bean HS, Becket AH, Carless JE. Advances in Pharmaceutical Sciences. Vol. 5.London: Academic Press.
6. Roseman TJ, Mansdorf SZ. Controlled Release Delivery Systems. New York: Marcel Dekker.

NOVEL DRUG DELIVERY SYSTEMS PRACTICAL (BP-482P)

Course Code	BP-482P	**Weekly Workload:** L-0, P-3	
Name of Course	NOVEL DRUG DELIVERY SYSTEMS PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Dissolution studies of marketed SR product. **(1 Expt)**
2. Preparation and evaluation of microspheres using egg albumin as polymer. **(1 Expt)**
3. Preparation and evaluation of matrix tablets using different polymers. **(2 Expts)**
4. Preparation and evaluation of buccal mucoadhesive tablets. **(1 Expt)**
5. Preparation and evaluation of transdermal films with different polymers. **(2 Expts)**
6. Preparation and evaluation of pH controlled release system using different grades of Eudragits. **(2 Expts)**
7. Preparation of niosomes and evaluation. **(1 Expt)**

QUALITY CONTROL AND QUALITY ASSURANCE (BP-483)

Course Code	BP-483	**Weekly Workload:** L-3, P-0	
Name of the Course	QUALITY CONTROL AND QUALITY ASSURANCE		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs /Week)

1. **Introduction:** An understanding of the concepts of quality assurance, good manufacturing practice and quality control as applied to the pharmaceutical Industry. **(2 Hrs)**

2. **Raw Materials Control:** Raw material, purchase specifications, vendor selection criteria, controls on raw materials. **(3Hrs)**

3. **Manufacturing Quality Control:** Manufacturing controls on dosage forms, manufacturing documents, master formula record, batch formula records, batch packaging records, quality audits of manufacturing processes and facilities. **(6 Hrs)**

4. **In-process Quality Control:** In-process quality controls on various sterile and non-steriledosage forms, standard operating procedures (SOP) for various operations like cleaning, filling, drying, compression, disinfection, fumigation, sterilisation, etc. **(6 Hrs)**

5. **Packaging and Labelling Control:** Packaging and labelling controls, line clearance, reconciliation of labels, cartons and other packaging material.**(3Hrs)**

6. **Validation:** Introduction to validation – concurrent validation, prospective validation and retrospective validation, design, development and process validation methods for pharmaceutical operations involved in production with special reference to tablets, cleaning validation, validation of production equipment and analytical instruments. **(4 Hrs)**

7. **Quality Audit:** Quality control documentation, retention of samples and records, quality audits and quality review. **(2Hrs)**

8. **Drug Regulatory Affairs:** Regulation on manufacture of drugs in India, drug regulatory controls and authorities, requirements of GMP, cGMP, GLP, ISO 9000 series, submission of marketing application for India, US and European markets. **(8 Hrs)**

9. **Performance Evaluation of Pharmaceutical Products:** Biopharmaceutical classification scheme (BCS), federal perspectives on *in vitro* dissolution of immediate release and extended release products, federal perspectives on bioavailability and bioequivalence, *in vitro – in vivo* correlations and bio-waiver. **(6 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Weinberg S. Good Laboratory Practice Regulations. New York: Marcel and Dekker.
2. SwarbrickJ. Encyclopedia of Pharmaceutical Technology. New York: Marcel Dekker.
3. Berry JR, Nash RA. Pharmaceutical Process Validation. New York: Marcel Dekker.
4. Will SH, Stoker JR. Good Manufacturing Practices for Pharmaceutics. New York: Marcel Dekker.
5. Brewer RF. Design of Experiments for Process Improvement and Quality Assurance. New Delhi: Narosa.

Regulatory Guidelines

1. FDA Guidelines. Website: www.fda.gov/cder/guidance/index.htm.
2. Orange Book. Website: www.fda.gov/cder/ob/default.htm.

QUALITY CONTROL AND QUALITY ASSURANCE PRACTICAL (BP-483P)

Course Code	BP-483P	**Weekly Workload:** L-0, P-3	
Name of Course	QUALITY CONTROL AND QUALITY ASSURANCE PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3 Hrs / Week)

Note: Minimum of 10 experiments to be carried out

1. Quality control tests for tablets, capsules, liquid orals, semi-solids (6 Expts)
2. Validation of various instruments used in manufacturing (4 Expts)

INDUSTRIAL PHARMACOGNOSY (BP-484)

Course Code	BP-484	**Weekly Workload:** L-3, P-0	
Name of the Course	INDUSTRIAL PHARMACOGNOSY		
Lectures to be delivered	40 (1 hr each for each semester)		
Semester End Examination	**Max. Time:** 3 hrs.	**Max. Marks:** 70	**Min. Marks:** 35
Continuous Assessment	Based on Sessional Tests (2) 70%, Assignments 10%, Quiz/Seminar 10%, Attendance 10%		**Max. Marks:** 30

INSTRUCTIONS

1. **For Paper Setters:** The question paper will consist of THREE sections A, B and C. Section A will contain THREE Essay Type Questions of 10 marks each. Section B will contain TEN Short Answer Type Questions carrying 5 marks each. Section C will contain FIVE Short Note Type Questions carrying 2 marks each. In this section, all the questions are COMPULSORY. The questions should be normally selected from all the chapters of the subject. The weightage is based on the teaching hours specified against each chapter.
2. **For Candidates:** The candidates are required to attempt ANY TWO questions from Section A, ANY EIGHT questions from Section B. Section C will be compulsory and students have to answer ALL questions from Section C.

Theory (40 Hrs: 3 Hrs / Week)

1. **Chemotaxanomy:** Chemotaxonomy of medicinal plants. **(5 Hrs)**
2. **Aromatic Plants:** Utilization of aromatic plant and derived products with special reference to sandalwood oil, mentha oil, lemongrass oil, vetiver oil, geranium oil and eucalyptus oil. **(4Hrs)**
3. **Herbal Cosmetics:** Raw materials used in herbal cosmetic with reference to Shampoos, conditioners, hair darkeners, skin care. **(5 Hrs)**
4. **Plant Biotechnology:** Historical development of plant tissue culture, types of cultures, nutritional requirements, growth and their maintenance, production of secondary metabolites like shikonin and taxol, biotransformation, immobilization of cells and enzymes, applications of plant tissue culture in pharmacognosy. **(6Hrs)**
5. **Allergens:** Natural allergens, photosensitizing agents and fungal toxins. **(3Hrs)**
6. **Neutraceuticals:** Herbs as health foods. **(4Hrs)**
7. **Herbal Industries:** A Brief account of plant based industries involved in work on Medicinal and Aromatic Plants in India. Utilization and production of phytoconstituents such as quinine, calcium sennosides, podophyllotoxin, diosgenin, solasodine, and tropane alkaloids. **(4Hrs)**
8. **Worldwide Trade of Medicinal Plants:** World-wide trade in medicinal plants and derived products with special reference to diosgenin (disocorea), taxol (taxussps) digitalis, tropane alkaloid containing plants, papain, cinchona, ipecac, liquorice, ginseng, aloe, valerian, rauwolfia and plants containing laxatives. **(6Hrs)**
9. **Intellectual Property Rights:** Plant breeder's rights with special reference to phytoconstituents. **(3 Hrs)**

Books Recommended

Note: Recent editions of the following books to be referred

1. Kalia AN. Textbook of Industrial Pharmacognosy. New Delhi: CBS Publishers.
2. Wealth of India - Raw Materials. New Delhi: NISCAIR.
3. Namdeo A. Medicinal Plant Biotechnology, New Delhi: Career Publications.
4. Veersham C. Medicinal Plant Biotechnology. New Delhi: CBS Publishers.
5. Vyas SP, Dixit VK. Pharmacetical Biotechnology. New Delhi: CBS Publishers.
6. Ramawat KG. Plant Tissue Culture.New Delhi: S Chand & Co.

INDUSTRIAL PHARMACOGNOSY PRACTICAL (BP-484P)

Course Code	BP-484P	**Weekly Workload:** L-0, P-3	
Name of Course	INDUSTRIAL PHARMACOGNOSY PRACTICAL		
Practicals to be Conducted	13 (not less than 10 for each semester)		
Semester End Examination	**Max. Time:** 3 hrs	**Max. Marks:** 50	**Min. Marks: 25**
Continuous Assessment	Lab work 30%, Lab record 25%, Viva 25%, Attendance 20%		**Max. Marks:** 50

INSTRUCTIONS

Laboratory examination will consist of three parts:

a. Performing a practical exercises assigned by the examiner
b. Viva-voce examination
c. Writing synopsis regarding principles / theory behind the experiments

Viva-voce examination will be related to the practicals performed / project executed by the candidate related to the paper during the course of the semester.

List of Experiments (3Hrs/ Week)

Note: Minimum of 10 experiments to be carried out

1. Isolation of some selected phytoconstituents studied in theory. **(4 Expts)**
2. Extraction of volatile oils and their chromatographic profiles. **(3 Expts)**
3. Some experiments in plant tissue culture (Demonstration). **(1 Expt)**
4. Preparation of Herbal Cosmetics. **(2 Expts)**

SYLLABUS

D.Pharm.

ORDINANCE, SCHEME & SYLLABUS FOR DIPLOMA IN PHARMACY

Course Title: Diploma in Pharmacy
Abbreviation: D. Pharm.
Type of Course: A Two years Diploma course
Pattern: Yearly
Award of the Degree: Diploma will be awarded for those passing in both the years as per rules and regulations.

O-D. Ph. 1. DURATION OF THE COURSE: The duration of the course shall be for two academic years, with each academic year spread over a period of not less than one hundred and eighty working days in addition to 500 hours practical training spread over a period of not less than 3 months.

O-D. Ph.2. ELIGIBILITY FOR ADMISSION: No. Candidate shall be admitted to Diploma in Pharmacy Pt. I unless he/she had passed any of the following examinations in all the optional subjects and compulsory subjects (Physics, Chemistry, Biology and /or Mathematics including English as one of the Compulsory subjects):

a) Intermediate examination in Science; The First Year of the three year degree course in Science; 10+2 Examination(Academic stream) in Science;
b) Pre-degree examination; any other qualification approved by the Pharmacy Council of India as equivalent to any of the above exam.

Admission of candidates to the Diploma in Pharmacy Part - I shall be made in order of merit on the basis of 'Pre-Pharmacy Test' conducted in accordance with the scheme of Examinations and syllabus laid-down by the University.

O- D. Ph.3. ELIGIBILITY FOR APPEARING IN EXAMINATION

(a) Eligibility for appearing at the Diploma in Pharmacy Part-I Examination: Only such candidates who produce-certificate from the Head of the Academic Institution in which he/she has undergone the Diploma in Pharmacy Part-I course, in proof of his/her having regularly and satisfactorily undergone the course of study by attending not less than 75% of the classes held both in theory and in practical separately in each, shall be eligible for appearing at the Diploma in Pharmacy (Part-I) examination.
(b) Eligibility for appearing at the Diploma in Pharmacy Part-II Examination: Only such candidates who produce certificate from the Head of the academic institution in which he/she has undergone the Diploma in Pharmacy Part-II course, in proof of his/her having regularly and satisfactorily attending not less than 75% of the classes held both in theory and practicals separately in each subject, shall be eligible for appearing at the Diploma in Pharmacy (Part-II) examination.
(c) A candidate can have a relaxation of 10% attendance on medical ground by producing a certificate from medical officer of government hospital and a 5% relaxation by the vice chancellor on the recommendation of Dean, faculty.

O-D. Ph. 4.GENERAL

(A) **Course of Study**: The course of study for Diploma in Pharmacy part-I and Diploma in pharmacy part-II shall include the subjects as given in the Tables I & II below. The number of hours devoted to each subject for its teaching is given against columns 2 and 3 of the Tables below.

TABLE-I Diploma in Pharmacy (Part-I)

Subject	Theory		Practical	
	hours /year	Hrs. / week	hours /year	Hrs. / week
Pharmaceutics-I	75	3	100	4
Pharmaceutical Chemistry-I	75	3	75	3
Pharmacognosy	75	3	75	3
Biochemistry & Clinical Pathology	50	2	75	3
Human Anatomy & Physiology	75	3	50	2
Health Education & community pharmacy	50	2		
	400	16	375	15

TABLE-II Diploma in Pharmacy (Part-II)

Subject	Theory		Practical	
	hours /year	Hrs. / week	hours /year	Hrs. / week
Pharmaceutics-II	75	3	100	4
Pharmaceutical Chemistry-II	100	4	75	3
Pharmacology & Toxicology	75	3	50	2
Pharmaceutical Jurisprudence	50	2	-	
Drug store and Business Management	75	3	-	
Hospital & Clinical Pharmacy	75	3	50	2
	450	18	275	11

(b) Examinations: There shall be an examination for Diploma in Pharmacy (part-I) to examine students of the first year course and an examination for Diploma in Pharmacy (part-II) to examine students of the second year course. Each examination may be held twice every year. The first examination in every year shall be the annual examination and the second examination shall be supplementary examination of the Diploma in Pharmacy (part-I) or Diploma in pharmacy (Part-II)as the case may be. The examinations shall be of written and practical (including oral) nature. Carrying maximum marks for each part of subject, as indicated in Table III and IV:R-29(A) (Plan and scheme of examination for Diploma in Pharmacy).

O-D. Ph.5. PRACTICAL TRAINING

Diploma in Pharmacy (Part-III)

(a) Period and other conditions of practical training:

After having appeared in Part-II examination of Diploma in Pharmacy conducted by Board/University or other approved examination Body or any other course accepted as being equivalent by the Pharmacy Council of India, a candidate shall be eligible to undergo practical training in one or more of the following institutions namely:

Hospitals/Dispensaries run by Central/State Government/Municipal corporations/ central Government Health scheme and Employees state Insurance scheme. A pharmacy, chemist and Druggist licensed under the Drugs and cosmetics Rules, 1945 made under the Drugs and Cosmetics Act,1940(23 of 1940). The institutions referred in sub-regulation(1)shall be eligible to impart training subject to the condition that the number of student pharmacists that may be taken in any Hospital, pharmacy, Chemist and Druggist licensed under the Drugs and cosmetics Rules,1945 made under the

Drugs and cosmetics Act,1940 shall not exceed two where there is one registered pharmacist engaged in the work in which the student pharmacist is under going practical training, where there is more than one registered pharmacist similarly engaged, the number shall not exceed one for each additional such registered pharmacist. Hospital and Dispensary other than those specified in sub-regulation(1)for the purpose of giving practical training shall have to be recognized by pharmacy council of India on fulfilling the conditions specified in Appendix-D to these regulations.

In the course of practical training, the trainees shall have exposure to: Working knowledge of keeping of records required by various acts concerning the profession of pharmacy and Practical experience in the manipulation of pharmaceutical apparatus in common use, the reading, translation and copying of prescription including checking of dose, the dispensing of prescriptions illustrating the commoner methods of administering medicaments; the storage of drugs and medical preparations. The practical training shall be not less than five hundred hours spread over a period of not less than three months provided that not less than two hundred and fifty hours and devoted to actual dispensing of prescriptions.

(b) **Procedure to be followed prior to commencing of the training**:

The head of the academic training institution, shall supply application in triplicate in' Practical Training Contract Form for Qualification as pharmacist' to candidate eligible to under-take the said practical training, the contract form shall be as specified in Appendix-E to these regulations.

The head of an academic training institution shall fill section I of the contract Form. The trainee shall fill section II of the said contract Form and the Head of the institution agreeing to impart the training (hereinafter referred to as the Apprentice Master) shall fill section III of the said contract Form.

It shall be the responsibility of the trainee to ensure that one copy (hereinafter referred to as the first copy of the contract Form)so filled is submitted to Head of the academic training institution and the other two copies(hereinafter referred to as the second copy and the third copy)shall be filled with Apprentice Master(if he so desires)or with the trainee pending completion of the training.

(c) Certificate of Passing Diploma in Pharmacy(part-III) on satisfactory completion of the apprentice period, the Apprentice Master shall fill Section IV of the second copy and third copy of contract form and cause it to be sent to the head to the academic training institution who shall suitably enter in the first copy of the entries from the second copy and third copy and shall fill section V of the three copies of contract form and thereafter handover both the second copy and the third copy to the trainee. Thus, if completed in all respect, shall be regarded as a certificate of having successfully completed the course of Diploma in Pharmacy (part-III).

O-D. Ph.6. Working out of Result

(a) Mode of examinations:

Each theory and practical examination in the subject mentioned in Table-III and IV shall be of three hours duration. A candidate who fails in theory or practical examination shall reappear in such theory or practical paper(s) as the case may be. Practical examination shall also consist of viva voce (oral) examination.

(b) Award of sessional marks and maintenance of records:

A regular record of both theory and practical class work and examinations conducted in an institution imparting training for Diploma in Pharmacy Part-I and Diploma in pharmacy Part-II courses, shall be maintained for each student in the institution and 20 marks for each theory and 20 marks for each practical subject shall be allotted as sessional.

There shall be at least three periodic sessional examinations during each academic year. The highest aggregate of any two performances shall form the basis of calculating sessional marks.

The sessional marks in practicals shall be allotted on the following basis:

Actual performance in the sessional examination. 10

Day to day assessment in the practical class work. 10

(c) Minimum marks for passing the examination: A student shall not be declared to have passed Diploma in Pharmacy examination unless he/she secures atleast 40% marks in each of the subject separately in theory examination, including sessional marks and atleast 40% marks in each of the practical examination including sessional marks. The candidates securing 60% marks or above in aggregate in

all subjects in a single attempt at the Diploma in Pharmacy (part-I)or Diploma in Pharmacy(part-II)examinations shall be declared to have passed in first class the Diploma in Pharmacy(part-I)of Diploma in Pharmacy (part-II)examinations, as the case may be. Candidates securing 75% marks or above in any subject or subjects provided he/she passes in all the subjects in single attempt, will be given distinction in that subjects(s).

(d) Eligibility for Promotion to Diploma in Pharmacy (Pt. II): All candidates who have appeared for all the subjects and passed the Diploma in pharmacy part-I class. However failure in more than two subjects (each Theory paper or practical examination shall be considered as a subject) shall debar him/her from promotion to the Diploma in Pharmacy Part-II class. Such candidates shall be examined in the failing subjects only at subsequent. A candidate who fails to pass D Pharm Part - I exam. in four attempts shall not allowed to continue the course.

(e) Improvement of sessional marks: Candidates who wish to improve sessional marks can do so by appearing in two additional sessional examinations during the next academic year. The average score of the two examinations shall be the basis for improved sessional marks in theory. The sessional of practicals shall be improved by appearing in additional practical examinations. Marks awarded to a candidate for day to day assessment in the practical class, can not be improved unless he/she attends regular course of study again.

(f) Certificate of passing examination for Diploma in Pharmacy (part-II): Certificate of having passes the examination for the Diploma in pharmacy Part-II shall be granted by the Examining Authority to a successful student.

(g) Certificate of Diploma in Pharmacy: A certificate of Diploma in pharmacy shall be granted by the Examining Authority to successful candidate on producing certificate of having passed the Diploma in Pharmacy part-I and Part-II and satisfactory completion of practical training for Diploma in pharmacy (part-III).

(h) The chairman and at least one expert member of examining committee of the Examining Authority Concerned with appointment of examiners and conduct of pharmacy examination should be persons possessing pharmacy Qualifications.

PLAN AND SCHEME OF EXAMINATION FOR THE DIPLOMA IN PHARMACY

(Based on effective teaching for 180 working days in one academic session)

Table-III Diploma in pharmacy (part-I) Examination

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	Sessional	Total	Examination	Sessional	Total
Pharmaceutics-I	80	20	100	80	20	100
Pharmaceutical Chemistry-I	80	20	100	80	20	100
Pharmacognosy	80	20	100	80	20	100
Biochem. & Clinical Pathology	80	20	100	80	20	100
Human Anatomy & Physiology	80	20	100	80	20	100
Health Education & community pharmacy	80	20	100			
			600			500

TABLE-IV Diploma in Pharmacy (Part-II)

Subject	Max. Marks in Theory			Max. Marks in Practical		
	Examination	Sessional	Total	Examination	Sessional	Total
Pharmaceutics-II	80	20	100	80	20	100
Pharmaceutical Chemistry-II	80	20	100	80	20	100
Pharmacology & Toxicology	80	20	100	80	20	100
Pharmaceutical Jurisprudence	80	20	100			
Drug store and Business Management	80	20	100			
Hospital & Clinical Pharmacy	80	20	100	80	20	100
			600			400

Note: Each paper shall consist of six questions out of which five shall be attempted. Half of the total number of papers in each year will be set and assessed by external examiners and the remaining half will be set and assessed by the internal examiners. There shall be one external and one internal examiner for each practical Examination.

SYLLABUS

DIPLOMA IN PHARMACY (PART-I)

1.1 PHARMACEUTICS I

Theory (75 Hours)

Introduction of different dosage forms. Their classification with examples-their relative applications. Familiarization with new drug delivery systems. Introduction to Pharmacopoeias with special reference to the Indian Pharmacopoeia.

Metrology-System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products .Use of alligation method in calculations .Isotonic solutions.

Packaging of pharmaceuticals-Desirable features of a container and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits. Introduction to aerosol packaging.
Size reduction, objectives, and factors affecting size reduction, methods of size reduction- study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.

Size separation-size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

Mixing and Homogenization-Liquid mixing and powder mixing, Mixing of semisolids. Study of silverson Mixer-Homogenizer, planetary Mixer; Agitated powder mixer; Triple Roller Mill; Propeller Mixer, colloid Mill and Hand Homogeniser. Double cone mixer.

Clarification and Filtration-Theory of filtration, Filter media; Filter aids and selection of filters. Study of the following filtration equipments-Filter Press, sintered filters, Filter candles, Metafilter.

Extraction and Galenicals-
(a) Study of percolation and maceration and their modification, continuous hot extraction-Application in the preparation of tinctures and extracts.
(b) Introduction to Ayurvedic dosage forms.
Heat process-Evaporation-Definition-Factors affecting evaporation-study of evaporating still and Evaporating pan.

Distillation-Simple distillation and Fractional distillation, steam distillation and vacuum distillation. Study of vacuum still, preparation of purified water I.P. and water for Injection I.P. construction and working of the still used for the same.

Introduction to drying process-Study of Tray Dryers; Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer.

Sterilization-Concept of sterilization and its differences from disinfection-Thermal resistance of microorganisms. Detailed study of the following sterilization process.
Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and Gaseous sterilization.

Aseptic techniques-Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

Processing of Tablets-Definition; different type of compressed tables and their properties. Processes involved in the production of tablets; Tablets excipients ; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; films coating, enteric coating and micro-encapsulation (Tablet coating may be de.. in an elementary manner).

Processing of Capsules-Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules.

Study of immunological products like sera, vaccines, toxoids & their preparations.

PRACTICAL (100 hours)

Preparation (minimum number stated against each of the following categories
illustrating different techniques involved.
1. Aromatic waters3
2. Solutions 4
3. Spirits2
4. Tinctures4
5. Extracts2
6. Creams2
7. Cosmetic preparations3
8. Capsules2
9. Tables2
10. Preparations involving2
11. Opthalmic preparations2
12. Preparations involving aseptic techniques2

Books recommended:(Latest editions)
1.) Remington's Pharmaceutical Sciences.
2.) The Extra Pharmacopoeia-Martindale.

1.2 PHARMACEUTICAL CHEMISTRY-I

THEORY (75 Hours)

General discussion on the following inorganic compounds including important physical and chemical properties, medicinal and pharmaceutical uses, storage conditions and chemical incompatibility.

Acids, bases and buffers-Boric acid, Hydrochloric acid, Strong Ammonium hydroxide, Sodium hydroxide and official buffers.

Antioxidants- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

Gastrointestinal agents-
Acidifying agents- Dilute Hydrochloric acid.
Antacids- Sodium bicarbonate, Aluminum hydroxide gel, Aluminum phosphate, Calcium carbonate, Magnesium carbonate, Magnesium trisilicate, Magnesium oxide, Combinations of antacid preparations.
Protective and Adsorbents- Bismuth sub carbonate and Kaolin.
Saline cathartics- Sodium potassium tartrate and Magnesium sulphate.

Topical Agents-
Protective- Talc, Zinc Oxide, Calamine, Zinc stearate, Titanium dioxide, silicone polymers.

Antimicrobials and Astringents- Hydrogen peroxide*, Potassium permanganate, Chlorinated lime, Iodine, Solutions of Iodine, Povidone-iodine, Boric acid, Borax, Silver nitrate, Mild silver protein, Mercury yellow, Mercuric oxide, Ammoniated mercury.
Sulphur and its compounds- Sublimed sulphur, Percipitated sulphur, Selenium sulphide.
Astringents- Alum and Zinc Sulphate.

Dental Products- Sodium fluoride, Stannous fluoride, Calcium carbonate, Sodium meta phosphate, Di-calcium phosphate ,Strontium chloride, Zinc chloride.
Inhalants- Oxygen, Carbon dioxide, Nitrous oxide.

Respiratory stimulants- Ammonium carbonate.

Expectorants and Emetics-Ammonium chloride*, Potassium iodide, Antimony potassium tartrate.

Antidotes- Sodium nitrite.

Major Intra and Extra cellular electrolytes-
Electrolytes used for replacement therapy- Sodium chloride and its preparations, Potassium chloride and its preparations.
Physiological acid-base balance and electrolytes used- Sodium acetate, Potassium Acetate, Sodium bicarbonate Inj., Sodium citrate, Potassium citrate, Sodium lactate injection, Ammonium chloride and its injection.

Combination of oral electrolyte powders and solutions.

Inorganic official compounds of Iron, Iodine and Calcium, Ferrous Sulphate and Calcium Gluconate.

Radio pharmaceuticals and contrast media- Radio activity-Alpha; Beta and Gamma Radiations, Biological effects of radiations, Measurement of radio activity, G.M. Counter, Radio isotopes-their uses, Storage and precautions with special reference to the official preparations. Radio opaque contrast media-Barium sulfate.

Quality control of Drugs and pharmaceuticals-Importance of quality control, significant errors, methods used for quality control, sources of impurities in pharmaceuticals. Limit tests for Arsenic, Chloride, Sulfate, Iron and Heavy metals.

Identification tests for cations and anions as per Indian Pharmacopoeia.

PRACTICAL (75 hours)

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals.
2. Limit test for chloride, Sulfate, Arsenic, Iron and Heavy metals.
3. Assay of inorganic pharmaceuticals involving each of the following methods of compounds marked with (*) under theory.
    i. Acid-Base titrations(at least 3)
    ii. Redox titrations (one each of permanganometry and iodimetry).
    iii. Precipitation titrations (at least 2)
    iv. Complexometric titration (Calcium and Magnesium).

Books recommended (Latest editions)
1. Indian pharmacopoeia.

1.3 PHARMACOGNOSY

THEORY (75 Hours)

1. Definition, history and scope of Pharmacogonosy including indigenous system of medicine.
2. Various systems of classification of drugs and natural origin.
3. Adulteration and drug evaluation; significance of pharmacopoeial standards.
4. Brief outline of occurrence, distribution, outline of isolation, identification tests, therapeutic effects and pharmaceutical application of alkaloids, terpenoids, glycosides, volatile oils, tannins and resins.
5. Occurrence, distribution, organoleptic evaluation, chemical constituents including tests wherever applicable and therapeutic efficacy of following categories of drugs.

(a) Laxatives- Aloes, Rhubarb, Castor oil, Ispaghula, Senna.
(b) Cardiotonics- Digitalis, Arjuna.
(c) Carminatives & G.I. regulators- Umbelliferous fruits, Coriander, Fennel, Ajowan, Cardamom, Ginger, Black pepper , Asafoetida, Nutmeg, Cinnamon, Clove.
(d) Astringents- Catecheu.
(e) Drugs acting on nervous system- Hyoscyamus, Belladonna, Aconite, Ashwagandha, Ephedra, Opium, Cannabis, Nux -vominca.
(f) Antihypertensive- Rauwolfia.
(g) Antitussives- Vasaka, Tolu balsam, Tulsi.
(h) Antirheumatics- Guggal, Colchicum.
(i) Antitumour- Vinca.
(j) Antileprotics- Chaulmoogra oil.
(k) Antidiabetics- Pterocarpus, Gymnema sylvestro.
(l) Diuretics- Gokhru, Punarnava.
(m) Antidysenterics- Ipecacuanha.
(n) Antiseptics and disinfectants- Benzoin, Myrrh, Neem, Curcuma.
(o) Antimalarials- Cinchona.
(p) Oxytocics- Ergot.
(q) Vitamins- Shark liver oil and Amla.
(r) Enzymes- Papaya, Diastase, Yeast.
(s) Perfumes and flavoring agents- peppermint oil, Lemon oil, Orange oil, lemon grass oil, sandal wood.

Pharmaceutical aids-Honey, Arachis oil, starch, kaolin, pectin, olive oil. Lanolin, Beeswax, Acacia, Tragacanth, sodium Alginate, Agar, Guar
gum, Gelatin.

Miscellaneous- Liquorice, Garlic, picrorhiza, Dirscorea, Linseed, shatavari, shankhpushpi, pyrethrum, Tobacco.

Collection and preparation of crude drugs for the market as exemplified by Ergot, opium, Rauwalfia, Digitalis, senna.

Study of source, preparation and identification of fibers used in sutures and surgical dressings-cotton ,silk, wool and regenerated fibers.

Gross anatomical studies of-senna , Datura, cinnamon, cinchona, fennal, clove, Ginger, Nuxvomica & ipecacuanha.

PRACTICAL (75 hours)

1. Identification of drugs by morphological characters. Physical and chemical tests for evaluation of drugs wherever applicable.
2. Gross anatomical studies(t.s.)of the following drugs :Senna, Datura, cinnamon, cinchona, coriander, fennel , clove, Ginger, Nux-vomica, Ipecacuanha.
3. Identification of fibers and surgical dressing.

1.4 BIOCHEMISTRY AND CLINICAL PATHOLOGY

THEORY (50 Hours)

Introduction to biochemistry. Brief chemistry and role of proteins, polypeptides and amino acids, classification, Qualitative tests, Biological value, Deficiency diseases.
Carbohydrates: Brief chemistry and role of carbohydrates, classification, qualitative tests, Diseases related to carbohydrate metabolism.
Lipids: Brief chemistry and role of lipids, classification and qualitative tests. Diseases related to lipids metabolism.
Vitamins: Brief chemistry and role of vitamins and coenzymes. Role of minerals and water in life processes.
Enzymes: Brief concept of enzymatic action. factors affecting it.
Therapeutics: Introduction to pathology of blood and urine. Lymphocytes and platelets, their role in health and disease. Erythrocytes-Abnormal cells and their significance. Abnormal constituents of urine and their significance in diseases.

PRACTICAL (75 Hours)

1. Detection and identification of proteins. Amino acids, carbohydrates and lipids.
2. Analysis of normal and abnormal constituents of Blood and Urine (Glucose, urea, creatine, cretinine, cholesterol, alkaline phosphatatase acid phosphatase, Bilirubin, SGPT, SGOT, calcium, Diastase, Lipase).
3. Examination of sputum and faeces (microscopic & staining).
4. Practice in injecting drugs by intramuscular, subcutaneous and intravenous routes, withdrawal of blood samples.

1.5 HUMAN ANATOMY AND PHYSIOLOGY

THEORY(75 Hours)

Scope of Anatomy and physiology. Definition of various terms used in Anatomy. Structure of cell, function of its components with special reference to mitochondria and microsomes.

Elementary tissues: Elementary tissues of the body, i.e. epithelial tissue, muscular tissue, connective tissue and nervous tissue.

Skeltal System: Structure and function of Skelton .Classification of joints and their function. Joint disorders.

Cardiovascular System: Composition of blood, functions of blood elements. Blood group and coagulation of blood. Brief information regarding disorders of blood. Name and functions of lymph glands. Structure and functions of various parts of the heart .Arterial and venous system with special reference to the names and positions of main arteries and veins. Blood pressure and its recording. Brief information about cardiovascular disorders.

Respiratory system: Various parts of respiratory system and their functions, physiology of respiration.

Urinary System: Various parts of urinary system and their functions, structure and functions of kidney. Physiology of urine formation. Patho-physiology of renal diseases and edema.

Muscular System: Structure of skeletal muscle, physiology of muscle contraction. Names, positions, attachments and functions of various skeletal muscles. physiology of neuromuscular junction.

Central Nervous System: Various parts of central nervous system, brain and its parts, functions and reflex action. Anatomy and physiology of automatic nervous system.

Sensory Organs: Elementary knowledge of structure and functions of the organs of taste, smell, ear, eye and skin. Physiology of pain.

Digestive System: names of various parts of digestive system and their functions. structure and functions of liver, physiology of digestion and absorption.

Endocrine System: Endocrine glands and Hormones. Location of glands, their hormones and functions. pituitary, thyroid. Adrenal and pancreas

Reproductive system: Physiology and Anatomy of Reproductive system.

PRACTICALS (50 hours)

1. Study of the human Skelton.
2. Study with the help of charts and models of the following system and organs:

Digestive system	Respiratory system	Ear
Cardiovascular system	Urinary system	
Reproductive system	Eye	

3. Microscopic examination of epithelial tissue, cardiac muscle, smooth muscle, skeletal muscle. Connective tissue and nervous tissues.
4. Examination of blood films for TLC.DLC and malarial parasite.
5. Determination of RBCs, clotting time of blood, erythrocyte sedimentation rate and Hemoglobin value.
6. Recording of body temperature, pulse, heart-rate, blood pressure and ECG.

1.6 HEALTH EDUCATION AND COMMUNITY PHARMACY

THEORY (50 hours)

Concept of health: Definition of physical health, mental health, social health, spiritual health determinants of health, indicatory of health, concept of disease, natural history of diseases, the disease agents, concept of prevention of diseases.
Nutrition and health: Classification of foods, requirements, diseases induced due to deficiency of proteins, vitamins and minerals-treatment and prevention.
Demography and family planning: Demography cycle, fertility, family planning, contraceptive methods, behavioral methods, natural family planning methods, chemical methods, mechanical methods, hormonal contraceptives, population problem of India.
First aid: Emergency treatment in shock, snake-bite, burns, poisoning, heart disease, fractures and resuscitation methods, Elements of minor surgery and dressings.
Environment and health: Source of water supply, water pollution, purification of water, health and air, noise, light-solid waste disposal and control-medical entomology, arthropod borne diseases and their control. rodents, animals and diseases.
Fundamental principles of microbiology: Classification of microbes, isolation, staining techniques of organisms of common diseases.
Communicable diseases: Causative agents, mode of transmission and prevention. Respiratory infections-chicken pox, measles, influenza, diphtheria, whooping cough and tuberculosis.
Intestinal infection-poliomyelitis, Hepatitis, cholera, Typhoid, food poisoning, Hookworm infection.
Arthropod borne infections-plague, Malaria, filariases.
Surface infection-Rabies, Tranchoma, Tetanus, Leprosy.
Sexually transmitted diseases-Syphilis, Gonorrhoea, AIDS.
Non-communicable diseases: causative agents, prevention, care and control.
Epidemiology: Its scope, methods, uses, dynamics of disease transmission. Immunity and immunization: Immunological products and their dose schedule. Principles of disease control and prevention, hospital acquired infection, prevention and control. Disinfection, types of disinfection procedures, for-faces, urine, sputum, room linen, dead-bodies, instruments.

2.1 PHARMACEUTICS II
(Dispensing Pharmacy)

THEORY (75 Hours)

Prescriptions-Reading and understanding of prescriptions; Latin terms commonly used (Detailed study is not necessary), Modern methods of prescribing, adoption of metric system. Calculations involved in dispensing.
Incompatibilities in prescriptions- study of various types of incompatibilities-physical, chemical and therapeutic.
Posology- Dose and dosage of drugs, factors influencing dose, calculations of doses on the basis of age, sex, surface area and veterinary doses.
Dispensed Medications: (Note: A detailed study of the following dispensed medication is necessary. Methods of preparation with theoretical and practical aspects, use of appropriate containers and closures. special labeling requirements and storage conditions should be high-lighted).
Powders-Type of powders-Advantages and disadvantages of powders, Granules, cachets and tablet triturates. preparation of different types of powders encountered in prescriptions. Weighing methods, possible errors in weighing, minimum weighable amounts and weighing of a material below the minimum weighable amount, geometric dilution and proper usage and care of dispensing balance.

Liquid oral Dosage forms:
Monophasic-Theoretical aspects including commonly used vehicles, essential adjuvant like stabilizers, colorants and flavors, with examples.
Review of the following monophasic liquids with details of formulation and practical methods. Liquids for internal administration Liquids for external administration or used on mucous membranes
Mixtures and concentrates, Gargles

Syrups Mouth washes	Throat-paints	Elixirs
Douches	Ear Drops	Nasal drops
Sprays	Liniments	Lotions.

Biphasic Liquid Dosage Forms:
Suspensions (elementary study)-Suspensions containing diffusible solids and liquids and their preparations. Study of the adjuvant used like thickening agents, wetting agents, their necessity and quantity to be incorporated ,suspensions of precipitate forming liquids like tinctures, their preparations and stability. suspensions produced by chemical reaction. An introduction to flocculated /non-flocculated suspension system.
Emulsions-Types of emulsions, identification of emulsion system, formulation of emulsions, selection of emulsifying agent. Instabilities in emulsions, preservation of emulsions.

Semi-Solid Dosage Forms:
Ointments: Types of ointments, classification and selection of dermatological vehicles. Preparation and stability of ointments by the following processes:

Trituration	fusion
chemical reaction	Emulsification.

Pastes: Differences between ointments and pastes, Bases of pastes. preparation of pastes and their preservation .
Jellies: An introduction to the different types of jellies and their preparation.
An elementary study of poultice.
Suppositories and peassaries-Their relative merits and demerits, types of suppositories, suppository bases , classification, properties. preparation and packing of suppositories. Use of suppositories of drug absorption.
Dental and cosmetic preparations: Introduction to Dentifrices, facial cosmetics, Deodorants. Anti-perspirants, shampoo, Hair dressings and Hair removers.
Sterile Dosage forms:

Parenteral dosage forms-Definition, General requirements for parenteral dosage forms. Types of parenteral formulations, vehicles, adjuvant, processing and personnel, Facilities and quality control. Preparation of Intravenous fluids and admixtures-Total parenteral nutrition, Dialysis fluids.
Sterility testing: particulate matter monitoring- Faculty seal packaging.
Ophthalmic products: study of essential characteristics of different ophthalmic preparations. Formulation: additives, special precautions in handling and storage of ophthalmic products.

PRACTICAL (100 hours)

Dispensing of at least 100 products covering a wide range of preparations such as mixtures, emulsion, solutions, liniments, E.N.T. preparations. Ointments, suppositories, powders, incompatible prescriptions etc.

Books recommended: (Latest editions)

1. Indian Pharmacopoeia.
2. British pharmacopoeia.
3. National formularies(N.F.I.,B.N.P)
4. Remington's pharmaceutical sciences.
5. Martindale's Extra pharmacopoeia.

2.2 PHARMACEUTICAL CHEMISTRY II

THEORY (100 hours)

1. Introduction to the nomenclature of organic chemical systems with particular reference to hetero-cyclic system containing up to 3 rings.
2. The chemistry of following pharmaceutical organic compounds covering their nomenclature, chemical structure, uses and the important physical and chemical properties(chemical structure of only those compounds marked with asterisk (*). The stability and storage conditions and the different type of pharmaceutical formulations of these drugs and their popular brand names.

Antiseptics and Disinfectants-Proflavine*, Benzalkonium chloride, Cetrimide, Phenol, chloroxylenol, Formaldehyde solution, Hexachlophene, Nitrofurantoin.
Sulphonamides- Sulphadiazine, Sulphaguanidine, Phthalylsulphathaizole, Succinylsulphathiazole, Sulphadimethoxine, Sulphamethoxypyridazine, Co-trimoxazole, sulfacetamide*
Antileprotic Drugs- Clofazimine , Thiambutosine, Dapsone*, solapsone,
Anti-tubercular Drugs- Isoniazid*, PAS*, Streptomycin, Rifampicin, Ethambutol*, Thiacetazone, Ethionamide, cycloserine, pyrazinamide*.
Antimoebic and Anthelmintic Drugs- Emetine, Metronidazole, Halogenated hydroxyquinolines, Diloxanide furoate, Paromomycin , Piperazine*, Mebendazole
,D.E.C.*
Antibiotics- Benzyl penicillin*, Phenoxy methyl penicillin*, Benzathine penicillin, Ampicillin*, Cloxacillin, Carbencicillin, Gentamicin, Neomycin, Erythromycin, Tetracycline, Cephalexin, Cephaloridine, Cephalothin, Griseofulvin, Chloramphenicol.
Antifungal agents- Udecylenic acid, Tolnaftate, Nystatin, Amphotericin, Hamycin.
Antimalarial Drugs-Chloroquine*,Amodiaquine, Primaquine, Proguanil, Pyrimethamine*, Quinine, Trimethoprim.
Tranquilizers-Chlorpromazine*, Prochlorperazine, Trifluoperazine, Thiothixene, Haloperiodol*, Triperiodol, Oxypertine, Chlordizepoxide, Diazepam*, Lorazepam, Meprobamate.
Hypnotics- Phenobarbitone*, Butobarbitone, Cylobarbitone, Nitrazepam, Glutethimide*, Methyprylon, Paraldehyde, Triclofosodium.
General Anaesthetics-Halothane*, Cyclopropane*, Diethyl ether*, Methohexital sodium, Thiopecal sodium, Trichloroethylene .
Antidepressant Drugs- Amitriptyline, Nortryptyline, Imperamine*, Phepelzine, Tranylcypromine.
Analeptics- Theophylline, Caffeine*, Coramine*, Dextro-amphetamine.

Adrenergic drugs- Adrenaline*, Noradrenaline, Isoprenaline*, Phenylephrine, Salbutamol, Terbutaline, Ephedrne*, Pseudoephedrine.
Adrenergic antagonist- Tolazoline, Propranolol*, Practolol.
Cholinergic Drugs- Neostigmine*, Pyridostigmine, Pralidoxime, Pilocarpine, Physostigmine*.
Cholinergic Antagonists- Atropine*, Hyoscine, Homatropine, Propantheline*, Benztropine, Tropicamide, Biperiden*.
Diuretic Drugs- Furosemide*, Chlorothiazide, Hydrochlorothiazidc*, Benzthiazide, Urea*, Mannitol*, Ethacrynic Acid.
Cardiovascular Drugs- Ethylnitrite*, Glyceryl trinitrate, Alpha methyldopa, Guanethidine, Clofibrate, Quinidine.
Hypoglycemie Agents- Insulin, Chlorpropamide*, Tolbutamide, Glibenclamide, Phenformin*, Metformin.
Coagulants and Anti coagulants- Heparin, Thrombin, Menadione*, Bisphydroxy-coumarin, Warfarin sodium.
Local Anaesthetics- Lignocaine*, Procaine*, Benzocaine,
Histamine and anti Histaminic Agents- Histamine, Diphenhydramine*, Promethazine, Cyproheptadine, Mepyramine*, Pheniramine, Chlorpheniramine*,
Analgesics and Anti-pyretics-Morphine, Pethidine, Codeine, Mathadone, Aspirin*, Paracetamol, Analgin, Dextropropoxphene, Pentazocine.
Non-steriodal anti-inflammatory agents- Indomethacin*, Phenylbutazone*, Oxyphenbutazone, Ibuprofen.
Thyroxine and Antithyroids- Thyroxine*, Methimazole, Methyl thiouracil, Propylthiouracil.
Diagnostic Agents- Lopanoic Acid, Propyliodone, Sulfobromopthalein-sodium, Indigotindisulfonate, Indigo Carmine, Evans blue, Congo Red, Fluorescein sodium.
Anticonvulsants, cardiac glycosides, Antiarrhythmic, Antihypertensives & Vitamins.
Steroidal Drugs- Betamethasone, Cortisone, Hydrocortisone, Prednisolone, Progesterone, Testosterone, Oestradiol, Nandrolone.
Anti-Neoplastic Drugs- Actinomycin, Azathioprie, Busulphan, Chloramubucil, Cisplatin, Cyclophosphamide, Daunorubicin Hydrochoride, Fluorouracil, Mercaptopurine, Methotrexate, Mytomycin.

Books Recommended: (Latest editions)
1. Pharmacopoeia of India.
2. British Pharmaceutical codex.
3. Martindale's Extra pharmacopoeia.

PRACTICAL (75 hours)
1. Systematic qualitative testing of organic drugs involving solubility determination, melting point and/or boiling point, detection of elements and functional groups (10 compounds).
2. Official identification tests for certain groups of drugs included in the I.P. like barbiturates, sulfonamides, Phenothiazines, Antibiotics etc.(8 compounds).
3. Preparation of three simple organic preparations.

2.3 PHARMACOLOGY & TOXICOLOGY

THEORY (75 hours)

Introduction to pharmacology, scope of pharmacology.

Routes of administration of drugs, their advantages and disadvantages. Various processes of absorption of drugs and the factors affecting them. Metabolism, distribution and excretion of drugs.

General mechanism of drugs action and their factors which modify drugs action. Pharmacological classification of drugs. The discussion of drugs should emphasize the following aspects:

Drugs acting on the central Nervous system:

General anaesthetics- adjunction to anaesthesia, intravenous anaesthetics.
Analgesic antipyretics and non-steroidal
Anti-inflammatory drugs- Narcotic analgesics.
Antirheumatic and anti-gout remedies.
Sedatives and Hypnotics, psychopharmacological agents, anticonvulsants, analeptics.
Centrally acting muscle relaxants and anti parkinsonism agents.
Local anesthetics.
Drugs acting on autonomic nervous system.
Cholinergic drugs, Anticholinergic drugs, anticholinesterase drugs.
Adrenergic drugs and adrenergic receptor blockers.
Neurone blockers and ganglion blockers.
Neuromuscular blockers, used in myasthenia gravis.
Drugs acting on eye: Mydriatics, drugs used in glaucoma.

Drugs acting on respiratory system
Respiratory stimulants, Bronchodilators, Nasal decongestants, Expectorants and Antitussive agents.

Autocoids: physiological role of histamine and serotonin, Histamine and Antihistamines, prostaglandins.

Cardio vascular drugs
Cardiotonics, Antiarrhythmic agents, Anti-anginal agents, Antihypertensive agents, peripheral Vasodilators and drugs used in atherosclerosis.
Drugs acting on the blood and blood forming organs. Haematinics, coagulants and anticoagulants, Haemostatic , Blood substitutes and plasma expanders.

Drugs affecting renal function- Diuretics and anti-diuretics.

Hormones and hormone antagonists- Hypoglycemic agents, Anti--thyroid drugs, sex hormones and oral contraceptives , corticosteroids.

Drugs acting on digestive system-carminatives, digest ants, Bitters, Antacids and drugs used in peptic ulcer, purgatives ,and laxatives, Antidiarrohoeals, Emetics, Anti-emetics, Antispasmodics.

Chemotherapy of microbial diseases:
Urinary antiseptics, sulphonamides, penicillin, streptomycin, Tetracyclines and other antibiotics. Anti-tubercular agents, Antifungal agents, antiviral drugs, anti-leprotic drugs.
Chemotherapy of protozoal diseases, Anthelmintic drugs.
Chemotherapy of cancer.

Disinfectants and antiseptics.

PHARMACOLOGY

PRACTICAL (50 hours)

1. The first six of the following experiments will be done by the students while
2. the remaining will be demonstrated by the teacher.
3. Effect of potassium and calcium ions, acetylcholine and adrenaline on frog's heart.
4. Effect of acetyl choline on rectus abdomens muscle of frog and guinea pig ileum.
5. Effect of spasmogens and relaxants on rabbits intestine.
6. Effect of local anaesthetics on rabbit cornea.
7. Effect of mydriatics and miotics on rabbit's eye.
8. To study the action of strychnine on frog.
9. Effect of digitalis on frog's heart.
10. Effect of hypnotics in mice.

11. Effect of convulsants and anticonvulsant in mice or rats.
12. Test for pyrogens.
13. Taming and hypnosis potentiating effect of chlorpromazine in mice/rats.
14. Effect of diphenhydramine in experimentally produced asthma in guinea pigs.

2.4 PHARMACEUTICAL JURISPRUDENCE

THEORY (50 hours)

Origin and nature of pharmaceutical legislation in India, its scope and objectives. Evolution of the "Concept of pharmacy" as an integral part of the Health care system.

Principles and significance of professional Ethics. Critical study of the code of pharmaceutical Ethics drafted by pharmacy council of India.

Pharmacy Act,1948-The General study of the pharmacy Act with special reference to Education Regulations ,Working of state and central councils, constitution of these councils and functions, Registration procedures under the Act.

The Drugs and Cosmetics Act,1940-General study of the Drugs and cosmetics Act and the Rules there under. Definitions and salient features related to retail and whole sale distribution of drugs. The powers of Inspectors, the sampling procedures and the procedure and formalities in obtaining licenses under the rule. Facilities to be provided for running a pharmacy effectively. General study of the schedules with special reference to schedules C,C1,F,G,J,H,P and X and salient features of labeling and storage conditions of drugs.

The Drugs and Magic Remedies (objectionable Advertisement)Act, 1954-General study of the Act, objectives , special reference to be laid on Advertisements, magic remedies and objections1 and permitted advertisements -diseases which cannot be claimed to be cured.

Narcotic Drugs and psychotropic substances Act,1985-A brief study of the act with special reference to its objectives, offences and punishment.

Brief introduction to the study of the following acts:
Latest Drugs (price control) order in force.

Poisons Act 1919(as amended to date)

Medicinal and Toilet preparations (excise Duties) Act, 1955 (as amended to date**).**

Medical Termination of Pregnancy Act, 1971(as amended to date).

Books recommended:(Latest editions)
Bare Acts of the said laws published by Government.

2.5 DRUG STORE AND BUSINESS MANAGEMENT

THEORY (75 hours)

Part I Commerce (50 hours)

Introduction-Trade, Industry and commerce, Functions and subdivision of commerce, Introduction to Elements for Economics and Management. Forms of Business Organizations. Channels of Distribution.

Drug House Management-selection of site, space Lay-out and legal requirements. Importance and objectives of purchasing, selection of suppliers, credit information, tenders, contracts and price determination and legal requirements thereto.Codification, handling of drug stores and other hospital supplies. Inventory Control-objects and importance, modern techniques like ABC,VED analysis, the lead time, inventory carrying cost, safety stock, minimum and maximum stock levels, economic order quantity, scrap and surplus disposal.

Sales promotion, Market Research, Salesmanship, qualities of a salesman, Advertising and Window Display.

Recruitment, training, evaluation and compensation of the pharmacist.

Banking and Finance-Service and functions of bank, Finance planning and sources of finance.

Part II Accountancy (25 hours)

Introduction to the accounting concepts and conventions. Double entry Book Keeping, Different kinds of accounts. Cash Book. General Ledger and Trial Balance. Profit and Loss Account and Balance Sheet. Simple techniques of analyzing financial statements. Introduction to Budgeting.

Books Recommended: (Latest editions)

2.6 HOSPITAL AND CLINICAL PHARMACY

THEORY (75 hours)

Part-I: Hospital Pharmacy:

Hospital-Definition, Function, classifications based on various criteria, organization, Management and health delivery system in India.

Hospital Pharmacy: Definition Functions and objectives of Hospital pharmaceutical services. Location, Layout, Flow chart of materials and men.
Personnel and facilities requirements including equipments based on individual and basic needs. Requirements and abilities required for Hospital pharmacists.
Drug Distribution system in Hospitals. Out-patient service,
In-patient services- types of services detailed discussion of unit Dose system, Floor ward stock system, satellite pharmacy services, central sterile services, Bed side pharmacy.

Manufacturing: Economical considerations, estimation of demand.

Sterile manufacture-Large and small volume parenterals, facilities, requirements, layout production planning , man-power requirements.

Non-sterile manufacture-Liquid orals, externals, Bulk concentrates. Procurement of stores and testing of raw materials.

Nomenclature and uses of surgical instruments and Hospital Equipments and health accessories.
P.T.C.(pharmacy Therapeutic Committee)

Hospital Formulary system and their organization, functioning, composition.

Drug Information service and Drug Information Bulletin.

Surgical dressing like cotton, gauze, bandages and adhesive tapes including their pharmacopoeial tests for quality. Other hospital supply eg. I.V.sets, B.G. sets, Ryals tubes, Catheters, Syringes etc
.
Application of computers in maintenance of records, inventory control, medication monitoring, drug information and data storage and retrieval in hospital retail pharmacy establishment.

Part II: Clinical Pharmacy:

Introduction to Clinical pharmacy practice- Definition, scope.

Modern dispensing aspects- Pharmacists and patient counseling and advice for the use of common drugs, medication history.

Common daily terminology used in the practice of Medicine.

Disease, manifestation and patho-physiology including salient symptoms to understand the disease like Tuberculosis, Hepatitis, Rheumatoid Arthritis, Cardio-vascular diseases, Epilepsy, Diabetes, Peptic Ulcer, Hypertension.

Physiological parameters with their significance.

Drug Interactions: Definition and introduction. Mechanism of Drug Interaction. Drug-drug interaction with reference to analgesics, diuretics, cardiovascular drugs, Gastro-intestinal agents. Vitamins and Hypoglycemic agents. Drug-food interaction.
Adverse Drug Reaction: Definition and significance. Drug-Induced diseases and Teratogenicity.

Drugs in Clinical Toxicity- Introduction, general treatment of poisoning, systemic antidotes, Treatment of insecticide poisoning, heavy metal poison, Narcotic drugs, Barbiturate, Organo-phosphorus poisons.

Drug dependences, drug abuse, addictive drugs and their treatment, complications.

Bio-availability of drugs, including factors affecting it.

Books Recommended:(Latest editions)
1. Remington's pharmaceutical sciences.
2. Testing of raw materials used in (1).
3. Evaluation of surgical dressings.
4. Sterilization of surgical instruments, glassware and other hospital supplies.
5. Handling and use of data processing equipments.

Subject	Advances in Pharmaceutical Sciences	
Subject code	AUPH-102	
Credits	04	
Examination	Theory	
	University	Internal Assessment
Maximum Marks	60	40

INSTRUCTIONS

1. Instruction for paper setters: The questions are to be fairly distributed within the syllabus for maximum marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A, B, C and D shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus. Section E shall contain four small compulsory questions selected from the entire syllabus carrying 3 marks each.

2. Candidates: The candidates are required to answer one question from every section (A, B, C and D) carrying 12 marks each and all four questions which are compulsory from Section E carrying 3 marks each.

Section – A

Principles, methods, interpretation of data and pharmaceutical applications of various analytical techniques: UV-Visible, IR, NMR spectroscopy, Mass spectrometry, GC, HPLC

Section - B

ADME pharmacokinetic characterization of drugs: Absorption kinetics, absorption rate constants, distribution kinetics, metabolic kinetics, dose and time dependencies, volume of distribution, renal clearance, mechanism of clearance, clearance ratio, determination of clearance, intrinsic clearance and hepatic clearance, plasma/serum concentrations

Section – C

Extraction and Isolation techniques: Principle and applications of different extraction & isolation methods viz Soxhlet extraction, microwave extraction, supercritical fluid extraction, solid phase extraction, column chromatography, flash chromatography, isolation and characterization studies of different class of phytoconstituents (Alkaloids, Glycosides, Steroids, Saponins etc)

Section – D

Intellectual property concepts and fundamentals: Intellectual property protection (IPP) and intellectual property right (IPR), copy right and trade mark protection, criteria for patentability, Indian patent act

Subject	Advanced Pharmacology	
Subject code	AUPH-103	
Credits	04	
Examination	Theory	
	University	Internal Assessment
Maximum Marks	60	40

INSTRUCTIONS

1. Instruction for paper setters: The questions are to be fairly distributed within the syllabus for maximum marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A, B, C and D shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus. Section E shall contain four small compulsory questions selected from the entire syllabus carrying 3 marks each.

2. Candidates: The candidates are required to answer one question from every section (A, B, C and D) carrying 12 marks each and all four questions which are compulsory from Section E carrying 3 marks each.

Section - A

Detailed study of guidelines for maintenance, breeding techniques and experimentation using laboratory animals: CPCSEA, ICH, GLP; Techniques for the study of Molecular Pharmacology: Western Blotting, Immunostaining, RT-PCR, Cell Cultures etc

Section - B

Organization of screening: Pharmacological activity of new substances, Toxicity studies: acute, sub acute (Repeated dose), subchronic and chronic toxicity

Section - C

Receptor occupancy and cellular signaling systems such as G-proteins, cyclic nucleotides, calcium and calcium binding proteins, phosphatidyl inositol, Ion channels and their modulators (calcium, potassium, sodium and chloride channels)

Section - D

Endogenous bioactive molecules: Cytokines, neuropeptides and their modulators, neurosteroids, nitric oxide, phosphodiestrase enzyme and protein kinase C, arachidonic acid metabolites, COX-2 regulators nd their role in inflammation, endothelium derived vascular substances (NO, endothelins) and their modulators. Pharmacology of atrial peptides, reactive oxygen intermediates, antioxidants and their therapeutic implications

Subject	Pharmaceutical Product Development	
Subject code	AUPH-103	
Credits	04	
Examination	Theory	
	University	Internal Assessment
Maximum Marks	60	40

INSTRUCTIONS

1. Instruction for paper setters: The questions are to be fairly distributed within the syllabus for maximum marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A, B, C and D shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus. Section E shall contain four small compulsory questions selected from the entire syllabus carrying 3 marks each.

2. Candidates: The candidates are required to answer one question from every section (A, B, C and D) carrying 12 marks each and all four questions which are compulsory from Section E carrying 3 marks each.

Section - A

Pre-formulation studies: Pre-formulation studies of drug substances, proteins and peptides. Pre-formulation work sheet

Section – B

Solubilization: Solubility and solubilization of non electrolyte, drug solubilization in surfactant systems, use of co-solvents, solid-state manipulations and drug derivitization

Section – C

Optimization and stability study: Statistical methods and factorial design, Quality by Design, Stability of dosage forms as per ICH guidelines

Section - D

Physicochemical characterization of pharmaceuticals: Molecular level: Crystallinity, crystal habit, polymorphism, amorphous state, solvates, hydrates, analytical techniques for characterization (DSC, PXRD, SEM, FTIR); Particle level: Particle size, particle shape, porosity, surface area, compaction; Bulk level: Bulk density, compressibility, flow properties, compaction and consolidation cohesivity, electrostatistics, aggregation, agglomeration, role in formulation development and processing

Subject	Herbal Drug Formulation and Evaluation	
Subject code	AUPH-103	
Credits	04	
Examination	Theory	
	University	Internal Assessment
Maximum Marks	60	40

INSTRUCTIONS

1. Instruction for paper setters: The questions are to be fairly distributed within the syllabus for maximum marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A, B, C and D shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus. Section E shall contain four small compulsory questions selected from the entire syllabus carrying 3 marks each.

2. Candidates: The candidates are required to answer one question from every section (A, B, C and D) carrying 12 marks each and all four questions which are compulsory from Section E carrying 3 marks each.

Section – A

Overview of novel herbal formulations: Phytosomes, liposomes, microspheres, novel vesicular herbal formulations etc

Section – B

Standardization of herbal drugs/ formulations: Conventional and modern techniques, sources and uses of natural products in traditional medicines, potential of natural products, natural products in drug discovery and development

Section – C

WHO Guidelines for assessment of crude drugs:

a) Evaluation of identity, purity and quality of crude drugs
b) Determination of pesticide residue
c) Determination of Micro-organisms
d) Determination of arsenic and heavy metals

Section – D

Herbal Drug Regulatory affairs: Role and importance of national and international regulatory bodies in assessment of quality of herbal drugs and formulations

Subject	Research Methodology	
Subject code	AUPH-101	
Credits	04	
Examination	Theory	
	University	Internal Assessment
Maximum Marks	60	40

INSTRUCTIONS

1. Instruction for paper setters: The questions are to be fairly distributed within the syllabus for maximum marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A, B, C and D shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus. Section E shall contain four small compulsory questions selected from the entire syllabus carrying 3 marks each.

2. Candidates: The candidates are required to answer one question from every section (A, B, C and D) carrying 12 marks each and all four questions which are compulsory from Section E carrying 3 marks each.

Section – A

Literature Survey: Accessing required information in a systematic manner from abstracts, books, journals, Proceedings of conferences, theses and dissertations, CD ROMs, internet and such other sources

Section - B

Scientific Writing: Writing of papers, articles and thesis, preparation of title, abstracts, introduction, methodology, results and discussion, summary-conclusion, preparation of tables and figures using software like MS Office, Open Office, etc; organization of dissertations and thesis; conventions adopted in writing; citing references; preparation of oral presentations and posters

Section - C

Data collection and statistical estimation: measures of describing the center of data distributions, measurement of spread of data, binomial and normal distributions; confidence intervals, tests for statistical significance, T-test, F-test, analysis of variance (ANOVA), Chi-square test, linear regression and correlation

Section – D

Statistical software: Introduction to statistical software such as SPSS, Graph Pad, Sigma Stat, MS Excel, open source software for statistical analysis

Subject	Advanced Pharmaceutical Chemistry	
Subject code	AUPH-103	
Credits	04	
Examination	Theory	
	University	Internal Assessment
Maximum Marks	60	40

INSTRUCTIONS

1. Instruction for paper setters: The questions are to be fairly distributed within the syllabus for maximum marks of 60. The question paper shall comprise five sections A, B, C, D and E. Section A, B, C and D shall contain two questions carrying 12 marks each. These questions shall be selected from the respective units of the syllabus. Section E shall contain four small compulsory questions selected from the entire syllabus carrying 3 marks each.

2. Candidates: The candidates are required to answer one question from every section (A, B, C and D) carrying 12 marks each and all four questions which are compulsory from Section E carrying 3 marks each.

Section – A

Pharmaceutical Organic Chemistry: Methods of determining reaction mechanisms (kinetic and non-kinetic methods), reaction intermediates, crossover experiments and isotopic labeling, order of reactions, reversible, consecutive and parallel reactions, solvent, ionic strength and salt effects, Multi-component reactions of pharmaceutical importance such as Biginelli reaction, Hantzsch reaction, Ugi reaction, Passerini reaction

Section – B

Pharmaceutical Medicinal Chemistry: General principles, identification and study of targets for development of various therapeutic agents, rational approach for drug design, computer aided drug design

Section – C

Assay of drugs and metabolites in pharmaceuticals and biological fluids

Section - D

Analytical and bioanalytical methods validation using ICH Guidelines

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग III—खण्ड 4
PART III—Section 4
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 372] नई दिल्ली, शुक्रवार, दिसम्बर 19, 2014/अग्रहायण 28, 1936
No. 372] NEW DELHI, FRIDAY, DECEMBER 19, 2014/AGRAHAYANA 28, 1936

भारतीय भेषजी परिषद्

अधिसूचना

नई दिल्ली, 18 दिसम्बर, 2014

भेषजी स्नातक (व्यवसाय) विनियम, 2014

सं. 14-117/2014-भा.भे.परि.—भेषजी अधिनियम, 1948 (1948 का 8) की धारा 10 और 18 द्वारा प्रदत्त शक्तियों का प्रयोग करते हुए भारतीय भेषजी परिषद्, केन्द्रीय सरकार के अनुमोदन से निम्नलिखित विनियम बनाती है, अर्थात्

अध्याय - I

1. संक्षिप्त नाम और प्रारंभ –

(1) इन विनियमों का संक्षिप्त नाम भेषजी स्नातक (व्यवसाय) विनियम, 2014 है।

(2) ये राजपत्र में प्रकाशन की तारीख से प्रवृत होंगे।

2. भेषजी स्नातक (व्यवसाय) (बी.फार्म. व्यवसाय) को भेषज रजिस्टर में अतिरिक्त अर्हता दर्ज किए जाने के लिए इन विनियमों में यथा विहित पाठ्यक्रम पूरा करने पर और परीक्षा उत्तीर्ण करने पर एक डिग्री प्रमाण-पत्र प्रदान किया जाना।

अध्याय - II

3. पाठ्यक्रम की कालावधि –

पाठ्यक्रम की कालावधि दो शैक्षणिक वर्ष होगी जिसमें हर वर्ष कम से कम 180 कार्य दिवसों का होगा।

4. पाठ्यक्रम में प्रवेश के लिए न्यूनतम अर्हता

i) भेषजी अधिनियम, 1948 की धारा 12 के अधीन भारतीय भेषजी परिषद् द्वारा अनुमोदित संस्थान से भेषजी में डिप्लोमा पाठ्यक्रम उत्तीर्ण किया हो।

ii) पंजीकृत भेषजज्ञ हो।

iii) सामुदायिक या अस्पताल भेषजी में कम से कम चार वर्ष का भेषजी व्यवसाय का अनुभव हो –

क. सक्षम प्राधिकारी का प्रमाण-पत्र जिसमें यह लिखा हो कि अभ्यर्थी सामुदायिक भेषजज्ञ की स्थिति में व्यवसाय के अनुभव के सबूत के रूप में भेषजी के औषध लाइसेन्स में पंजीकृत भेषजज्ञ के रूप में पृष्ठांकित है।

ख. प्रधानाचार्य/चिकित्सा अधीक्षक/अस्पताल/स्वास्थ्य इकाई के सक्षम व्यक्ति का प्रमाण-पत्र जिसमें यह लिखा हो कि अभ्यर्थी भेषजज्ञ के रूप में काम कर रहा है, अस्पताल भेषजज्ञ की स्थिति में व्यवसाय अनुभव के सबूत के रूप में स्वीकार किया जाएगा।

iv) निधारित प्रारूप (उपाबंध-क) में नियोक्ता का अनापत्ति प्रमाण-पत्र। (संलग्नक - क)

तथापि अनुसूचित जातियों, अनुसूचित जनजातियों तथा अन्य पिछड़े वर्गों के छात्रों के लिए सीटों का आरक्षण केन्द्रीय सरकार/राज्य सरकार/संघ राज्यक्षेत्र प्रशासन जो भी हो द्वारा समय-समय पर जारी किए गए अनुदेशों के अनुसार होगा।

5. कार्यक्रम में प्रवेश संख्या भारतीय भेषजी परिषद् द्वारा समय-समय पर निर्धारित की जाएगी और वर्तमान में यह संख्या एक शैक्षणिक वर्ष में 40 छात्रों तक सीमित है।

6. पाठ्यक्रम संचालित करने वाले प्राधिकरण का अनुमोदन -

क. कोई भेषजी संस्थान भारतीय भेषजी परिषद् का पूर्व अनुमोदन प्राप्त किए बिना भेषजी स्नातक (व्यवसाय) कार्यक्रम चालू नहीं करेगा अथवा प्रवेश संख्या नहीं बढ़ाएगा।

ख. भेषजी अधिनियम, 1948 की धारा 12 की उपधारा (1) के अधीन अनुमति प्राप्त करने के प्रयोजनार्थ कोई भेषजी महाविद्यालय भारतीय भेषजी परिषद् द्वारा परिशिष्ट-I में निर्धारित स्कीम प्रस्तुत करेगा।

ग. उपर्युक्त उपविनियम (ख) में निर्दिष्ट स्कीम ऐसे प्रारूप में होगी और उसमें ऐसी विशिष्टियां होंगी तथा वह ऐसी रीति से प्रस्तुत की जाएगी और उसके साथ ऐसी फीस संलग्न होगी जो निर्धारित की गई हो।

घ. भेषजी अधिनियम, 1948 की धारा 12 के अधीन भेषजी स्नातक पाठ्यक्रम चलाने के लिए भारतीय भेषजी परिषद द्वारा अनुमोदित संस्थान ही भेषजी स्नातक (व्यवसाय) डिग्री पाठ्यक्रम चालू करने के लिए पात्र होंगे।

भारतीय भेषजी परिषद् तब तक किसी भी संस्थान को अनुमोदित नहीं करेगी जब तक शिक्षण के लिए पर्याप्त प्रबंध नहीं कर लिये जाते भवन, आवास, प्रयोगशालाएँ, उपकरण, शिक्षक, गैर-शिक्षक, इत्यादि जो विनियमों में दिये गये परिशिष्ट-II में दर्शाये गये हैं।

7. पाठ्यक्रम

पाठ्यक्रम में वे विषय होंगे जो निम्न सारणी में दिए गए हैं। पाठ्यक्रम में कक्षा शिक्षण तथा समनुदेशन (असाइन्मेंट) कार्य होगा। समनुदेशन कार्य शैक्षणिक संस्था के शिक्षण कर्मचारियों के पर्यवेक्षण और मार्गदर्शन में कार्यस्थल पर किया जाएगा। कक्षा शिक्षण के लिए प्रत्येक विषय पर लगाए जाने वाले एक सप्ताह में संपर्क घन्टे कम से कम उतने होंगे जो निम्न तालिका के स्तंभ (3) में उसके सामने अंकित है।

तालिका-I

प्रथम वर्ष :

क्रमांक	विषय	कुल संपर्क घंटों की न्यूनतम संख्या	संपर्क घंटों की संख्या प्रतिसप्ताह
(1)	(2)	(3)	(4)
1.1	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स I	40	1
1.2	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स II	40	1
1.3	फार्मेसी प्रैक्टिस I	40	1
1.4	फार्मेसी प्रैक्टिस II	40	1
1.5	अप्लाईड फार्मास्युटिक्स	40	1
1.6	सोशल फार्मेसी I	40	1
1.7	केस प्रस्तुतिकरण, संगोष्ठी, समनुदेशन (असाइन्मेंट)	160	4
	योग	400	10

द्वितीय वर्ष :

क्रमांक	विषय	कुल संपर्क घंटों की न्यूनतम संख्या	संपर्क घंटों की संख्या प्रति सप्ताह
(1)	**(2)**	**(3)**	**(4)**
2.1	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स III	40	1
2.2	पैथोफिसियोलॉजी फार्माकोथेरापुटिक्स IV	40	1
2.3	फार्मेसी प्रैक्टिस – III	40	1
2.4	फार्मेसी प्रैक्टिस – IV	40	1
2.5	सोशल फार्मेसी – II	40	1
2.6	भेषजिक न्याय शास्त्र	40	1
2.7	केस प्रस्तुतिकरण, संगोष्ठी, समनुदेशन (असाइन्मेंट)	160	4
	योग	400	10

8. पाठ्य विवरण

उक्त तालिका में अध्ययन के प्रत्येक विषय का विस्तृत पाठ्य विवरण वैसा होगा जो परिशिष्ट–III में दिए गए दिशानिर्देशों में निहित हैं। दिशानिर्देशों को भारतीय भेषजी परिषद् की केन्द्रीय परिषद् के अनुमोदन से, समय–समय पर संशोधित और अधिसूचित किया जाएगा।

9. परीक्षा –

1. कलेण्डर वर्ष के अंत में एक परीक्षा होगी। प्रथम परीक्षा वार्षिक परीक्षा होगी और दूसरी परीक्षा अनुपूरक परीक्षा होगी।
2. परीक्षाएं सिद्धांत पक्ष के लिए एवं व्यवहार पक्ष के लिए लिखित रूप में होंगी। छात्र अपने द्वारा किए गए समनुदेशन कार्य को रिपोर्ट के रूप में प्रस्तुत करेंगे उसके बाद विषय के हर भाग के लिए अधिकतम अंकों की मौखिक परीक्षा होगी जैसा कि निम्न तालिका में दर्शाया गया है:–

तालिका–II

प्रथम वर्ष :

क्रमांक	विषय	सिद्धांत पक्ष के अधिकतम अंक			समनुदेशन के अधिकतम अंक (मौखिक परीक्षा के 25% अंकों सहित)
		विश्वविद्यालय परीक्षा	सत्र परीक्षा अंक	योग	
1.1	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स I	60	40	100	100
1.2	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स II	60	40	100	100
1.3	फार्मेसी प्रैक्टिस I	60	40	100	100
1.4	फार्मेसी प्रैक्टिस II	60	40	100	100
1.5	अप्लाईड फार्मास्युटिक्स	60	40	100	100
1.6	सोशल फार्मेसी I	60	40	100	100
	योग			600	600

द्वितीय वर्ष परीक्षा :

क्रमांक	विषय	सिद्धांत पक्ष के अधिकतम अंक			समनुदेशन के अधिकतम अंक (मौखिक परीक्षा के 25% अंकों सहित)
		विश्वविद्यालय परीक्षा	सत्र परीक्षा अंक	योग	
2.1	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स III	60	40	100	100
2.2	पैथोफिसियोलॉजी एण्ड फार्माकोथेरापुटिक्स IV	60	40	100	100
2.3	फार्मेसी प्रैक्टिस III	60	40	100	100
2.4	फार्मेसी प्रैक्टिस IV	60	40	100	100
2.5	सोशल फार्मेसी II	60	40	100	100
2.6	भेषजिकी न्याय शास्त्र	60	40	100	100
	योग			600	600

10. परीक्षा में बैठने की पात्रता :

वही छात्र परीक्षा में बैठने का पात्र होगा जो उस संस्था के प्रमुख का, जिसमें उसने पढ़ाई की है, प्रमाण-पत्र इस सबूत के रूप में प्रस्तुत करेगा कि उसने सिद्धांत पक्ष में कम से कम 80 प्रतिशत कक्षाओं में उपस्थित रहकर नियमित तथा समाधानप्रद रूप में पढ़ाई की है और उसने पर्यवेक्षक शिक्षक द्वारा सम्यकतः अनुमोदित असाइनमेन्ट/परियोजना रिपोर्ट प्रस्तुत कर दी है।

11. परीक्षा का ढंग :

(1) सैद्धांतिक परीक्षा तीन घन्टे की होगी ।

(2) जो छात्र सिद्धांत पक्ष के किसी विषय की परीक्षा में अनुत्तीर्ण रहेगा उसे उस विषय में पुनः बैठने की अनुमति होगी।

(3) असाइनमेन्ट कार्य में संगोष्ठी और मौखिक परीक्षा सहित आंतरिक और बाहरी दोनों परीक्षकों द्वारा रिपोर्ट का मूल्यांकन शामिल होगा।

12. सत्रीय अंक देना और अभिलेख रखना

(1) भेषजी स्नातक (व्यवसाय) पाठ्यक्रम करवाने वाले संस्थान में आयोजित सैद्धांतिक परीक्षाओं का नियमित अभिलेख संस्थान में प्रत्येक छात्र का रखा जाएगा और हर विषय के 40 अंक आंतरिक आकलन के रूप में आवंटित किए जाएंगे।

(2) हर वर्ष कम से कम तीन आवधिक सत्र परीक्षाएं होंगी और किन्ही दो प्रदर्शनों के सर्वोच्च योग के आधार पर सत्रीय अंक की गणना की जाएगी।

13. परीक्षा उत्तीर्ण करने के लिए न्यूनतम अंक –

कोई छात्र तब तक परीक्षा में उत्तीर्ण घोषित नहीं किया जाएगा जब तक कि उसने सत्रीय अंकों सहित सैद्धांतिक परीक्षा में अलग-अलग विषय में कम से कम 50% अंक प्राप्त न किए हों तथा असाइनमेन्ट कार्य में कम से कम 50% अंक प्राप्त न किए हों। परीक्षा में एक ही बार में सब विषयों में कुल मिलाकर 60% या अधिक अंक प्राप्त करने वाले छात्रों को प्रथम श्रेणी में उत्तीर्ण घोषित किया जाएगा तथा किसी विषय या किन्हीं विषयों में 75% या अधिक अंक पाने वाले छात्र को उस विषय या उन विषयों में विशेष योग्यता के साथ उत्तीर्ण घोषित किया जाएगा, बशर्ते कि वह एक ही बार में सब विषयों में उत्तीर्ण हो।

14. अगली कक्षा में प्रौन्नति के लिए पात्रता –

1. वे सब छात्र, जो सब विषयों में परीक्षा में बैठे हैं और उत्तीर्ण हुए हैं, अगली कक्षा में प्रोन्नति के लिए पात्र हैं।

2. प्रथम वर्ष की बी.फार्म. (व्यवसाय) परीक्षा के विषयों में अनुत्तीर्ण रहने वाला छात्र बी.फार्म. (व्यवसाय) के दूसरे वर्ष में जाने दिया जाएगा। किन्तु ऐसे छात्रों को बी.फार्म. (व्यवसाय) पाठ्यक्रम के प्रथम और द्वितीय वर्ष के सब विषयों में उत्तीर्ण होना होगा और उसे उस सत्र से जिसमें उसने पाठ्यक्रम में दाखिला लिया था पाठ्यक्रम बी.फार्म. (व्यवसाय) डिग्री हेतु विचार किए जाने के लिए, 4 शैक्षणिक वर्षों के भीतर पूरा करना होगा।

15. परीक्षाओं का अनुमोदन

विनियम 9 से 12 और 14 में वर्णित परीक्षाएँ भेषजी अधिनियम, 1948 की धारा 12 की उपधारा (2) के अधीन भारतीय भेषजी परिषद् द्वारा अनुमोदित परीक्षा प्राधिकरण द्वारा आयोजित की जाएंगी ।

16. परीक्षा उत्तीर्ण करने का प्रमाण–पत्र

ऐसे प्रत्येक छात्र को जिसने भेषजी स्नातक (व्यवसाय) की परीक्षाएँ उत्तीर्ण कर ली हैं, परीक्षा प्राधिकरण द्वारा डिग्री प्रमाण–पत्र दिया जाएगा।

अध्याय - III

17. समनुदेशन (असाईन्मैंट) कार्य :–

1. विशिष्टतया सामुदायिक, अस्पताल और नैदानिक (क्लिनिकल) भेषजी के क्षेत्र में आंकड़ों के संग्रहण और रिपोर्टिंग कौशल को तथा साधारणतया भेषजी व्यवसाय के सिद्धातों को समझने और विकसित करने के लिए छात्र को अनुज्ञात करने के लिए समनुदेशन (असाईन्मेंट) कार्य शिक्षा संस्था के प्रमुख द्वारा अनुमोदित विषय पर शैक्षणिक संस्था के शिक्षक की देखरेख में किया जाएगा। वह कार्य सत्र के प्रत्येक विषय में कक्षाएं प्रारंभ होने के एक मास के भीतर छात्रों को बता दिया जाएगा। समनुदेशन (असाईन्मेंट) कार्य अंतिम परीक्षा से पूर्व लिखित रिपोर्ट में तथा एक संगोष्ठी के रूप में प्रस्तुत किया जाएगा। उक्त प्रयोजन के लिए परीक्षा प्राधिकरण द्वारा नियुक्त बाहरी और आंतरिक परीक्षक उस कार्य का आकलन करेंगे।
2. समनुदेशन (असाईन्मेंट) कार्य में कार्य के उद्देश्य, कार्य प्रणाली, परिणाम, परिचर्चा और निष्कर्ष शामिल होंगे।

18. समनुदेशन (असाईन्मैंट) कार्य के उद्देश्य : इस कार्य के मुख्य उद्देश्य –

(i) कार्य का विशुद्ध वर्णन किए जाने और निष्पक्ष तरीके से निष्कर्षों को लेखबद्ध किए जाने का साक्ष्य दर्शाना है ; तथा

(ii) आंकड़ों के संग्रहण, विश्लेषण और प्रतिवेदन तथा निर्वचन कौशलों में छात्र के कौशलों को विकसित करना है।

19. कार्य प्रणाली :–

इस कार्य को पूरा करने के लिए निम्नलिखित कार्यप्रणाली अपनाई जाएगी, अर्थात –

(i) अधिक से अधिक दस छात्र एक प्राधिकृत शिक्षक के अधीन कार्य करेंगे ;

(ii) प्रविषय विभागाध्यक्ष या संस्थान प्रमुख द्वारा अनुमोदित किया जाएगा।

(iii) चुना गया कार्य एक सत्र विशेष में पढ़ाए गए विषयों से संबंद्ध होगा तथा कार्य को उसके कार्यस्थल में करने की उपयुक्तता के विषय में संपर्क ध्यान देना होगा।

20. प्रतिवेदन (रिपोर्टिंग) :–

(1) समनुदेशन (असाईन्मैन्ट) पर कार्य करने वाला छात्र काम पूरा होने के बाद विभागाध्यक्ष या संस्थान प्रमुख को रिपोर्ट प्रस्तुत करेगा। उस रिपोर्ट में प्राधिकृत शिक्षक द्वारा जारी किया गया प्रमाण–पत्र भी सम्मिलित होगा।

(2) रिपोर्ट वार्षिक परीक्षा प्रारंभ होने से कम से कम एक मास पूर्व प्रस्तुत की जाएगी।

21. मूल्यांकन :–

समनुदेशन (असाईन्मैन्ट) कार्य का मूल्यांकन करने के लिए निम्नलिखित कार्य प्रणाली अपनाई जाएगी –

मूल्यांकन निम्नलिखित मदों पर किया जाएगा		–	अंक
क.	समनुदेशन (असाईन्मैन्ट) का आलेख	-	40
ख.	कार्य का प्रस्तुतीकरण	-	15
ग.	संगोष्ठी	-	20
घ.	प्रश्नोत्तर कौशल (मौखिक)	-	25
		योग –	**100**

अध्याय - IV

22. पाठ्यक्रम की फीस राज्य सरकार/पाठ्यक्रम संचालन प्राधिकारियों के मार्गदर्शन के लिए भारतीय भेषजी परिषद् द्वारा समय-समय पर निर्धारित की जाएगी।

उपाबंध-क

[विनियम 4 (iv) देखिए]

नियोक्ता के अनापत्ति प्रमाण-पत्र का प्रारूप (फार्मेट)

प्रमाणित किया जाता है कि .....पुत्र/पुत्री श्री ..... इस संस्थान/भेषजी में ..... पद पर ..... से कार्यरत है और .. .. सत्र में भेषजी स्नातक (व्यवसाय) पाठ्यक्रम में उसके प्रवेश लेने पर अधोहस्ताक्षरी को कोई आपत्ति नहीं है।

उसे पाठ्यक्रम में उपस्थित रहने की अनुमति होगी तथा उसे इस संस्थान/संगठन में पाठ्यक्रम के भाग के रूप में असाइन्मैंट करने के लिए सुविधाएं प्रदान की जाएगी।

प्राधिकृत व्यक्ति के हस्ताक्षर और मुहर

भेषजी स्नातक (व्यवसाय) पाठ्यक्रम संचालित करने के लिए दिशानिर्देश

परिशिष्ट-II

[विनियम 6 (ख) देखिए]

भेषजी स्नातक (व्यवसाय) पाठ्यक्रम संचालित करने के लिए भारतीय भेषजी परिषद् की पूर्व अनुमति प्राप्त करने की स्कीम

1. पाठ्यक्रम संचालित करने वाले प्राधिकरण का नाम.....

2. पाठ्यक्रम संचालित करने वाले प्राधिकरण का पूरा डाक पता.....

.....

3. संस्था की स्थापना का वर्ष .....

4. भेषजी स्नातक (बी.फार्म.) पाठ्यक्रम संचालित करने के लिए संस्थान के अनुमोदन की स्थिति (नवीनतम अनुमोदन की प्रतिलिपि संलग्न की जाए) .....

5. पाठ्यक्रम चालू करने के लिए परीक्षा प्राधिकरण (अर्थात विश्वविद्यालय) से संबंद्धन पर अनापत्ति/सहमति (पत्र की प्रतिलिपि संलग्न की जाए)

6. नवीनतम निरीक्षण रिपोर्ट में बताई गई खामियाँ .....
(पृथक कागज का प्रयोग करें)

7. पाठ्यक्रम प्रारंभ करने की प्रस्तावित तारीख .....

8. प्रस्तावित प्रवेश संख्या .....

9. पाठ्यक्रम चालू करने के लिए प्रस्तावित समय सारणी :.....

10. विषय विशेष में शिक्षकों का विवरण निम्नलिखित फॉर्मेट में दीजिए –

विभाग का नाम	क्रमांक	शिक्षक का नाम	संस्था में कार्य अनुभव	अर्हता	अनुभव	वर्तमान शिक्षण भार	अस्पताल/सामुदायिक/क्लिनिकल शोध/ व्यवसाय में कोई अनुभव
1	2	3	4	5	6	7	8
फार्मास्युटिक्स							
फार्माकोलॉजी							
फार्मेसी प्रैक्टिस							

11. अतिरिक्त पाठ्यक्रम पढ़ाने के लिए शिक्षकों की घोषणाएं .....
(शिक्षकों से प्राप्त की घोषणाएं संलग्न करें)

12. क्या विजिटिंग/अंशकालिक शिक्षक नियुक्त होंगे : .....
(यदि हाँ, तो निम्नलिखित प्रारूप में विवरण दें)

क्रमांक	शिक्षक का नाम	अर्हता	व्यवसाय अनुभव	वर्तमान संबंद्धता

13. पहचान किये गये विजिटिंग शिक्षकों की स्वीकृति संलग्न करें : .....

14. क्या संस्थान/न्यास मॉडल सामुदायिक भेषजी चला रहा है : .....

15. यदि नहीं, तो क्या निकट भविष्य में उसे चालू करने की कोई योजना है : .....

तारीख सहित प्रधानाचार्य के हस्ताक्षर

परिशिष्ट–2

[विनियम 6 (घ) का परन्तुक देखिए]

भेषजी स्नातक (व्यवसाय) पाठ्यक्रम चलाने के लिए भारतीय भेषजी परिषद् का अनुमोदन प्राप्त करने के लिए न्यूनतम आवश्यकताएँ

भाग–I <u>प्रधानाचार्य</u>

अर्हता/अनुभव	अर्हता	आवश्यक शिक्षण अनुभव
	एम.फार्म.	15 वर्ष जिसमें से 5 वर्ष प्रोफेसर/विभागाध्यक्ष के रूप में
	पी.एच.डी.	10 वर्ष जिसमें से कम से कम 5 वर्ष सहायक प्रोफेसर के रूप में

भाग–II <u>भौतिक अवसंरचना</u>

1. भूमि उपलब्धता (ब्यौरा)

(क) भवन : स्वयं का/किराये पर

(ख) महाविद्यालय भवन का कुल निर्मित क्षेत्रफल वर्ग मीटर में : निर्मित क्षेत्रफल

(ग) सुख सुविधाएं और परिचालन क्षेत्रफल

2. कक्षा कमरे :

डी.फार्म. और बी.फार्म./भेषजी स्नातक (व्यवसाय) पाठ्यक्रम के लिए उपलब्ध कराये गए कक्षा कमरों की कुल संख्या

कक्षा	आवश्यकता	उपलब्ध संख्या	प्रत्येक कक्षा कमरे के लिए आवश्यक क्षेत्रफल*
डी.फार्म.	02		प्रत्येक 90 वर्ग मीटर
बी.फार्म.	04		प्रत्येक 90 वर्ग मीटर (वांछनीय) प्रत्येक 75 वर्ग मीटर (अनिवार्य)
भेषजी स्नातक (व्यवसाय)	01		40 वर्ग मीटर प्रत्येक

(*60 विद्यार्थियों के लिए)

3. डी.फार्म. और बी.फार्म./भेषजी स्नातक (व्यवसाय) पाठ्यक्रम के लिए उपलब्ध करायी गई प्रयोगशालाओं की कुल संख्या

क्रमांक	अवसंरचना किसे चाहिए	नियमों के अनुसार आवश्यकता	उपलब्ध संख्या एवं वर्ग मीटर में क्षेत्रफल	अभ्युक्ति/कमियाँ
1.	बी.फार्म. पाठ्यक्रम के लिए प्रयोगशाला क्षेत्रफल (10 प्रयोगशालाएं) डी.फार्म. पाठ्यक्रम के लिए प्रयोगशाला क्षेत्रफल (03 प्रयोगशालाएं)	90 वर्ग मीटर x एन (एन = 10) तैयारी कक्ष सहित (वांछनीय) 75 वर्ग मीटर (अनिवार्य)		
2.	फार्मास्युटिक्स फार्मास्युटिकल कैमिस्ट्री फार्मास्युटिकल अनालिसिस फार्माकोलॉजी फार्माकोग्नॉजी फार्मास्युटिकल बोयोटैकनोलॉजी (अपूर्तित कक्ष सहित) बी.फार्म. और डी.फार्म. पाठ्यक्रम के लिए प्रयोगशालाओं की कुल संख्या	03 प्रयोगशालाएं 03 प्रयोगशालाएं 01 प्रयोगशालाएं 03 प्रयोगशालाएं 02 प्रयोगशालाएं 01 प्रयोगशालाएं 13 प्रयोगशालाएं*		
3.	प्रत्येक प्रयोगशाला के लिए तैयारी कक्ष (यदि वह दो प्रयोगशालाओं के बीच में है तो उसे दो प्रयोगशालाएँ साझा कर सकती हैं)	10 वर्ग मीटर (न्यूनतम)		
4.	मशीन कक्ष का क्षेत्रफल	80-100 वर्ग मीटर		
5.	केन्द्रीय यंत्र कक्ष	80 वर्ग मीटर		
6.	भण्डार कक्ष–1	1 क्षेत्रफल 100 वर्ग मीटर		
7.	भण्डार कक्ष–2 (ज्वलनशील रसायनों के लिए)	1 क्षेत्रफल 20 वर्ग मीटर		

*डी.फार्म. और बी.फार्म. दोनों के लिए

1. सभी प्रयोगशालाओं में पर्याप्त रोशनदान और संवातन हो।

2. सभी प्रयोगशालाओं में बुनियादी सुख-सुविधाएँ और सेवाएँ उपलब्ध हों जैसे एक्जास्ट फैन और धूम कक्ष जहां कहीं प्रदूषण को कम करने के लिए आवश्यकता हो।

3. कार्य बेंच सपाट और सहज सफाई योग्य हों अधिमानतः अवशोषी सामग्री की न हों।

4. पानी के नल टपकने वाले न हों तथा सीधे सिंक से लगे हों।

5. तुला कक्ष संबंधित प्रयोगशालाओं से संबंद्ध हो।

4. प्रशासन क्षेत्र

क्रमांक	अवसंरचना का कक्ष	प्रतिमानकों के अनुसार आवश्यकता (संख्या में)	प्रतिमानकों के अनुसार आवश्यकता (क्षेत्रफल में)
1.	प्रधानाचार्य का कक्ष	01	30 वर्ग मीटर
2. 3. 4.	कार्यालय-I स्थापन कार्यालय-II शिक्षाविद गोपनीय कक्ष	01	60 वर्ग मीटर

5. कर्मचारियों की सुविधाएं

क्रमांक	अवसंरचना का कक्ष	प्रतिमानकों के अनुसार आवश्यकता (संख्या में)	प्रतिमानकों के अनुसार आवश्यकता (क्षेत्रफल में)
1.	बी.फार्म. पाठ्यक्रम के लिए विभागाध्यक्ष कक्ष	न्यूनतम 4	20 वर्ग मीटर x 4
2.	डी.फार्म. और बी.फार्म. के लिए संकाय कक्ष		10 वर्ग मीटर x संख्या संख्या = शिक्षकों की संख्या
3.	भेषजी स्नातक (व्यवसाय) पाठ्यक्रम के लिए संकाय कक्ष		10 वर्ग मीटर x संख्या संख्या = शिक्षकों की संख्या

6. संग्रहालय, पुस्तकालय, पशुशाला और अन्य सुविधाएँ

क्रमांक	अवसंरचना का कक्ष	प्रतिमानकों अनुसार आवश्यकता (संख्या में)	प्रतिमानकों के अनुसार आवश्यकता (क्षेत्रफल में)
1.	पशु प्रयोगात्मक विद्या माड्यूल	01	-
2.	पुस्तकालय	01	150 वर्ग मीटर
3.	संग्रहालय	01	50 वर्ग मीटर (फार्माकोग्नोसी प्रयोगशाला के साथ अटैच किया जा सकता है)
4.	मॉडल भेषजी <u>अनिवार्य</u> : मॉडल सामुदायिक भेषजी चलाना <u>वांछनीय</u> : औषध मॉडल भण्डार	01	80 वर्ग मीटर (औषध सूचना केन्द्र के लिए 10 वर्ग मीटर एवं रोगी परामर्श सेवा के लिए 10 वर्ग मीटर सहित)
5.	सभागार (बहुउद्देशीय) हाल (वांछनीय)	01	250-300 सीट क्षमता का
6.	जड़ी बूटी उद्यान (वांछनीय)	01	औषधिपरक पौधों की पर्याप्त संख्या

7. छात्र सुविधाएं

क्रमांक	अवसंरचना का कक्ष	प्रतिमानकों अनुसार आवश्यकता (संख्या में)	प्रतिमानकों के अनुसार आवश्यकता (क्षेत्रफल में)
1.	बालिका कॉमन रूम (अनिवार्य)	01	60 वर्ग मीटर
2.	बालक कॉमन रूम (अनिवार्य)	01	60 वर्ग मीटर
3.	बालकों के लिए शौचालय खंड	01	24 वर्ग मीटर
4.	बालिकाओं के लिए शौचालय खंड	01	24 वर्ग मीटर
5.	पेय जल सुविधा वाटर कूलर (अनिवार्य)	01	
6.	बालक छात्रावास (वांछनीय)	01	9 वर्ग मीटर कक्ष अकेले के लिए
7.	बालिका छात्रावास (वांछनीय)	01	9 वर्ग मीटर कक्ष अकेले के लिए 20 वर्ग मीटर कक्ष तीन के लिए
8.	पावर बैकअप व्यवस्था (वांछनीय)	01	

8. कंप्यूटर और अन्य सुविधाएं

नाम	आवश्यकता
बी.फार्म. पाठ्यक्रम के लिए कंप्यूटर कक्ष	हर 2 छात्रों के लिए एक सिस्टम (इंटरनेट और मुद्रक की सुविधाओं के साथ) (क्षेत्रफल 75 वर्ग मीटर)
मॉडल भेषजी के लिए कंप्यूटर	शिक्षण और व्यवसाय प्रयोजनों के लिए तथा औषध सूचना सेवा के लिए यथा आवश्यक
कंप्यूटर (नवीनतम आकृति)	हर 10 छात्रों के लिए एक सिस्टम (स्नातकपूर्व एवं स्नातकोत्तर)
मुद्रक	हर 10 कम्प्यूटर के लिए एक
ब्हु-मीडिया प्रोजेक्टर	01
जेनेरेटर (5 कि.वाट)	01

9. पुस्तकें और पत्र-पत्रिकाएं

आरंभिक स्टाक की पुस्तकें तथा पुस्तकों और पत्र-पत्रिकाओं के वार्षिक योग के लिए न्यूनतम प्रतिमानक निम्नलिखित हैं :-

मद	शीर्षक संख्या	न्यूनतम खंड (संख्या)
पुस्तकों की संख्या	150	भेषजी के समस्त विषयों में अनेकों मानक पाठ्यपुस्तकों के 1500 पर्याप्त कवरेज
पुस्तकों का वार्षिक संस्करण		प्रति वर्ष 150 पुस्तकें
आवधिक पत्रिकाएं हार्ड प्रतियां/आनलाईन		10 राष्ट्रीय 05 अंतर्राष्ट्रीय आवधिक पत्रिकाएं
सी.डी.		पर्याप्त संख्या
इंटरनेट ब्राउजिंग सुविधा		हाँ/नहीं (न्यूनतम दस कंप्यूटर)
रेप्रोग्राफिक सुविधाएं : फोटोकोपियर फैक्स स्केनर		 01 01 01

10 क. विषयवार वर्गीकरण

क्रमांक	विषय	शीर्षक	संख्या
1.	फार्मास्युटिक्स		
2.	फार्मास्युटिकल कैमिस्ट्री		
3.	फार्माकोग्नॉजी		
4.	बायोकैमिस्ट्री एण्ड क्लिनिकल पैथोलॉजी		
5.	हुमैन अनाटॉमी एण्ड फ़िजियोलॉजी		
6.	हैल्थ एजूकेशन एण्ड कॉमुनिटी फार्मेसी		
7.	फार्मेसी प्रैक्टिस		
8.	फार्माकोलॉजी एण्ड टोक्सिकॉलोजी		
9.	फार्मास्युटिकल जूरिसप्रुडैन्स		
10.	ड्रग स्टोर एण्ड बिजिनेस मैनेजमैन्ट		
11.	हॉस्पिटल एण्ड क्लिनिकल फार्मेसी		
12.	सोशल फार्मेसी		

10 ख. पुस्तकालय कर्मचारीवृंद

	कर्मचारीवृंद	अर्हता	आवश्यकता
1.	पुस्तकालय प्रमुख	एम.लिब.	1
2.	सहायक पुस्तकालय प्रमुख	डी.लिब.	1
3.	पुस्तकालय परिचर	10+2/पी.यू.सी.	2

भाग-III शैक्षणिक आवश्यकताएं

क. संकाय आवश्यकता

1. छात्र कर्मचारी अनुपात

   (आवश्यक अनुपात – सैद्धांतिक पक्ष 40 : 1 और असाईन्मेंट 10 : 1)
2. बी.फार्म. (व्यवसाय) के लिए कार्य दिवसों की न्यूनतम संख्या 180
3. बी.फार्म. और बी.फार्म (व्यवसाय) के लिए पाठ्यक्रम विभागवार कर्मचारी कार्य प्रणाली :

   प्रोफेसर : सहायक प्रोफेसर : प्राध्यापक

विभाग/प्रभाग	पदनाम	बी.फार्म. के 60 छात्रों और बी.फार्म. (व्यवसाय) के 40 छात्रों के लिए
डिपार्टमैन्ट ऑफ फार्मास्युटिक्स	प्रोफेसर/सह प्रोफेसर	1
	सहायक प्रोफेसर	1
	प्राध्यापक	4
डिपार्टमैन्ट ऑफ फार्मास्युटिकल कैमस्ट्री (फार्मास्युटिकल अनालिसिस सहित)	प्रोफेसर/सह प्रोफेसर	1
	सहायक प्रोफेसर	1
	प्राध्यापक	4
डिपार्टमैन्ट ऑफ फार्माकोलॉजी	प्रोफेसर/सह प्रोफेसर	1
	सहायक प्रोफेसर	1
	प्राध्यापक	5
डिपार्टमैन्ट ऑफ फार्माकोग्नोजी	प्रोफेसर/सह प्रोफेसर	1
	सहायक प्रोफेसर	1
	प्राध्यापक	2
डिपार्टमैन्ट ऑफ फार्मेसी प्रैक्टिस	प्रोफेसर/सह प्रोफेसर	1
	सहायक प्रोफेसर	2
	प्राध्यापक	2

4. 40 छात्रों के प्रवेश पर बी.फार्म. (व्यवसाय) के लिए अनन्यतः वर्षवार आवश्यक शिक्षण कर्मचारीगण :

	बी.फार्म. व्यवसाय के लिए आवश्यक कर्मचारी	**II बी.फार्म. व्यवसाय के लिए आवश्यक कर्मचारी**
प्रिंसिपल	1	1
फार्माकोलॉजी	1	1
फार्मास्युटिक्स	1	1
फार्मेसी प्रैक्टिस	2	2
अंशकालिक शिक्षण कर्मचारी विकारी शरीर क्रिया और भेषज चिकित्सा विज्ञान	यथा आवश्यक	यथा आवश्यक

कम से कम दो शिक्षकों के पास एम.फार्म. (भेषजी व्यवसाय) या फार्म.डी अर्हता हो।

5. 60 छात्रों के प्रवेश पर डी.फार्म. और बी.फार्म. के लिए उपलब्ध शिक्षणेतर कर्मचारियों की संख्या :

क्रमांक	**पदनाम**	**आवश्यक संख्या**	**आवश्यक अर्हता**	**उपलब्धता**	**निरीक्षण दल की टिप्पणी**
1	पुस्तकालय तकनीशियन	प्रति विभाग 1	डी.फार्म.		
2	पुस्तकालय सहायक/परिचर	प्रति प्रयोग 1 (न्यूनतम)	एस.एस.एल.सी.		
3	कार्यालय अधीक्षक	1	डिग्री		
4	लेखापाल	1	डिग्री		
5	भंडारी	1	डी.फार्म/डिग्री		
6	कंप्यूटर डाटा ऑपरेटर	1	बी.सी.ए./कंप्यूटर पाठ्यक्रम के साथ स्नातक		
7	प्रथम श्रेणी सहायक	1	डिग्री		
8	द्वितीय श्रेणी सहायक	2	डिग्री		
9	चपरासी	2	एस.एस.एल.सी.		
10	सफाई कार्मिक	पर्याप्त	-		
11	माली	पर्याप्त	-		

ख. प्रलेखन

दस्तावेजों का रखरखाव : आवश्यक

क्रमांक	**अभिलेख**
1	प्रवेश रजिस्टर
2	व्यक्तिगत सेवा रजिस्टर
3	कर्मचारी उपस्थिति रजिस्टर
4	सत्रीय अंक रजिस्टर
5	अंतिम अंक रजिस्टर
6	छात्र उपस्थिति रजिस्टर
7	बैठक का कार्यवृत – शिक्षण कर्मचारी
8	संदत्त शुल्क रजिस्टर
9	संदाय (भुगतान) रजिस्टर
10	पुस्तकालय में पुस्तकों और पत्रिकाओं का परिग्रहण रजिस्टर
11	एक लाख रूपये से अधिक लागत के रसायनों और उपस्करों की लॉग बुक
12	प्रयोगशालाओं के जॉब कार्ड
13	उपस्कर की मानक प्रचालन प्रक्रिया
14	प्रयोगशाला निदेशिका

15	उपस्कर का स्टॉक रजिस्टर
16	सी.पी.सी.एस.ई.ए. के अनुसार पशुशाला अभिलेख
17	छात्रों द्वारा असाईन्मेंट प्रस्तुत करने का अभिलेख
18	केस प्रस्तुतीकरण/संगोष्ठी आयोजित करने का अभिलेख

भाग IV उपस्कर और उपकरण

भेषजी अधिनियम की धारा 12 के अधीन बी.फार्म. पाठ्यक्रम के अनुमोदन के लिए एस आई एफ में यथा विहित समस्त उपस्कर रखने से संस्था द्वारा पूर्ण अनुपालन हो जाएगा।

परिशिष्ट-III

(विनियम 8 देखिए)

पाठ्यक्रम पाठ्यचर्या

1.1 पैथोफिज़ियोलॉजी एण्ड फार्माकोथेरापियुटिक्स - I

विषय क्षेत्र

व्यवसाय करने वाले भेषजज्ञों को अपने व्यवसाय सेटिंग में केस नोट्स या औषध-पत्र की समीक्षा करने का अवसर मिलेगा तथा वे औषधि विषयक समस्याओं की पहचान करने और उनका समाधान करने में समर्थ होंगे। इससे बेहतर रोगी देखभाल सुनिश्चित होगी तथा अनावश्यक स्वास्थ्य देखभाल व्यय कम हो जाएगा।

उद्देश्य :

पाठ्यक्रम पूरा करने पर छात्र -

क, संबंधित प्रणाली के शरीर रचना विज्ञान तथा शरीर क्रिया विज्ञान को समझने में ;

ख, रोग की प्रक्रिया को समझने में ;

ग, रोग के लक्षण और चिन्ह जानने में ;

घ, लाभ हानि सहित विभिन्न उपचारार्थ विधान को समझने में समर्थ हो जाएगा।

पाठ्यक्रम की कालावधि

विद्या प्राप्त करना (पढ़ाई)

शिक्षण की मिश्रित पद्धति से पढ़ाई के 40 घण्टे। मिश्रित शिक्षण के अंतर्गत डाइडेक्टिक और आनसाइट पढ़ाई भी शामिल है।

केस प्रस्तुतिकरण

पाठ्यक्रम के दौरान हर छात्र 5 केस प्रस्तुत करेगा जिनमें पाठ्य-विवरण में विहित रोगों पर चर्चा होगी।

समनुदेशन (असाईन्मैन्ट)

प्रत्येक छात्र को भेषज चिकित्सा विज्ञान और भेषजी व्यवसाय संकल्पनाओं को समाविष्ट करते हुए दो समनुदेशन पूरे करने चाहिए जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

विस्तृत पाठ्य-विवरण और व्याख्यान वार अनुसूची

1. पैथोफिज़ियोलॉजी एण्ड फार्माकोथेरापियुटिक्स का परिचय विषय क्षेत्र और उद्देश्य **- 1 घंटा**

2. 4 घंटों के लिए दिशानिर्देश विहित करना (औषध और मात्रा निर्धारण तथा मात्रा परिकलन)

क, पेडियाट्रिक्स

ख, जेरियाट्रिक्स

ग, गर्भवती और स्तनपान कराने वाली स्त्रियां

घ, रिनेली और हिपेटिकली विकलांग रोगी

3. शरीर रचना विज्ञान, ईटियोपैथोजेनेसिस, निदान प्रविधि, क्लिनिकल अभिव्यक्ति और कार्डियोवेसकुलर सिस्टम से संबंद्ध रोगों की भेषज चिकित्सा के तत्व **- 15 घंटे**

क, हाइपरटेन्शन

ख, अरक्तताजन्य हृदयरोग (एन्जिना और मायोकाट्रिक्स इन्फ्रैक्शन)

ग, अति वसा रक्तता

घ, रक्ताधिक्य हृदयपात

ड., अतालता (अर्थिमियाज)

4. शरीर रचना विज्ञान, ईटियोपैथोजेनेसिस, रोगनिदान प्रविधि, क्लिनिकल अभिव्यक्ति और श्वसन तंत्र से संबंद्ध रोगों की भेषज चिकित्सा के तत्व **- 12 घंटे**

क, दमा
ख, सी.ओ.पी.डी.
ग, औषध प्रेरित फुप्फुसी रोग

5. शरीर रचना विज्ञान, ईटियोपैथोजेनेसिस, रोगनिदान प्रविधि, क्लिनिकल अभिव्यक्ति और एन्डोक्रोमिक तंत्र से संबंद्ध रोगों की भेषज चिकित्सा के तत्व **– 8 घंटे**

क, मधुमेह
ख, अवटुकंठिका (थाइराइड)रोग

पुस्तकें/संदर्भ :
सुझाए गए असाइन्मेंट

1.2 पैथोफिज़ियोलॉजी एण्ड फार्माकोथेरापियुटिक्स - II

विषय क्षेत्र

व्यवसाय करने वाले भेषजज्ञों को अपने व्यवसाय स्थापन में केस नोट्स या औषध-पत्रों की समीक्षा करने का अवसर प्राप्त होगा और वे औषधि विषयक समस्याओं की पहचान करने और उनका समाधान करने में समर्थ होंगे। इससे बेहतर रोगी देखभाल सुनिश्चित होगी तथा अनावश्यक स्वास्थ्य देखभाल व्यय में कमी आएगी।

उद्देश्य :

पाठ्यक्रम पूरा करने पर छात्र –

क, संबंधित प्रणाली के शरीर रचना विज्ञान तथा शरीर क्रिया को समझने में ;
ख, रोग प्रक्रिया को समझने में ;
ग, रोग के लक्षणों और चिन्हों को जानने में ;
घ, लाभ हानि सहित विभिन्न उपचारार्थ विधानों को समझने में समर्थ हो जाएगा।

पाठ्यक्रम की कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रण पद्धतियों द्वारा पढ़ाई के 40 घण्टे शिक्षा की मिश्रित पद्धति और इसमें डाइडेक्टिक तथा ऑनसाइट पढ़ाई भी शामिल है।

केस प्रस्तुतिकरण

पाठ्यक्रम के दौरान प्रत्येक छात्र को पाठ्य-विवरण में विहित रोगों को समाविष्ट करते हुए 5 मामले प्रस्तुत करने चाहिए।

असाईन्मैन्ट्स

प्रत्येक छात्र को भेषज चिकित्सा विज्ञान और भेषजी व्यवसाय संकल्पनाओं को समाविष्ट करते हुए दो असाइन्मेंट पूरे करने चाहिए जिनका अंतिम परीक्षाओं के समय मूल्यांकन होगा।

विस्तृत पाठ्य-विवरण और व्याख्यानवार अनुसूची

1. शरीर रचना विज्ञान, ईटियोपैथोजेनेसिस, रोगनिदान प्रविधि, क्लिनिकल अभिव्यक्ति और सी एन एस से संबंद्ध रोगों की भेषज चिकित्सा के तत्व **– 18 घंटे**

क, चिन्ता
ख, अवदाब
ग, शीजोफ्रेनिया
घ, मेनिया अवदाबीय विकार
ड., मिरगी
च, पर्किंसन्स रोग,
छ, सिरदर्द

2. शरीर रचना विज्ञान, ईटियोपैथोजेनेसिस, रोग निदान प्रविधि, क्लिनिकल अभिव्यक्ति और जी. आई. विकार से संबंद्ध रोगों के भेषज चिकित्सा के तत्व **– 10 घंटे**

क, डिसपेप्सिया
ख, अम्ल पेप्सिन रोग
ग, ज्वलनशील फुंसी रोग
घ, जिगर विकार – हेपेटाइटिस, पित्ताशय पथरी, अल्कोहोलिक जिगर रोग

3. शरीर रचना विज्ञान, ईटियोपैथोजेनेसिस, क्लिनिकल अभिव्यक्ति और हेमोटोलोजिकल सिस्टम से संबंद्ध रोगों के भेषज चिकित्सा के तत्व **– 8 घंटे**

क, लोहित कोशिका जनन प्रणाली – सामान्य दृष्टिकोण, लौह न्यूनता एनिमिया, मेगालोब्लास्टिक एनिमिया, सिड्रोब्लास्टिक एनिमिया, हेमोलिटिक एनिमिया, शिरा (वीनाउस) थ्रोम्बोयमबोलिज्म, (अर्टिरियल) धमनी–थ्रोम्बोयमबोलिज्म, औषध प्रेरित रक्त विकार

पुस्तकें और संदर्भ :
असाइन्मेंट के लिए सुझाए गए प्रविषय

1.3 भेषजी व्यवसाय I

विषय क्षेत्र

व्यवसायी भेषजज्ञों को सामुदायिक स्थापन में रोगी के स्वास्थ्य के बारे में परामर्श, स्वास्थ्य स्क्रीनिंग सेवाओं और अन्य शिक्षा कार्यक्रमों के माध्यम से सुधार करने के लिए विभिन्न रोगी देखभाल सेवाएँ उपलब्ध कराने का अवसर मिलता है। अस्पताल के स्थापन में भेषजज्ञ रोगी को समुचित दवाईयाँ दिलवा सकते हैं, शिक्षा सुनिश्चित कर सकते हैं तथा सभी अस्पताल भेषजी सेवाएँ सुलभ करा सकते हैं जिसके अंतर्गत क्लिनिकल (नैदानिक) भेषजी सेवाएँ भी शामिल हैं जैसे औषध सूचना और ए.डी.आर. रिपोर्टिंग।

उद्देश्य :
पाठ्यक्रम पूरा होने पर छात्र –
क, सामुदायिक, अस्पताल और नैदानिक भेषजी क्षेत्र में वृत्तिक भूमिका समझने में,
ख, भेषजज्ञ के वृत्तिक उत्तरदायित्वों को समझने में,
ग, आशायित सेवाएँ देने में समर्थ हो जाएगा।

पाठ्यक्रम की कालावधि
विद्या प्राप्त करना (पढ़ाई)
मिश्रण पद्धति द्वारा पढ़ाई के 40 घण्टे। मिश्रण पद्धति के अंतर्गत डाइडैक्टिक और आनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट्स
प्रत्येक छात्र को भेषज चिकित्सा विज्ञान और भेषजी व्यवसाय संकल्पनाओं में दो असाइन्मेंट पूरे करने चाहिए जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

विस्तृत पाठ्यविवरण और व्याख्यानवार अनुसूची

1. भेषजी व्यवसाय का परिचय परिभाषा, रोगीमुखी दृष्टिकोण व्यवसाय का विषयक्षेत्र। – **1 घण्टा**

2. नैदानिक भेषजी का परिचय – **3 घण्टे**

क, नैदानिक भेषजी व्यवसाय की परिभाषा, विषयक्षेत्र और उद्देश्य
ख, अंतरराष्ट्रीय बनाम राष्ट्रीय परिदृश्य
ग, नैदानिक भेषजज्ञों के वृत्तिक उत्तरदायित्त्व

3. नैदानिक भेषजी दैनिक गतिविधियाँ – **6 घण्टे**

क,
i) वार्ड दौरे की सहभागिता
ii) उपचार चार्ट समीक्षा
iii) औषध सूचना
iv) रोगी को परामर्श
v) ए.डी.आर. मानिटरिंग और रिपोर्टिंग
vi) भेषजी चिकित्सा औषध मानिटरिंग
vii) गृह उपचार समीक्षा

की परिभाषा, उद्देश्य और प्रक्रियाएँ।

ख, रोगी के आंकड़ों का विश्लेषण – **2 घण्टे**
रोगी की केस हिस्ट्री, औषध चिकित्सा मूल्यांकन, औषधि से संबंद्ध समस्याओं को पहचानना और उनका समाधान करना।

4. व्यवसाय प्रबंध – **8 घण्टे**

क, वृत्तिक व्यवसाय मानक – उत्तम भेषजी व्यवसाय – विस्तारपूर्वक जिसके अंतर्गत, उत्तम भण्डारण व्यवसाय, उत्तम उपचार करने की पद्धतियाँ आदि (राष्ट्रीय और अंतर्राष्ट्रीय परिदृश्य) (सामुदायिक और अस्पताल भेषजी दोनों के लिए) भी शामिल हैं

ख, भेषजी व्यवसाय विनियम (पी.सी.आई.), भेषजज्ञों के लिए आचार संहिता
ग, एस.ओ.पी. ; एस.ओ.पी. लेखन, प्रलेखन, सामुदायिक और अस्पताल भेषजी के लिए विभिन्न अभिलेख फार्मेट अस्पताल और सामुदायिक भेषजी के औचित्य की संकल्पनाएँ लिखना
घ, भेषजियों के प्रत्यायन (एक्रीडिटेशन) की संकल्पना
ड. सामुदायिक भेषजी और अस्पताल भेषजी के औचित्य की संकल्पनाएँ
च. सामुदायिक और अस्पताल भेषजी में संपरीक्षा की संकल्पना

5. अस्पताल, अस्पताल भेषजी संगठन – – 6 घण्टे

क, अस्पताल की परिभाषा, अस्पताल भेषजी, अस्पताल की संगठनात्मक संरचना, अस्पताल भेषजज्ञों की वृत्तिक भूमिका और उत्तरदायित्व।
ख, अस्पताल में भर्ती करने के फायदे, जरूरत और नुकसान/जोखिम/नोसोकोनियल संक्रमण/एच.ए.आई. विश्वव्यापी परिदृश्य, आंकड़ें/प्रचलन, खतरे, ग्रहण करने की पूर्वावधानियाँ, अस्पतालों से संबंद्ध समस्याएँ, उच्च जोखिम पर्यावरण।
ग, अंतर्राष्ट्रीय परिदृश्य बनाम अस्पताल भेषजी व्यवसाय का भारतीय परिदृश्य।
घ, अस्पताल भेषजी व्यवसाय – अस्पताल भेषजी के कार्यकरण की अपेक्षाएँ, भेषजज्ञों की अर्हता और अनुभव अपेक्षाएँ, कार्यभार के आंकड़ें।
ड., अस्पतालों में भेषजियों के मानक ?

6. औषध समितियाँ – 4 घण्टे

भेषजी और चिकित्सा समिति, अस्पताल फार्मूलरी संक्रमण नियंत्रण समिति, संस्थागत समीक्षा बोर्ड

7. सामुदायिक भेषजी – 8 घण्टे

क, सामुदायिक भेषजज्ञ की परिभाषा विषयक्षेत्र और उसके वृत्तिक उत्तरदायित्व
ख, सामुदायिक भेषजी व्यवसाय का अंतर्राष्ट्रीय परिदृश्य बनाम भारतीय परिदृश्य
ग, भेषजी सहायक/तकनीशियन/विक्रयकर्ता (सेल्सपर्सन) कर्तव्य और उत्तरदायित्व,
घ, अन्य स्वास्थ्य देखभाल वृत्तिकों और नरसिंग होम के प्रति सामुदायिक भेषजज्ञ की सेवाएँ

8. सामुदायिक भेषजी प्रबंध – 4 घण्टे

स्थान का चुनाव, वैधानिक आवश्यकताएँ, अर्जित, भण्डारण, आविष्कारक नियंत्रण, उत्पाद प्रदर्शनी, वित्त प्रबन्ध।

पुस्तकें और संदर्भ

सुझाए गए असाइन्मेंट प्रविषय

1.4 भेषजी व्यवसाय – II

विषय क्षेत्र

व्यवसाय करने वाले भेषजज्ञों को सामुदायिक स्थापन में परामर्श सेवा, स्वास्थ्य स्क्रीनिंग सेवा के माध्यम से तथा अन्य शिक्षा कार्यक्रम के माध्यम से रोगी के स्वास्थ्य में सुधार करने के लिए विभिन्न रोगी देखभाल सेवाएँ प्रदान करने का अवसर प्राप्त होगा। अस्पताल के स्थापन में, भेषजज्ञ समुचित दवाई देना, रोगी को शिक्षा देना सुनिश्चित कर सकते हैं, तथा अस्पताल भेषजी सेवाएँ सुलभ करा सकते हैं जिसके अंतर्गत क्लिनिकल भेषजी सेवाएँ भी शामिल हैं जैसे औषधि की जानकारी और ए.डी.आर.रिपोर्टिंग।

उद्देश्य :

पाठ्यक्रम पूरा होने पर छात्र –

क) सामुदायिक, अस्पताल और क्लिनिकल (नैदानिक) भेषजी में भेषजज्ञों की वृत्तिक भूमिका समझने में,
ख) भेषजज्ञों के वृत्तिक उत्तरदायित्वों को समझने में
ग) आशायित सेवाएँ प्रदान करने में समर्थ हो जाएगा।

पाठ्यक्रम की कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रण पद्धति से पढ़ाई के 40 घण्टे मिश्रित शिक्षण के अंतर्गत डाइडेक्टिक और ऑनसाइट सीखना भी शामिल है।

असाईन्मैन्ट्स

प्रत्येक छात्र को चिकित्सा विज्ञान और भेषजी व्यवसाय संकल्पनाओं को समाविष्ट करते हुए दो असाइन्मेंट पूरे करने चाहिए जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

विस्तृत पाठ्यविवरण और व्याख्यानवार शिक्षण अनुसूची

1. अस्पताल भेषजी भण्डार प्रबन्ध – 4 घण्टे

भण्डार प्रबन्ध, औषधियां क्रय करना और प्राप्त करना, माल नियंत्रण और जी.पी.पी. सामान और वित्त का प्रबंध ।

2. औषधि देना और औषधि वितरण – 8 घण्टे

औषधि वितरण – विभिन्न पद्धतियाँ, व्यक्तिगत आर्डर पद्धति, फ्लोर स्टॉक पद्धति, यूनिट मात्रा औषध वितरण पद्धति,औषधि बास्केट पद्धति,आई.सी.सी.यू./आई.सी.यू. आपात वार्डों में औषधि वितरण, औषधि देने की स्वचालित प्रणालियाँ और साधन स्वापक और मन प्रभावी पदार्थों का विवतरण, इन सबसे संबंद्ध जी.पी.पी.

3. केन्द्रीय स्टेराइल वितरण सेवाएँ – 2 घण्टे

4. औषध पत्र और औषध पत्र को संभालना – 5 घण्टे

क. परिभाषा, औषध पत्र के भाग, उत्तम औषधपत्र लिखने की पद्धतियां, औषध–पत्रों की वैद्यता, औषध–पत्रों में औषधि से संबंद्ध समस्याओं की पहचान करना।

ख. औषध पत्र को संभालना, नुस्खे की दवाईयों पर लेबल लगाना, (मुख्य लेबल, आनुसंगिक लेबल, पिक्टोग्राम), दवाई का प्रयोग करने के लिए के अनुदेश।

ग. उत्तम दवा वितरण पद्धतियां।

घ. औषध अनुक्रिया (औषध–औषध, औषध–भोजन औषध, प्रयोगशाला अन्वेषण) – प्रकार, निर्वचन, और पता लगाना, निवारण, बाजार औषध–पत्रों पर व्यवसाय, औषध अनुक्रिया सोफ्टवेअरों का उपयोग।

ड. पी.पी.आई. – (रोगी पैकेज दर्ज करना) – बुनियादी संकल्पनाएँ, पी.पी.आई. की महत्ता और लाभप्रद उपयोग। भारत और अन्य देशों में परिदृश्य।

5. भेषजिक देखभाल – 2 घण्टे

भेषजिक देखभाल की परिभाषा, सिद्धांत और प्रक्रियाएँ

6. रोगी को परामर्श देना – 4 घण्टे

परिभाषा, रोगी को परामर्श देने के विभिन्न प्रक्रम, परामर्श देने में बाधाएँ और रोगी को परामर्श देने की बाधाओं को दूर करने की रणनीतियाँ/रोगी सूचना पर्चे–पी.आई.एल. की परिभाषा, नक्शा और डिजाइन।

7. स्वास्थ्य स्क्रीनिंग सेवाएँ – 4 घण्टे

स्वास्थ्य सक्रीनिंग सेवाओं की परिभाषा, विषय क्षेत्र और उपयोग रक्तदाब के सक्रीनिंग में अंतर्ग्रस्त प्रक्रियाएँ, केशिका रक्त ग्लूकोज, पिंड पुंज इन्डेक्स।

8. प्रयोगशाला आंकड़ों का निर्वचन – 10 घण्टे

क, हेमाटोलोजीकल, जिगर कार्य, वृक्क कार्य, थाइरायड कार्य परीक्षण

ख, हृदय विकार से संबंद्ध परीक्षण

ग, तरल विद्युत अपघटन संतुलन

घ, सूक्ष्म जीव वैज्ञानिक संस्कृति सुग्राह्यता परीक्षण

ड., फुप्फुसी कार्य परीक्षण

पुस्तकें और संदर्भ

सुझाए गए असाइनमेंट प्रविषय।

1.5 अनुप्रयुक्त भेषजिकी

विषय क्षेत्र

इस पाठ्यक्रम का उद्देश्य विभिन्न मात्रारूपों और शरीर में भेषजिक परिवर्तनों के बारे में मूलभूत जानकारी प्रदान करना है। इससे अवशोषण, विवतरण उपापचय और उत्सर्जन विषयक बुनियादी संकल्पनाओं को समझने में छात्रों को मदद मिलेगी।

उद्देश्य

पाठ्यक्रम पूरा होने पर छात्र –

क, विभिन्न मात्रा रूपों के रचना सिद्धांतों को समझने में,
ख, विभिन्न मात्रा रूपों के स्थिरता, भण्डारण और प्रशासन के बुनियादी सिद्धांतों को समझने में,
ग, उपरोक्त अभिनव औषधि प्रदान करने की प्रणाली को सीखने में,
घ, विभिन्न भेषजिक उपायों को समझने तथा आयुर्विज्ञान चिकित्सा को आशावादी बनाने में,
ड., औषधि परक संकल्पना को समझने में, समर्थ हो जाएगा।

पाठ्यक्रम कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रित पद्धति से पढ़ाई के 40 घण्टे। मिश्रण पद्धति के शिक्षण के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट्

प्रत्येक छात्र को भेषजिक मात्रारूपों और भेषजिक संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिए।

पाठ्य पुस्तकें

सुझाए गए प्रविषय असाइन्मेंट के लिए

क. कूपर एण्ड गुन्नस डिस्पैन्सिंग फॉर फार्मेसी स्टूडेंट ।
ख. ए टैक्सट बुक प्रोफेशनल फार्मेसी बाई एन.के. जैन एण्ड एस.एन. शर्मा।
ग. डी.एम. ब्रह्मांकर एण्ड सुनील बी जैसवाल। टैक्सट बुक ऑफ बॉयोफार्मास्युटिक्स एण्ड फार्माकोकिनेटिक्स – ए ट्रीटाइज। वल्लभ प्रकाशन, दिल्ली।

संदर्भ पुस्तकें

क, हावर्ड सी. अंसेल रचित इंट्रोडक्शन टू फार्मास्युटिकल डोसेज फॉर्मस
ख, रेमिंगटन रचित फार्मास्युटिकल सांईसेज

व्याख्यानवार कार्यक्रम और विस्तृत पाठ्य विवरण

1. इंट्रोडक्शन टू फार्मास्युटिकल डोसेज फॉर्मस – 1 घण्टा

2. बेसिक्स ऑफ जी.एम.पी., जी.एल.पी., क्यू.ए. क्यू.सी. – 1 घण्टा

3. समस्त मात्रारूपों का अनुशरण करते हुए अध्ययन –15 घण्टे

क, जरूरत, लाभ, हानियाँ
ख, इनमें प्रयुक्त विभिन्न घटक और इनकी जरूरतों का सारांश, अक्रियाओं के बुनियादी गुणधर्म, विस्तार में जाए बिना विनिर्माण का बुनियादी आद्योपांत दृष्टिकोण (ओवर व्यु)
ग, भण्डार की पैकेज करने की अपेक्षाएँ
घ, संभव स्थिरता और खराबियों के मुद्दे
ड., उचित प्रयोग, प्रयोग करते समय विशेष सावधानी, रोगी के लिए अनुदेश
च, जीव उपलब्धता/जीव भेषजिकी पहलु

4. **अभिनव औषधि प्रदान करने की प्रणालियों का परिचय, रोगियों को दिए जाने वाले अनुदेश – ट्रान्सडर्मल, इन्फ्यूजन पम्प, पारम्परिक तौर पर निर्मित दवाईयाँ आदि – 6 घण्टे**

5. **इन्ट्रोडक्शन टू बायो–फार्मास्युटिक्स – 1 घण्टा**

6. **औषधि अवशोषण – 3 घण्टे**

क, कोशिका कला के अवशोषण, संरचना और शरीर रचना विज्ञान का परिचय
ख, औषध अवशोषण को प्रभावित करने वाले कारक, वाह्य रक्तघर मार्ग

7. औषधि वितरण – 2 घण्टे

क, औषधियों की ऊतक परगम्यता, औषधि वितरण के शरीर क्रियात्मक रोध

ख, औषधि वितरण को प्रभावित करने वाले पहलू
ग, औषधि वितरण मात्रा, औषध प्रोटीन, औषध ऊतक आबद्धकर

8. औषधियों का जीवी परिवर्तन – 3 घण्टे

क, औषधि उपापचय अवयव और एन्जाइम
ख, चरण I अनुक्रियाएँ, चरण II अनुक्रियाएँ,
ग, औषधियों का कारकों को प्रभावित करने वाला जीवी परिवर्तन

9. औषधियों का उत्सर्जन – 1 घण्टा

औषधियों का वृक्क उत्सर्जन
औषधि उत्सर्जन का अवृक्क मार्ग

10. उप औषधि (प्रो ड्रग) – 1 घण्टा

क, उप औषधि की परिभाषा और अप्लीकेशन

11. जीवी उपलब्धता और जीवी समकक्षता – 4 घण्टे

क, जीवी उपलभ्यता और जीवी समकक्षता
ख, जीवी उपलभ्यता को प्रभावित करने वाले कारक
ग, बी.ए., बी.ई., बी.ए. वर्गीकरण प्रणाली की महत्ता, एन.टी.आई. औषधि, ऐसी औषधियों को विहित करने तथा नुस्खा बनाने में बरती जाने वाली सावधानी।

असाईन्मैन्ट्

प्रत्येक छात्र को चिकित्सा विज्ञान और भेषजी व्यवसाय संकल्पनाओं को समाविष्ट करते हुए दो असाईन्मेंट पूरे करने चाहिएं जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

1.6 सामाजिक भेषजी – 1

विषय क्षेत्र

व्यवसाय करने वाले भेषजज्ञों को समाज में रोगियों के स्वास्थ्य में सुधार करने के लिए विभिन्न रोगी देखभाल सेवाएँ उपलब्ध कराने का अवसर मिलेगा। व्यक्तियों के स्वास्थ्य को मानिटर करके उन्हें स्वास्थ्य, पूर्वावधानियों विषयक शिक्षा देकर भेषजज्ञ अपनी वृत्तिक छवि को निखार सकते हैं।

उद्देश्य :

पाठ्यक्रम पूरा होने पर छात्र –
क, समाज में भेषजज्ञों के सामाजिक उत्तरदायित्वों को समझने में,
ख, स्वास्थ्य नीतियों को समझने में,
ग, रोगियों को स्वास्थ्य देखभाल सेवाएँ प्रदान करने में समर्थ हो जाएगा।

पाठ्यक्रम कालावधि

विद्या प्राप्त करना (पढ़ाई)
मिश्रण पद्धति से विद्या प्राप्त करने के 40 घण्टे।
मिश्रण पद्धति के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट्

प्रत्येक छात्र को चिकित्सा विज्ञान और भेषजिक व्यवसाय की संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिएं।

<u>विस्तृत पाठ्य विवरण और विषय</u>

1. सामाजिक भेषजी का परिचय –

क, परिभाषा और विषयक्षेत्र – एक अनुशासन के रूप में सामाजिक भेषजी का परिचय और उसकी विभिन्न संकल्पनाएँ। स्वास्थ्य और बीमारी का समाजशास्त्रीय बोध, जन स्वास्थ्य में भेषजज्ञों की भूमिका **– 1 घण्टा**

ख, स्वास्थ्य की डब्लू.एच.ओ. (विश्व स्वास्थ्य संगठन) परिभाषा – स्वास्थ्य के विविध आयाम **– 1 घण्टा**

ग, भारत में और अन्य देशों में – सार्वजनिक क्षेत्र और प्राईवेट दोनों क्षेत्रों में – स्वास्थ्य प्रणालियाँ, अवसंरचना और कार्यकरण का परिचय तथा सामान्य दृष्टिकोण। भारत में राष्ट्रीय

स्वास्थ्य कार्यक्रम इनका संक्षिप्त अध्ययन और इनमें से प्रत्येक में भेषजज्ञ की भूमिका। **– 5 घण्टा**

2. औषधि, उद्योग और नीतियाँ **– 7 घण्टे**
   क, औषधि और विकसित देश, विकासशील देश, जी.ए.टी.टी. पेटेन्ट, पेटेन्ट अधिनियम
   ख, भेषजिक उद्योग और उसकी गतिविधियाँ, औषधों का वर्गीकरण तंत्र, सामाजिक विपणन – संगठनों का संक्षिप्त अध्ययन तथा सीमा विहीन दवाईयों की भांति कार्यकरण
   ग, आर.यू.एम., डब्लू.एच.ओ. अनिवार्य दवाईयों की संकल्पना, दवाईयों का, अतार्किक प्रयोग और उससे जुडी समस्याएँ आदि, साक्ष्य आधारित दवाईयाँ, ए.टी.जी. (मानक उपचार दिशानिर्देश)
   ध, राष्ट्रीय औषध नीति, राष्ट्रीय स्वास्थ्य नीति, भेषजी एवं औषध आचार

3. भेषजी अर्थशास्त्र – भेषजी अर्थशास्त्र प्रतिरूपों की परिभाषा, प्रकार, औषधि उपयोग, भेषजिक मूल्य निर्धारण और प्रतिपूर्ति, स्वास्थ्य बीमा **– 3 घण्टे**
4. फार्माकोयपिडेमायोलोजी – परिभाषा, विषयक्षेत्र, लाभ–हानि **– 3 घण्टे**

5. स्वास्थ्य संवर्धन और स्वास्थ्य शिक्षा **– 20 घण्टे**
   क, संचारी बीमारियों का जनपदीक रोग विज्ञान : उत्पन्न करने वाले कारक और नैदानिक प्रस्तुतिकरण तथा संचारी बीमारियों की रोकथाम में भेषजज्ञों की भूमिका :–
   i) **श्वसन संक्रमण** – चेचक, खसरा, रूबेला, कनफेड़ इनफ्लुएन्जा (एविआन फ्लु, एच.1 एन.1 सहित), रोहिणी (डिफ्थेरिया) हूपिंग खांसी, मस्तिष्कावरण मेनिनजाइटिस, अत्यधिक श्वसन संक्रमण, तपेदिक (क्षय)
   ii) **आंतों का संक्रमण** – पोलियोमाइलिटिस, वायरल हेपटाइटिस हैजा, तीव्र दस्त वाली बीमारियाँ, मियादी ज्वर, भोजन विषाक्तकरण, अमेवायसिस, कृमि जन्तुबाधा
   iii) **हड्डियों का संक्रमण** – डेंगू, मलेरिया, फिलारियासिस, चिकुनगुनिया
   iv) **पशुजन्य रोग** – रेबीज़ पीतज्वर, जापानी एन्सेफलाइटिस प्लेग, ह्यूमन साल्मोनेलोसिस, रिकेटसल रोग, टेनियासिस हाइडेटिड रोग, लीशमैनियासिस।
   v) **पृष्ठ संक्रमण** – ट्राकोमा, टेटनस, कुष्ठ, एस.टी.डी./एच.आई.वी./एड्स ।
   vi) संक्रमण रोग होना और बार–बार होना।

पाठ्य पुस्तकें (सिद्धांत)

1. सोशल फार्मेसी – इन्नोवेशन एण्ड डेवलपमैन्ट संपादन – ज्योफ हार्डिंग, साराह नेटलटन तथा केविन टेलरए द फार्मास्युटिकल प्रेस।
2. टैक्स्ट बुक ऑफ कम्युनिटी फार्मेसी प्रेक्टिस – आर.पी.एस. जी.बी. पब्लिकेशन।

द्वितीय वर्ष

2.1 विकारी शरीर क्रिया विज्ञान तथा भेषज चिकित्सा विज्ञान III

विषय क्षेत्र

व्यवसाय करने वाले भेषजज्ञों को अपने व्यवसाय के स्थापन में केस नोट्स या औषध पत्र की समीक्षा करने का अवसर प्राप्त होगा और वे औषधि से संबंद्ध समस्याओं की पहचान करने तथा उनका समाधान करने में समर्थ होंगे। इससे रोगी की देखभाल में सुधार होगा तथा अनावश्यक स्वास्थ्य देखभाल व्यय में कमी आएगी।

उद्देश्य

पाठ्यक्रम पूरा होने पर छात्र –

क, संबंधित व्यवस्था के शरीर रचना और शरीर क्रिया को समझने में,
ख, रोग प्रक्रिया को समझने में,
ग, रोग के चिन्हों और लक्षणों को जानने में,
घ, लाभ हानि सहित विभिन्न उपचारार्थ विधानों को समझने में समर्थ हो जाएगा।

पाठ्यक्रम कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रण शिक्षण द्वारा पढ़ाई के 40 घण्टे।

मिश्रित शिक्षण के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।

केस प्रस्तुतिकरण

पाठ्यक्रम के दौरान प्रत्येक छात्र को पाठ्यविवरण में निर्धारित बीमारियों की समाविष्ट करते हुए 5 रोगी मामले प्रस्तुत करने चाहिएं।

असाईन्मैन्ट्
प्रत्येक छात्र को चिकित्सा विज्ञान और भेषजिक व्यवसाय की संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिए तथा उसका मूल्यांकन अंतिम परीक्षा के समय होगा।

<u>विस्तृत पाठ्य विवरण और व्याख्यानवार अनुसूची</u>

1. संक्रामक रोग – 25 घण्टे

क, ऐन्टी–बायोटिक और शल्यचिकित्सीय रोगनिरोध के तर्कसंगत उपयोग के लिए दिशानिर्देश।

ख, विकारी शरीर रचना विज्ञान और क्षय, मेनिनजाइटिस, श्वसन तंत्र संक्रमण, गैसट्रोएन्ट्रीटिस, एन्ड्रोकार्डियाटिस, सेप्टीसिमिया, मूत्र मार्ग संक्रमण, प्रोटोजोल संक्रमण – मलेरिया, एच आई वी एण्ड ओपरचुनिस्टिक संक्रमण, फफून्दी संक्रमण, मियादी बुखार संक्रमण, गोनारहोइया एण्ड सिफिलिस।

2. मांसपेशी कंकाली विकार – 8 घण्टे

क, मांसपेशी कंकाली तंत्र की शरीर रचना और शरीर क्रिया विज्ञान के मूलतत्व।

ख, रयुमेटायड आर्थराइटिस की विकारी शरीर क्रिया और भेषजी चिकित्सा विज्ञान, आस्टियोआर्थराइटिस गाउट, स्पोडिलाइटिस, सिस्टेमेटिक लुपुस एरिथमेटोसस

3. वृक्क तंत्र – 7 घण्टे

क, वृक्क तंत्र की शरीर रचना और शरीर क्रिया विज्ञान के मूलतत्व

ख, तीव्र वृक्क पात, जीर्ण वृक्क पात, वृक्क अपोहन (डायलासिस), औषध प्रेरित वृक्क विकार की पैथोफिजियोलॉजी और फार्माकोथेरापियुटिक्स

पुस्तकें और संदर्भ
सुझाए गए असाइनमेंट प्रविषय

2.2 पैथोफिजियोलॉजी और फार्माकोथेरापियुटिक्स – IV

विषयक्षेत्र
व्यवसाय करने वाले भेषजज्ञों को अपने व्यवसाय के स्थापन में केस नोट्स और औषधपत्र की समीक्षा करने का अवसर मिलेगा और वे औषधि से संबंद्ध समस्याओं की पहचान करने तथा उनका समाधान करने में समर्थ होंगे। इससे रोगी की देखभाल में सुधार होगा तथा स्वास्थ्य देखभाल के अनावश्यक व्यय में कमी आएगी।

उद्देश्य
पाठ्यक्रम पूरा होने पर छात्र –

क, संबंधित तंत्र की शरीर रचना विज्ञान और शरीर क्रिया विज्ञान को समझने में,
ख, रोग प्रक्रिया को समझने में,
ग, रोग के चिन्हों और लक्षणों को जानने में,
घ, लाभ हानि सहित विभिन्न उपचारार्थ विधानों को समझने में समर्थ हो जाएगा।

पाठ्यक्रम की कालावधि –
विद्या प्राप्त करना (पढ़ाई)
मिश्रित शिक्षण से पढ़ाई के 40 घण्टे। मिश्रित शिक्षण के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।
केस प्रस्तुतिकरण
प्रत्येक छात्र को पाठ्यक्रम के दौरान पाठ्यविवरण में दिये गये रोगों के 5 मामलों को प्रस्तुत करना होगा।
असाइनमैंट
प्रत्येक छात्र को थेरापियुटिक्स और भेषजिक अभ्यास के दो असाइनमैंट पूरे करने होंगें जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

विस्तृत पाठ्यविवरण और व्याख्यानवार कार्यक्रम

1. **अर्बुद विद्या (आनकोलोजी)** – **15 घण्टे**

केंसर चिकित्सा के मूलभूत सिद्धांत,
केंसर रसायन चिकित्सा कारकों का व्यापक परिचय
स्तन केंसर, ल्युकेमिया की रसायन चिकित्सा
रसायन चिकित्सा प्रेरित नौसिया और एमेसिर का प्रबंध

2. **डर्माटोलॉजी** – **7 घण्टे**

क) पैथोफिज़ियोलॉजी एण्ड फार्माकोथेरापियुटिक्स ऑफ सोरियासिस, सकैबिज, एंज्मा, इम्पैटियो

3. स्त्रियों का स्वास्थ्य – **10 घण्टे**

क, आर्तव (मेन्सट्रुअल) चक्र की शरीर क्रिया
ख, गर्भ निरोध – भौतिक पद्धतियाँ, रसायनिक पद्धतियाँ, आई.यू.डी. तथा स्थायी पद्धतियाँ,
ग, आर्तव चक्र संबंधी विकार – पालीसिसटिक ओवरी संलक्षण (सिन्ड्रोम) डिसमेनोरिया, आर्तव पूर्व संलक्षण

घ, प्रसूति विज्ञानी औषध चिकित्सा – सगर्भता का त्रिमास, सगर्भता की सामान्य शिकायतें और उनका प्रबंध – मचली (मतली), उल्टी, रिफ्लेक्स एसोफेगाइटिस, मधुमेह मेलीटस, अतिरक्तदाब और प्रीक्लेम्पसिया, सदार्भता में औषधों का एफ.डी.ए. प्रवर्गीकरण

ड., रजोनिवृति – चिन्ह और लक्षण तथा प्रबंध

4. दृष्टि ईटियोपैथोजेनेसिस की शरीर रचना और शरीर क्रिया के तत्व, रोगनिदान प्रविधि, नैदानिक अभिव्यक्तियाँ और नेत्र से संबंद्ध रोगों का भेषज चिकित्सा विज्ञान

क, लुकोमा

ख, संक्रामक नेत्र संबंधी रोग

पुस्तकें और संदर्भ – **3 घण्टे**

असाईन्मेंट के लिए सुझाए गए प्रविषय

2.3 भेषजी व्यवसाय III

विषयक्षेत्र

व्यवसाय करने वाले भेषजज्ञों को सामुदायिक स्थापन में परामर्श देकर, स्वास्थ्य सक्रीनिंग सेवाएँ देकर और अन्य शिक्षा कार्यक्रमों के माध्यम से रोगी के स्वास्थ्य में सुधार करने के लिए विभिन्न रोगी देखभाल सेवा प्रदान करने का अवसर मिलता है। अस्पताल स्थापन में, भेषजज्ञ समुचित उपचार, रोगी को शिक्षा देना तथा समस्त अस्पताल भेषजी सेवाएँ देना सुनिश्चित कर सकते हैं जिसके अंतर्गत नैदानिक भेषजी सेवाएँ शामिल हैं जैसे औषधि की सूचना तथा भेषजिक सतर्कता बरतना।

उद्देश्य

पाठ्यक्रम पूरा होने पर छात्र –
क, सामुदायिक, अस्पताल और नैदानिक भेषजी क्षेत्रों में भेषजज्ञों की वृत्तिक भूमिका को समझने में,
ख, भेषजज्ञों के वृत्तिक उत्तरदायित्वों को समझने में,
ग, आशायित सेवाएँ प्रदान करने में समर्थ हो जाएगा।

पाठ्यक्रम कालावधि

<u>विद्या</u> प्राप्त करना (पढ़ाई)
मिश्रण युक्त शिक्षण द्वारा पढ़ाई के 40 घण्टे।
मिश्रित शिक्षण के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट

प्रत्येक छात्र को चिकित्सा विज्ञान तथा भेषजिक व्यवसाय की संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिए तथा जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

विस्तृत पाठ्यविवरण और व्याख्यानवार कार्यक्रम

1. औषधियों और विषों की जानकारी – 6 घण्टे

क. उपलब्ध औषधि सूचना संसाधनों का परिचय
ख. डी.आई. प्रश्नों के उत्तर देने में क्रमबद्ध दृष्टिकोण
ग. औषधि सूचना और साहित्य का आलोचनात्मक मूल्यांकन
घ. लिखित और मौखिक रिपोर्टों की तैयारी
ड. औषधि सूचना केन्द्र स्थापित करना
च. विष की सूचना – संगठन एवं सूचना संसाधन
छ. औषधि सूचना बुलेटिन

2. भेषजिक सतर्कता – 5 घण्टे

क. भेषजिक सतर्कता का विषयक्षेत्र, परिभाषा और उद्देश्य
ख. प्रतिकूल औषधि प्रतिक्रिया – वर्गीकरण, तंत्र, पूर्व निपटान कारक, कैज्युलिटी निर्धारण (विभिन्न मान प्रयुक्त)
ग. ए.डी.आर. का प्रतिवेदन, मूल्यांकन, अनुश्रवण, निवारण एवं प्रबंधन
घ. ए.डी.आर. के प्रबंध में भेषजज्ञ की भूमिका

3. उपचार त्रुटियाँ

वर्गीकरण, परिणाम, निवारण, तथा भेषजज्ञ की भूमिका, उपचार त्रुटियाँ, तथा उन्हें न्यूनतम करने के तरीके **– 3 घण्टे**

4. उपचार का पालन करना – न पालन करने के परिणाम, भेषजज्ञ की भूमिका, अनुपालन सहायता में सुधार की पद्धतियाँ, कम्प्लायन्य एड्स **– 3 घण्टे**

5. संचार कौशल – मौखिक, लिखित, हावभाव **– 3 घण्टे**

6. ओ.टी.सी. उपचार – परिभाषा, जरूरत, और भेषजज्ञ की भूमिका भारत में ओ.टी.सी. उपचार, ओ.टी.सी. उत्पादों के लिए परामर्श देना, स्वउपचार और इसको बढ़ावा देने में भेषजज्ञ की भूमिका **– 2 घण्टे**

7. लक्षणों/हल्की बीमारी का ध्यान रखना – 10 घण्टे

सुगंत विकारी शरीर क्रिया, सामान्य गैर भेषजिक और ओ.टी.सी. औषधि चिकित्सा, और चिकित्सक के पास भेजना – पीड़ा में, जी.आई. विक्षिप्पता (नौसिया, उल्टी, डिसपेप्सिया, दस्त अपच), कृमि जन्तुबाधा (इनफेस्टेशन) ज्वर (पाईरेक्सिया), नेत्र–लक्षण, यू.आर.टी. संक्रमण, त्वचा विकार, मुख और दांतों के विकार।

8. अस्पताल प्रदाय – 7 घण्टे

क. शल्य चिकित्सा की वस्तुएँ/प्रदाय – कैथीटर (नालशलाका) पिचकारी एवं सुईया, आई.वी.सेट, राइलेज ट्यूब, घाव प्रबंध, स्टोमा और असंयति उत्पाद, शल्यचिकित्सीय मरहम पट्टी, जैसे रूई, गेज, पट्टी, और आसंजक टेप,
ख. सीवन, बंध (लिगेचरस)
ग. रोगी देखभाल के उपस्कर – नेबुलाइजर, थर्मामीटर

9. पशु चिकित्सा भेषजी – पशु चिकित्सा की औषधियाँ प्राप्त करने और वितरित करने में भेषजज्ञ की भूमिका **– 4 घण्टे**

पुस्तकें और संदर्भ

असाइन्मैंट के लिए सुझाए गए प्रविषय

2.4 भेषजी व्यवसाय – IV

विषयक्षेत्र

व्यवसाय करने वाले भेषजज्ञों को सामुदायिक स्थापन में परामर्श देकर, स्वास्थ्य सक्रीनिंग सेवाएँ देकर और अन्य शिक्षा कार्यक्रमों के माध्यम से रोगी के स्वास्थ्य में सुधार करने के लिए विभिन्न रोगी देखभाल सेवा प्रदान करने का अवसर मिलता है। अस्पताल स्थापन में, भेषजज्ञ समुचित उपचार, रोगी को शिक्षा देना तथा समस्त अस्पताल भेषजी सेवाएँ देना सुनिश्चित कर सकते हैं जिसके अंतर्गत नैदानिक भेषजी सेवाएँ शामिल हैं जैसे औषधि की सूचना तथा भेषजिक सतर्कता बरतना।

उद्देश्य

पाठ्यक्रम पूरा होने पर छात्र –

क. सामुदायिक, अस्पताल और नैदानिक भेषजी क्षेत्रों में भेषजज्ञों की वृत्तिक भूमिका को समझने में,
ख. भेषजज्ञों के वृत्तिक उत्तरदायित्वों को समझने में,
ग. आशायित सेवाएँ प्रदान करने में समर्थ हो जाएगा।

पाठ्यक्रम कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रण की पद्धति से पढ़ाई के 40 घण्टे। मिश्रित शिक्षण के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट्

प्रत्येक छात्र को चिकित्सा विज्ञान तथा भेषजिक व्यवसाय की संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिएं जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

क. <u>विस्तृत पाठ्यविवरण और व्याख्यानवार कार्यक्रम</u>

1. स्वास्थ्य के उपसाधन – 5 घण्टे

अस्पताल और सामुदायिक भेषजी में रखे विभिन्न सामान्य स्वास्थ्य उपसाधनों का अध्ययन और उन्हें संभालना। छात्रों को कार्यसाधक ज्ञान हो, इनका प्रयोग करना चाहिए और इनका प्रयोग करने में सावधानी बरतनी चाहिए (जैसे, पहिया कुर्सी, केन, क्रच और अन्य विकलांग सहायक चीजें, विस्तर पैन, वेपराइजर, पिचकारी और सुईयां, गरम पानी की बोतलें, नैदानिक थर्मामीटर, ट्रसेज, प्राथमिक उपचार प्रदाय, कुटुम्ब औषधि अल्मारी आदि

2. <u>चिकित्सीय गैस</u> विभिन्न गैसें और उनका प्रयोग, सिलिंडरों की कोडिंग और देखभाल, गैसों का अस्पताल के विभिन्न हिस्सों में प्रदाय, डोमिसिलियरी आक्सीजन सेवाएँ, तथा भेषजज्ञ की भूमिका – **3 घण्टे**

3. आई.वी. एडमिक्चर सेवाएँ और भेषजज्ञ की भूमिका – 3 घण्टे

4. <u>आन्त्रेतर पोषण</u> परिभाषा, रचना और टी.पी.एन. का नैदानिक उपयोग – 2 घण्टे

5. <u>नैदानिक अनुसंधान</u> – 12 घण्टे

नैदानिक परीक्षणों का परिचय
नैदानिक परीक्षण के विविध चरण
विपणनोत्तर निगरानी की पद्धतियाँ
संक्षिप्त नव औषधि प्रयोग प्रस्तुत करना

उत्तम नैदानिक व्यवसाय – आई.सी.एच./जी.सी.पी.

केन्द्रीय औषध मानक नियंत्रण संगठन (सी.डी.एस.सी.ओ.) दिशानिर्देश, अनुसूची, रचना, उत्तरदायित्व, आई.आर.बी./आई.ई.सी. की प्रक्रियाएँ

आई.सी.एच./जी.सी. के अनुसार नैदानिक परीक्षण कार्मिकों की भूमिका और उत्तरदायित्व,

क. प्रायोजक
ख. अन्वेषण
ग. नैदानिक अनुसंधान सहयुक्त
घ. संपरीक्षक
ड. संपर्क अनुसंधान समन्वयक
च, नियामक प्राधिकरण

नैदानिक अध्ययन दस्तावेजों की रचना (प्रोटोकोल, सी.आर.एफ.आई.सी.एफ. असाईन्मेंट के साथ पी.आई.सी.) सूचित सम्मति प्रक्रिया।

सूचित सम्मति प्रक्रिया

6. जीवी आंकड़ों का परिचय – 3 घण्टे

7. भेषजिक व्यवसाय के क्षेत्रों में शोध

8. भेषजज्ञों के लिए सतत् शिक्षा – 1 घण्टा

9. अस्पताल/सामुदायिक भेषजी में भेषजिकों की औषधिमिश्रणता, तोल, माप, प्रतिशत में घोल, एलिगेशन, प्रूफ स्पिरिट, आईसोटानिक घोल, अस्पतालों में थोक औषधिमिश्रणता, पूर्व–पैकेज करना

10. अस्पतालों में भेषजिक सूत्र बनाना – विभिन्न पहलू, मौजूदा स्थिति – 3 घण्टे

11. रेडियो भेषजिक – संभालना और पैकेजिंग, नैदानिक उपयोग, तथा भेषजज्ञ की भूमिका – 2 घण्टे

12. आई.टी. के प्रयोग और भेषजी व्यवसाय में कंप्यूटर – 2 घण्टे

13. मूत्राशय विषाक्त रसायन चिकित्सा की व्यवस्था और विभिन्न ध्यान देने योग्य बातें/संभालना। मूत्राशय विषाक्त उच्छिष्ट को संभालना और उसका निपटान भेषजिक (औषधियां और सहायक उत्पाद) अस्पतालों में, सामुदायिक भेषजी में उच्छिष्ट प्रबंधन, तथा समाज और भेषजज्ञ की भूमिका – 3 घण्टे

14. चिकित्सीय साधन एवं आई.वी.पम्प

15. विशिष्टकृत औषधियाँ, जेनी चिकित्सा, जेनोनिक्स एण्ड प्रोटियामिक्स, बायोचिप्स, बायोसेन्सर्स तथा एम.ई.एम.एस. सूक्ष्म वैद्युत यांत्रिक प्रणालियाँ – 2 घण्टे

2.5 भेषजिक न्याय शास्त्र

विषयक्षेत्र

कोई वृति तभी सफल होती है जब उसे उपयुक्त विधियों का मार्ग दर्शन प्राप्त होता है। इस पाठ्यक्रम में भेषजी अधिनियम औषधि और प्रशाधन सामग्री अधिनियम, अनिष्टकारक मादक द्रव्य अधिनियम, 1930 औषधीय और प्रशाधन निर्मितयाँ अधिनियम, डी.पी.सी.ओ. और वृत्तिक आचरण का विवरण है।

पाठ्यक्रम के उद्देश्य :

पाठ्यक्रम पूरा होने पर छात्र –

1. भारत में भेषजिक विधान की विभिन्न संकल्पनाओं को समझने में,
2. भेषजी व्यवसाय से सुसंगत औषधि और प्रसाधन सामग्री अधिनियम, भेषजी अधिनियम, एन.डी.पी.एस. अधिनियम में प्रारूपित विभिन्न नियमों को जानने में,
3. उपभोक्ता संरक्षण अधिनियम, खाद्य अपमिश्रण निवारण अधिनियम, डी.पी.सी.ओ. को जानने में,
4. औषधि और प्रसाधन सामग्री की लेबल लगाने की आवश्यकताओं तथा पैकेज करने के दिशानिर्देशों को समझने में समर्थ हो जाएगा।

पाठ्यक्रम की कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रित शिक्षण द्वारा पढ़ाई के 40 घण्टे/मिश्रित शिक्षण पद्धति के अंतर्गत डाइडेक्टिक तथा ऑनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट

प्रत्येक छात्र को चिकित्सा विज्ञान और भेषजिक व्यवसाय की संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिए जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

विस्तृत पाठ्यविवरण और व्याख्यानवार कार्यक्रम

1. भेषजिक विधानों की संक्षिप्त समीक्षा – 1 घण्टा

भारत में सामुदायिक और अस्पताल भेषजी व्यवसाय से सुसंगत पहलुओं को कवर करते हुए विभिन्न भेषजिक और संबंद्ध विधानों का अध्ययन। पहलुओं का अध्ययन व्यावहारिक दृष्टिकोण से, सोदाहरण, केस अध्ययन आदि के साथ कीजिए।

2. औषधि और प्रसाधन सामग्री अधिनियम 1940 तथा नियम 1945 – 15 घण्टे

- औषधि निरीक्षकों, अन्य अधिकारियों के कर्त्तव्य और उत्तरदायित्व, तथा उनके प्रति भेषजी की बाध्यताएँ
- डी.टी.ए.बी., डी.सी.सी., औषधि परीक्षण प्रयोगशालाओं के बारे में संक्षिप्त टिप्पणी
- खुदरा भेषजी के लिए विभिन्न औषधि लाइसेन्स भेषजी/औषधि भण्डार, खोलने की अपेक्षाएँ, आवेदन-पत्र, लाईसेन्स देना, लाईसेन्स का प्रदर्शन, लाईसेन्स की कालावधि, औषधियों और साधनों की उठाई धराई और बेचने से संबंधित कानून।
- अधिनियम और नियमों के अंतर्गत विभिन्न अनुसूचियाँ –

  अध्ययन संक्षेप में, केवल उनका अध्ययन जो भेषजी व्यवसाय से सुसंगत है।
- औषधियों पर विभिन्न पहलुओं की लेबल अपेक्षाएँ
- नकली, मिथ्या छापवाली, अपमिश्रित, जाली औषधियाँ – इससे संबंधित विभिन्न पहलू, कैसे पहचान दें, भेषजज्ञ की भूमिका

- निजी उपयोग के लिए औषधियों का आयात
- भेषजी द्वारा अधिनियम और नियमों के अधीन विभिन्न दस्तावेजों का रखरखाव
- भण्डारण आवश्यकताएँ, कालातीत औषधियों को संभालना
- अधिनियम के अधीन विभिन्न दण्ड
- औषधपत्र और गैर-औषधपत्र औषधियों का व्यावहारिक अध्ययन, बाजार नमूने, लेबलिंग के लिए जांच पड़ताल आदि
- भारत में अनुमोदित विभिन्न पारम्परिक प्रणालियों/औषधि विषयक कानून
- मादक द्रव्यों पर प्रतिबन्ध

3.	भेषजी अधिनियम, 1948	–	**3 घण्टे**
4.	औषधि और प्रसाधन निर्मितियां अधिनियम 1955	–	**4 घण्टे**
5.	स्वापक औषधि और मनः प्रभावी पदार्थ अधिनियम 1985	–	**4 घण्टे**
6.	औषधि और चमत्कारिक उपचार (आक्षेपणीय विज्ञापन) अधिनियम 1954	–	**2 घण्टे**
7.	आवश्यक वस्तु अधिनियम	–	**2 घण्टे**
8.	औषधि मूल्य नियंत्रण आदेश	–	**2 घण्टे**
9.	पशुओं के प्रति क्रूरता का निवारण अधिनियम, 1960	–	**2 घण्टे**
10.	उपभोक्ता संरक्षण अधिनियम, 1986	–	**2 घण्टे**
11.	खाद्य अपमिश्रण निवारण अधिनियम और नियम, आहार पूरकों, खाद्यपूरकों आदि विषयक कानून	–	**2 घण्टे**
12.	शिशु दुग्ध प्रतिस्थानी, दूध पिलाने की बोतलें तथा शिशु आहार (उत्पादन, प्रदाय और वितरण) संशोधन अधिनियम, 2003	–	**2 घण्टे**

पुस्तकें और संदर्भ

2.6 सामाजिक भेषजी–II

विषयक्षेत्र

व्यवसाय करने वाले भेषजज्ञों की समाज में रोगियों के स्वास्थ्य में सुधार करने के लिए विभिन्न रोगी देखभाल सेवाएँ प्रदान करने का अवसर प्राप्त होगा। व्यक्तियों के स्वास्थ्य को मानिटर करके उन्हें स्वास्थ्य पूर्वावधानियों की शिक्षा प्रदान करके भेषजज्ञ अपनी वृत्तिक छवि को बेहतर बना सकते हैं।

उद्देश्य

पाठ्यक्रम पूरा होने पर छात्र –

क. समाज में भेषजज्ञों के सामाजिक उत्तरदायित्वों को समझने में,

ख. रोगियों को वृत्तिक सेवाएँ प्रदान करने में समर्थ हो जाएगा।

पाठ्यक्रम कालावधि

विद्या प्राप्त करना (पढ़ाई)

मिश्रण की पद्धति से पढ़ाई के 40 घण्टे। मिश्रण की पद्धति के अंतर्गत डाइडेक्टिक और ऑनसाइट पढ़ाई भी शामिल है।

असाईन्मैन्ट्

प्रत्येक छात्र को चिकित्सा विज्ञान और भेषजी व्यवसाय की संकल्पनाओं को समाविष्ट करते हुए, दो असाइन्मेंट पूरे करने चाहिए तथा जिनका मूल्यांकन अंतिम परीक्षा के समय होगा।

पाठ्यविवरण और व्याख्यानवार कार्यक्रम

क. निवारक देखभाल

1.	टीका और प्रतिरक्षण तथा भेषजज्ञ की भूमिका	–	**2 घण्टे**
2.	जनसांख्यिकी एवं परिवार नियोजन में भेषजज्ञ की भूमिका	–	**2 घण्टे**
3.	माँ और बालक का स्वास्थ्य, स्तनपान की महत्ता, फार्मूला भोजन और बोतल से दूध पिलाने के कुप्रभाव और भेषजज्ञ की भूमिका	–	**4 घण्टे**
4.	गेरियाट्रिक्स और भेषजज्ञ की भूमिका	–	**1 घण्टा**
5.	स्वास्थ्य पर पर्यावरण का प्रभाव, भेषजज्ञ की भूमिका, जल प्रदूषण, पानी का सुरक्षित प्रदाय	–	**1 घण्टा**
6.	उपजीविका जन्य रोग/बीमारियाँ तथा भेषजज्ञ की भूमिका	–	**1 घण्टा**

7. मानसिक स्वास्थ्य और भेषजज्ञ की भूमिका – **1 घण्टा**
8. मनोसामाजिक भेषजी, गलत उपयोग और दुरूपयोग की औषधियाँ – मनः प्रभावी और स्वापक द्रव्य तथा अन्य भेषजिक तथा रसायन, तम्बाकू और तम्बाकू उत्पाद, ऐल्कोहल इन चीजों के सामाजिक और मनोवैज्ञानिक परिणाम, इस जोखिम को कम करने और निवारित करने में भेषजज्ञ की भूमिका तम्बाकू समाप्ति और भेषजज्ञ की भूमिका – **3 घण्टे**
9. मनोसामाजिक मुद्दों में कार्यवाही करते समय भेषजज्ञ की भूमिका और प्रशासक तथा अंतस्थ देखभाल – **3 घण्टे**
10. विकलांग की देखभाल और मनोसामाजिक मुद्दों के कार्यवाही करते समय भेषजज्ञ की भूमिका – **2 घण्टे**
11. वंशानुगत बीमारियों में शुरू में ही अंतक्षेप, परीक्षणों की जांच परख – **1 घण्टा**

ख. पोषण और स्वास्थ्य – 20 घण्टे

1. पोषण के मूलतत्व – सूक्ष्मपोषक तत्व और वृहत्पोषक तत्व, तन्तु – महत्व, संसाधन (वनस्पति और पशु उत्पत्ति)
2. विभिन्न खाद्यों के कलोरीप्रद और पोषक मूल्य
3. दैनिक/सिफारिश किए गए आहार का भत्ता और प्रत्येक के कार्य विभिन्न अलग-अलग समूहों के लिए संतुलित आहार/पोषण कमी वाली बीमारियाँ
4. दवाई के रूप में भोजन। प्राकृतिक चिकित्या की विभिन्न संल्पनाओं का संक्षिप्त अध्ययन
5. आयुर्वेद के अनुसार पोषण – आहार के बारे में आयुर्वेदिक दृष्टिकोण, प्रकृति के अनुसार ऋतुएँ, खाद्य की मौसमी उपलब्धता आदि। प्रकृति अध्ययन संक्षेप में
6. गलत/अनुचित भोजन और खाने की आदतें, विभिन्न रोग अवस्थाओं के कारण, गलत भोजन/फास्ट फूड के बुरे परिणाम; समयबद्ध खाद्य आदि, पाश्चात्य खाद्य और भारतीय खाद्य, शरीर पर बुरे प्रभाव के कारण।
7. आनुवंशिक रूप से उपांतरित खाद्य के मूल तत्व – लाभ और हानि
8. खाद्य पर पर्यावरण का प्रभाव, कृत्रिम रूप से पकाना, संकरीकरण, कीटनाशक दवाओं का प्रयोग, अपमिश्रण आदि
9. विभिन्न रोग अवस्थाओं के लिए पोषण/आहार सिफारिशे, जैसे मधुमेह, रक्तदाब, अति वसा रक्तता, संधिशोथ (आर्थराइटिस), मूत्राशय रोग, जिगर के रोग, एलर्जी आदि
10. कृत्रिम स्वीटनर्स, शून्य कलोरी संकल्पना, खाद्यों का शर्करारक्तता सूचकांक
11. आहार पूरक, न्यूट्रास्युटिकल्स, खाद्यपूरक, विधिक स्थिरता, संकेत, तार्किक उपयोग, फायदे, ए.डी.आर. औषध प्रतिक्रियाएँ, भेषजिक अर्थशास्त्र

ग. सामुदायिक भेषजी में प्राथमिक उपचार सेवा – 10 घण्टे

अनुशंसित पुस्तकें

1. क्लिनिकल फार्मेसी एण्ड थेराप्युटिक्स – रोजर और वाकर, चर्चिल लिविंगस्टोन पब्लिकेशन
2. फार्माकोथेरापी : ए पैथोफिजियोलोजिक अप्रोच – जोसफ टी. डिपिरो एट अल एण्ड एप्पिलटन एण्ड लेंगे
3. क्लीनिकल फार्मेसी एण्ड थेराप्युटिक्स – एरिक टी. हरफिंडल, विलियम्स और बिल्किन्स पब्लिकेशन
4. एप्लाइड थेराप्युटिक्स – द क्लिनिकल यूज ऑफ ड्रग्स, लायड यंग और कोडा, किम्बले एमए
5. क्वाड्री और मर्चेन्ट कृत टैक्स्ट बुक ऑफ हॉस्पिटल फार्मेसी

6. टैक्स्ट बुक ऑफ क्लिनिकल फार्मेसी प्रैक्टिस – संपादन – जी. पार्थसारथी, केरिन नाइफर्ट हेन्सन और मिलाप सी. नाहटा, ओरियन्ट लोंगमैन पब्लिकेशन्स
7. टैक्स्ट बुक ऑफ कम्युनिटी फार्मेसी प्रैक्टिस – आर.पी.एस. जी.बी. पब्लिकेशन्स
8. कम्युनिटी फार्मेसी हैन्ड बुक – जोनाथन वाटरफील्ड
9. कम्युनिटी फार्मेसी – सिम्टम्स, डाइग्नोसिस एण्ड ट्रीटमेन्ट : पॉल रूटर
10. माइनर इलनैस इन मेजर डिसीजेज – द क्लिीनिकल मेनिफेस्टेशन्स इन द कम्युनिटी : पॉल स्टिलमैन
11. सोश्योलॉजी फॉर फार्मेसिस्ट : टेलर, नेटलटन, हार्डिंग
12. फार्मेसी प्रैक्टिस : टेलर, हार्डिंग
13. सोश्यल फार्मेसी : टेलर ज्योफरी
14. स्टॉकलेज़ ड्रग्स इन्टरएक्शन : कैरैन बेक्स्टर
15. कूपर और गन : डिस्पेंसिंग फॉर फार्मेसी स्टुडेन्टस
16. ए टेक्स्ट बुक प्रोफेशनल फार्मेसी – एन.के. जैन और एस.एन. शर्मा
17. हावर्ड सी. अन्सेल कृत इन्ट्रोडक्शन टू फार्मास्युटिकल डोज़ेज फॉर्मस
18. रेमिंगटन कृत फार्मास्युटिकल सांइसेज
19. डी.एम. ब्रह्मांकर और सुनील बी. जायसवाल : टैक्स्ट बुक ऑफ बायोफार्मास्युटिक्स एण्ड फार्माकोकीनेटिक्स – ए ट्रटाइज – वल्लभ प्रकाशन, दिल्ली ।
20. स्वर ब्रिक कृत बायोफार्मास्युटिक्स
21. मइलो जिबाल्डी कृत बायो फार्मास्युटिक्स एण्ड क्लिीनिकल फार्माकोकीनेटिक्स
22. मिथल, बी.एम. टैक्स्ट बुक ऑफ फोरेंसिक फार्मेसी, कलकत्ता : नेशनल : 1988
23. सिंह, के.के. संपादक, बायोत्राज़ द लाज़ ऑफ ड्रग्स, मेडिसन्स एण्ड कोस्मेटिक्स, इलाहाबाद : लॉ बुक हाऊस, 1984
24. जैन, एन.के., ए टैक्स्ट बुक ऑफ फोरेंसिक फार्मेसी, दिल्ली : वल्लभ प्रकाशन, 1995
25. रिपोर्ट्स ऑफ द फार्मास्युटिकल इन्क्वायरी कमेटी
26. आई.डी.एम.ए. मुम्बई, डी.पी.सी.ओ. 1995
27. वेरियस रिपोर्ट्स आफ अमेन्डमेंट्स
28. देशपांडे, एस.डब्ल्यु : द ड्रग्स एण्ड मेजिक रेमेडीज़ एक्ट 1954 एण्ड रूल्स 1995; मुम्बई सुस्मित पब्लिकिशन्स 1998
29. ईस्टर्न बुक कम्पनी, द नारकोटिक्स एण्ड साइकोट्रोपिक सब्सटेन्सेज़ एक्ट 1985 लखनऊ : ईस्टर्न 1987
30. ड्रग इन्फार्मेशन एबाउट कॉमनली यूज्ड ड्रग्स : पी.पी. शर्मा, आर सिंह

अर्चना मुदगल, निबन्धक-एवं-सचिव

[विज्ञापन III/4/असा./101/14]

PHARMACY COUNCIL OF INDIA

NOTIFICATION

New Delhi, the 18th December, 2014

Bachelor of Pharmacy (Practice) Regulations, 2014

No. 14-117/ 2014- PCI.—In exercise of the powers conferred by Section 10 and 18 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government hereby makes the following regulations; namely–

CHAPTER-I

1. Short title and commencement. –

(1) These regulations may be called the **Bachelor of Pharmacy (Practice) Regulations, 2014**

(2) They shall come into force from the date of their publication in the official Gazette.

2. **Bachelor of Pharmacy (Practice)** [B.Pharm. (Practice)] shall consist of a degree certificate of having completed the course of study and passed examination as prescribed in these regulations for the purpose of additional qualification to be entered in the register of pharmacists.

CHAPTER-II

3. Duration of the course. –

The duration of the course shall be of two academic years with each year spread over a period of not less than 180 working days

4. Minimum qualification for admission to the course –

i. A pass in Diploma course in Pharmacy from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act, 1948.
ii. A registered pharmacist.
iii. A minimum of four years of pharmacy practice experience in a community or hospital pharmacy –

a. A certificate from competent authority stating that the candidate is endorsed as registered pharmacist in the drug license of a pharmacy as proof of practice experience in case of community pharmacist
b. A certificate from the Principal/Medical Superintendent/competent person of the Hospital/Health Unit stating that the candidate is working as a pharmacist will be accepted as proof of practice experience in case of hospital pharmacist

iv. A 'No Objection Certificate' from the employer in prescribed format (Annexure -A)

.
Provided that there shall be reservation of seats for the students belonging to the scheduled castes, scheduled tribes and other backward classes in accordance with the instructions issued by the Central Government/State Government/Union Territory Administration, as the case may be, from time to time.

5. The number of admissions in the programme shall be as prescribed by the Pharmacy Council of India from time to time and presently be restricted to 40 students in an academic year

6. Approval of the authority conducting the course of study –

a. No pharmacy institution shall start Bachelor of Pharmacy (Practice) programme or increase the number of admission without obtaining the prior approval of the Pharmacy Council of India.
b. Any pharmacy college for the purpose of obtaining permission under sub-section (1) of section 12 of the Pharmacy Act shall submit a scheme as prescribed in Appendix-I by the Pharmacy Council of India.
c. The scheme referred to in sub-regulation (b) above, shall be in such form and contain such particulars and be preferred in such manner and be accompanied with such fee as may be prescribed.
d. The institutions approved by the Pharmacy Council of India for running Bachelor of Pharmacy course under section 12 of the Pharmacy Act, 1948 alone shall be eligible for starting Bachelor of Pharmacy (Practice) degree course.

Provided that the Pharmacy Council of India shall not approve any institution under these regulations unless it provides adequate arrangements for teaching in regard to building, accommodation, laboratories, equipments, teaching staff, non-teaching staff, etc., as specified in Appendix-II to these regulations.

7. Course of study. –The course of study shall consist of the subjects as given in the Tables below. The course shall consist of class room teaching and assignment works. The assignment works shall be done at the place of work under the supervision and guidance of teaching staff of the academic institution. The number of contact hours in a week devoted to each subject for class room teaching shall not be less than that noted against it in columns (3) below.

TABLE - I

First Year :

S.No.	Name of Subject	Minimum No. of total contact hours	No. of contact hours /week
(1)	(2)	(3)	(4)
1.1	Pathophysiology and Pharmacotherapeutics I	40	1
1.2	Pathophysiology and Pharmacotherapeutics II	40	1
1.3	Pharmacy Practice I	40	1
1.4	Pharmacy Practice II	40	1
1.5	Applied Pharmaceutics	40	1
1.6	Social Pharmacy I	40	1
1.7	Case presentation,Seminar, Assignments	160	4
	Total	400	10

Second Year :

S.No.	Name of Subject	Minimum No. of total contact hours	No. of contact hours /week
(1)	(2)	(3)	(4)
2.1	Pathophysiology and Pharmacotherapeutics III	40	1
2.2	Pathophysiology and Pharmacotherapeutics IV	40	1
2.3	Pharmacy Practice III	40	1
2.4	Pharmacy Practice IV	40	1
2.5	Social Pharmacy II	40	1
2.6	Pharmaceutical Jurisprudence	40	1
2.7	Case presentation, Seminar, Assignments	160	4
	Total	400	10

8. Syllabus. – The detailed syllabus for each subject of study in the said Tables shall be as specified in the guidelines given in Appendix-III. The guidelines may, with the approval of Central Council of the Pharmacy Council of India, be amended and notified from time to time.

9. Examination. –

1. There shall be an examination at the end of calendar year. The first examination shall be the annual examination and the second examination shall be supplementary examination.
2. The examinations shall be of written nature for theory and for the practicals: The students shall submit the assignments done by them in the form of a report which will be followed by viva-voce carrying maximum marks for each part of a subject as indicated in Tables below :

T A B L E -II

1st Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Assignments (including Viva voce 25%)
		University Examination	Sessional marks	Total	
1.1	Pathophysiology and Pharmacotherapeutics I	60	40	100	100
1.2	Pathophysiology and Pharmacotherapeutics II	60	40	100	100
1.3	Pharmacy Practice I	60	40	100	100
1.4	Pharmacy Practice II	60	40	100	100
1.5	Applied Pharmaceutics	60	40	100	100
1.6	Social Pharmacy I	60	40	100	100
	Total			600	600

2nd Year examination :

S.No.	Name of Subject	Maximum marks for Theory			Maximum marks for Assignments (including Viva Voce-25%)
		University Examination	Sessional marks	Total	
1.1	Pathophysiology and Pharmacotherapeutics III	60	40	100	100
1.2	Pathophysiology and Pharmacotherapeutics IV	60	40	100	100
1.3	Pharmacy Practice III	60	40	100	100
1.4	Pharmacy Practice IV	60	40	100	100
1.5	Social Pharmacy - II	60	40	100	100
1.6	Pharmaceutical Jurisprudence	60	40	100	100
	Total			600	600

10. Eligibility for appearing at the examination.— A student who produces a certificate from the Head of the Institution in which he has undergone the course in proof of his having regularly and satisfactorily undergone the course of study by attending not less than 80% of the classes held in theory and has submitted the assignments/ project report duly approved by the supervising teacher shall be eligible for appearing at the examination.

11. Mode of examinations.—

(1) Theory examination shall be of three hours duration.

(2) A student who fails in theory examination of a subject shall be permitted to re-appear in that subject

(3) Assignment work shall consist of evaluation of report by both internal & external examiners with a seminar and viva –voce (Oral) examination.

12. Award of sessional marks and maintenance of records.—

(1) A regular record of theory examinations conducted in an institution imparting the Bachelor of Pharmacy (Practice) Course, shall be maintained for each student in the institution and 40 marks for each subject shall be allotted as internal assessment.

(2) There shall be at least three periodic sessional examinations during each year and the highest aggregate of any two performances shall form the basis of calculating sessional marks.

13. Minimum marks for passing examination.— A student shall not be declared to have passed examination unless he secures at least 50% marks in each of the subjects separately in the theory examinations, including sessional marks and at least 50% marks in assignment work. The students securing 60% marks or above in aggregate in all subjects in a single attempt at the examination shall be declared to have passed in first class. A student securing 75% marks or above in any subject or subjects shall be declared to have passed with distinction in the subject or those subjects provided he passes in all the subjects in a single attempt.

14. Eligibility for promotion to next Class.—

1. All students who have appeared for all the subjects and passed the examination are eligible for promotion to the next year.
2. The student failing in subjects of 1st year B.Pharm. (Practice) examination shall be permitted to proceed to the 2nd year of B.Pharm. (Practice). However, such students shall have to pass all the subjects of the 1st and 2nd year of B.Pharm. (Practice) course and shall complete the course within 4 academic years from the session in which he was admitted in the course, for the consideration of B.Pharm. (Practice) degree.

15. Approval of examinations.— Examinations mentioned in regulations 9 to12 and 14 shall be held by the examining authority approved by the Pharmacy Council of India under sub-section (2) of Section 12 of the Pharmacy Act, 1948.

16. Certificate of passing examination.— every student who has passed the examinations for the Bachelor of Pharmacy (Practice) shall be granted a degree certificate by the examining authority.

CHAPTER-III

17. Assignment work.—

1. To allow the student to understand and develop data collection and reporting skills in the area of community, hospital and clinical pharmacy in particular and principles of pharmacy practice in general, the assignment work shall be carried out under the supervision of a teacher of the Academic Institution on the topic approved by the Head of the Academic Institution. The same shall be announced to students within one month of commencement of the classes in each of the subjects for the session. Assignment shall be presented in a written report and as a seminar before the final examination. External and the internal examiners appointed by the examining authority for the said purpose shall do the assessment of the work done.
2. Assignment work shall comprise of objectives of the work, methodology, results, discussions and conclusions.

18. Objectives of Assignment work.— The main objectives of the work is to—

(i) show the evidence of having made accurate description of work and of having recorded the findings in an impartial manner; and

(ii) develop the students skills in data collection, analysis and reporting and interpretation skills.

19. Methodology.— To complete the work following methodology shall be adopted, namely:—

(i) Not more than ten students shall work under an authorized teacher;

(ii) The topic shall be approved by the Head of the Department or Head of the Institution;

(iii) The work chosen shall be related to the subjects taught in a particular session and due consideration has to be given regarding the suitability for carrying out the work in his workplace.

20. Reporting .— (1) Student working on the assignment shall submit the report after completion of work to the Head of the Department or Head of the Institution. The report should include a certificate issued by the authorized teacher.

(2) Submission of the report shall be done at least one month prior to the commencement of annual examination.

21. Evaluation.— The following methodology shall be adopted for evaluating assignment work—

Evaluation shall be done on the following items:	**Marks**
a) Write up of the assignment	(40)
b) Presentation of work	(15)
c) Seminar	(20)
d) Question and answer skills (viva voce)	(25)
Total	(100 marks)

CHAPTER-IV

22. The fees for the course shall be prescribed by Pharmacy Council of India from time to time for guidance to the State Government/Course Conducting Authorities.

Annexure-A

{See regulation 4(iv)}

Format for 'No Objection Certificate' from the Employer

This to certify that ---------- son/daughter of---------- is working in this Institution/Pharmacy as-------- since ---------- and the undersigned has no objection if he gets himself admitted in the Bachelor in Pharmacy (Practice) Course for the session----------.
He will be allowed to attend the course and facilities will be provided for carrying out the assignments as part of course in this Institution/Organization.

Signature and seal of the authorized person.

Guidelines for conducting Bachelor of Pharmacy (Practice) course

APPENDIX-I
{See Regulation 6(b) }

SCHEME FOR OBTAINING PRIOR PERMISSION OF PHRMACY COUNCIL OF INDIA FOR CONDUCTING THE BACHELOR OF PHARMACY (PRACTICE) COURSE.

1. Name of the Course Conducting Authority:

2. Complete Postal Address of the Course Conducting Authority:

3. Year of establishment of the Institute:

4. Approval status of the Institute for conducting Bachelor of Pharmacy (B.Pharm) Course:
(Copy of the latest approval to be enclosed)

5. No objection/consent of affiliation from Examining Authority (i.e, University) for starting the course:
(Copy of the letter to be enclosed)

6. Deficiencies as pointed out in the latest Inspection Report:
(Use separate sheet)

7. Proposed date of commencement of the course:

8. Proposed intake capacity:

9. Proposed Time schedule for conducting the course:

10. Details of teaching staff in the specified subject in the following format:

Name of the Department	Sl. No.	Name of the Teachers	Working experience in the Institution	Qualification	Experience	Existing Teaching Load	Any Experience in Hospital/Community/Clinical Research/Practice
1	2	3	4	5	6	7	8
Pharmaceutics							
Pharmacology							
Pharmacy Practice							

11. Declaration of the teachers for teaching the additional Course:
(Declarations from teachers to be enclosed)

12. Whether visiting/part-time teachers to be appointed:
(If yes, furnish the details in the following proforma)

Sl.No.	Name of the Teacher	Qualification	Practice Experience	Present attachment

13. Enclose the acceptance from the visiting teachers as identified:

14. Whether the Institute/Trust is running a Model Community Pharmacy :

15. If not, is there any planning to start the same in near future:

Signature of the Principal with date

APPENDIX-II
{See proviso to regulation 6(d) }

MINIMUM REQUIREMENT FOR OBTAINING
THE APPROVAL OF PHRMACY COUNCIL OF INDIA
FOR CONDUCTING THE BACHELOR OF PHARMACY (PRACTICE) COURSE

PART I - PRINCIPAL

		Qualification	**Teaching Experience Required**
Qualification/ Experience		M. Pharm	15 years, out of which 5 years as Prof. / HOD
		Ph.D	10 years, out of which at least 05 years as Asst. Prof

PART II PHYSICAL INFRASTRUCTURE

1. Availability of Land (details)

a. Building : **Own/rented**

b. Total built up area of the college building in Sq.mts : Built up Area
c. Amenities and Circulation Area

2. Class rooms:

Total number of class rooms provided for D. Pharm and B. Pharm/Bachelor of Pharmacy (Practice) course

Class	Required	Available numbers	Required Area * for each Class Room
D. Pharm	02		90 Sq. mts each
B. Pharm	04		90 Sq. mts each (Desirable) 75 Sq. mts each (Essential)
Bachelor of Pharmacy (Practice)	01		40 Sq. mts each

(* To accommodate 60 students)

3. Laboratory requirement for both D. Pharm and B. Pharm and Bachelor of Pharmacy (Practice) course.

Sl. No.	**Infrastructure for**	**Requirement as per Norms**	**Available No. & Area in Sq. mts.**	**Remarks/ Deficiency**
1	Laboratory Area for B. Pharm Course (10 Labs) Laboratory area for D. Pharm Course (03 Labs)	90 Sq .mts x n (n=10) - Including Preparation room - Desirable 75 Sq. mts - Essential		
2	Pharmaceutics Pharmaceutical Chemistry Pharmaceutical Analysis Pharmacology Pharmacognosy	03 Laboratories 03 Laboratories 01 Laboratory 03 Laboratories 02 Laboratories		

	Pharmaceutical Biotechnology (Including Aseptic Room) Total No. Laboratories for B.Pharm and D.Pharm Course	01 Laboratory 13 Laboratories *		
3	Preparation Room for each lab (One room can be shared by two labs, if it is in between two labs)	10 sq mts (Minimum)		
4	Area of the Machine Room	80-100 Sq.mts		
5	Central Instrument Room	80 Sq.mts with A/ C		
6	Store Room – I	1 (Area 100 Sq mts)		
7	Store Room – II (For Inflammable chemicals)	1 (Area 20 Sq mts)		

*For D. Pharm and B. Pharm both.

1. All the Laboratories should be well lit & ventilated.
2. All Laboratories should be provided with basic amenities and services like exhaust fans and fuming chamber to reduce the pollution wherever necessary.
3. The workbenches should be smooth and easily cleanable preferably made of non-absorbent material.
4. The water taps should be non-leaking and directly installed on sinks. Drainage should be efficient.
5. Balance room should be attached to the concerned laboratories.

4. Administration Area:

Sl.No.	Name of infrastructure	Requirement as per Norms in number	Requirement as per Norms, in area
1	Principal's Chamber	01	30 Sq .mts
2	Office – I – Establishment	01	60 Sq. mts
3	Office – II – Academics		
4	Confidential Room		

5. Staff Facilities:

Sl. No.	Name of infrastructure	Requirement as per Norms in number	Requirement as per Norms in area
1	HODs rooms for B.Pharm Course	Minimum 4	20 Sq mts x 4
2	Faculty Rooms for D.Pharm & B.Pharm course		10 Sq mts × n (n=No. of teachers)
3	Faculty Rooms for Bachelor of Pharmacy (Practice) course		10 Sq mts × n (n=No. of teachers)

6. Museum, Library, Animal House and other Facilities:

Sl No.	Name of infrastructure	Requirement as per Norms in number	Requirement as per Norms in area
1	Animal experimentation learning modules	01	-
2	Library	01	150 Sq. mts

3	Museum	01	50 Sq. mts (May be attached to the Pharmacognosy lab)
4	**Model Pharmacy** **<u>Essential</u>:** **Running Model Community Pharmacy** **<u>Desirable</u>** Drug Model Store	**01**	**80 Sq.mts (including 10 Sq.mt for Drug Information Centre & 10 Sq.mt. for Patient Counselling)**
5	Auditorium / Multi Purpose Hall (Desirable)	01	250 – 300 seating capacity
6	Herbal Garden (Desirable)	01	Adequate number of medicinal plants

7. Student Facilities:

Sl. No.	Name of infrastructure	Requirement as per Norms in number	Requirement as per Norms in area
1	Girl's Common Room (Essential)	01	60 Sqmts
2	Boy's Common Room (Essential)	01	60 Sq.mts
3	Toilet Blocks for Boys	01	24 Sq.mts
4	Toilet Blocks for Girls	01	24 Sq.mts
5	Drinking Water facility – Water cooler (Essential).	01	-
6	Boy's Hostel (Desirable)	01	9 Sq mts/ Room Single occupancy
7	Girl's Hostel (Desirable)	01	9 Sq mts / Room (single occupancy) 20 Sq mts / Room (triple occupancy)
8	Power Backup Provision (Desirable)	01	

8. Computer and other Facilities:

Name	Required
Computer Room for B.Pharm Course	01 system for every 2 students (with internet and Printer facilities) (Area 75 Sq mts)
Computer For Model Pharmacy	As required for teaching and practice purposes and for drug information services
Computer (Latest configuration)	1 system for every 10 students (UG & PG)
Printers	1 printer for every 10 computers
Multi Media Projector	01
Generator (5KVA)	01

9. Library books and periodicals

The minimum norms for the initial stock of books, yearly addition of the books and the number of journals to be subscribed are as given below:

Item	Titles (No)	Minimum Volumes (No)
Number of books	150	1500 adequate coverage of a large number of standard text books and titles in all disciplines of pharmacy
Annual addition of books		150 books per year
Periodicals Hard copies / online		10 National 05 International periodicals
CDS		Adequate Nos
Internet Browsing Facility		Yes/No (Minimum ten Computers)
Reprographic Facilities: Photo Copier Fax Scanner		 01 01 01

10. A. Subject wise Classification:

Sl. No	Subject		
		Titles	Numbers
1	Pharmaceutics		
2	Pharmaceutical Chemistry		
3	Pharmacognosy		
4	Biochemistry and Clinical Pathology		
5	Human Anatomy and Physiology		
6	Health Education and Community Pharmacy		
7	Pharmacy Practice		
8	Pharmacology and Toxicology		
9	Pharmaceutical Jurisprudence		
10	Drug Store and Business Management		
11	Hospital and Clinical Pharmacy		
12	Social Pharmacy		

10. B. Library Staff:

	Staff	Qualification	Required
1	Librarian	M. Lib	1
2	Assistant Librarian	D. Lib	1
3	Library Attenders	10 +2 / PUC	2

PART III ACADEMIC REQUIREMENTS

A. Faculty requirements:

1. Student Staff Ratio:

(Required ratio --- Theory → 40:1 and Assignment → 10:1.

2. Minimum No. of working days for B. PHARM PRACICE: 180

3. Staff Pattern for B. Pharm & B.Phram (Practice) courses department wise:

Professor : Asst. Professor : Lecturer

Department / Division	Name of the post	For strength of 60 students of B.Pharm & 40 students of B.Pharm (Practice)
Department of Pharmaceutics	Professor	1
	Asst. Professor	1
	Lecturer	4
Department of Pharmaceutical Chemistry (including Pharmaceutical Analysis)	Professor	1
	Asst. Professor	1
	Lecturer	4
Department of Pharmacology	Professor	1
	Asst. Professor	1
	Lecturer	5
Department of Pharmacognosy	Professor	1
	Asst. Professor	1
	Lecturer	2
Department of Pharmacy Practice	Professor	1
	Asst.professor	2
	lecturer	2

4. Teaching Staff required year wise exclusively for B. Pharm (Practice) for intake of 40 Students.

	Staff required for I B. Pharm Practice	Staff required for II B. Pharm Practice
Principal	1	1
Pharmacology	1	1
Pharmaceutics	1	1
Pharmacy Practice	2	2
Part time teaching Staff For pathophysiology and pharmacotherapeutics	As required	As required

At least 2 teachers shall possess M.Pharm (Pharmacy Practice) or Pharm D. Qualification.

5. Number of non-teaching staff available for D. Pharm and B. Pharm course for intake of 60 students:

Sl. No.	Designation	Required Number	Required Qualification	Available		Remarks of the Inspection team
				Number	Qualification	
1	Laboratory Technician	1 for each Dept	D. Pharm			
2	Labortory Assistants/ Attenders	1 for each Lab (minimum)	SSLC			
3	Office Superintendent	1	Degree			
4	Accountant	1	Degree			
5	Store keeper	1	D. Pharm/ Degree			

6	Computer Data Operator	1	BCA / Graduate with Computer Course			
7	First Division Assistant	1	Degree			
8	Second Division Assistant	2	Degree			
9	Peon	2	SSLC			
10	Cleaning personnel	Adequate	---			
11	Gardener	Adequate	---			

B. DOCUMENTATION

Records to be maintained: Essential

Sl. No	Records
1	Admissions Registers
2.	Individual Service Register
3.	Staff Attendance Registers
4.	Sessional Marks Register
5.	Final Marks Register
6.	Student Attendance Registers
7.	Minutes of meetings- Teaching Staff
8.	Fee paid Registers
9.	Acquittance Registers
10.	Accession Register for books and Journals in Library
11.	Log book for chemicals and Equipment costing more than Rupees one lakh
12.	Job Cards for laboratories
13.	Standard Operating Procedures (SOP's) for Equipment
14.	Laboratory Manuals
15.	Stock Register for Equipment
16.	Animal House Records as per CPCSEA
17.	**Record of submission of Assignments by students**
18.	**Record of Case presentation/Seminars conducted**

PART IV – EQUIPMENT AND APPARATUS

The institution shall comply fully by having all equipments as prescribed in SIF for approval of B. Pharm course u/s 12 of the Pharmacy Act.

APPENDIX-III

(See regulation 8)

Course curriculum

1.1. Pathophysiology and Pharmacotherapeutics I

Scope:

Practicing pharmacists will have opportunity to review the case notes or prescriptions in their practice setting and able to identify and resolve the drug related problems. This will ensure the improved patient care and decreases the unnecessary health care expenditure.

Objectives:

Upon completion of the course, the student will be able to

(a) Understand the anatomy and physiology of the respective system

(b) Understand the disease process
(c) Know the signs and symptoms of the disease.
(d) Appreciate the various therapeutic regimens with their advantages and disadvantages.

Course duration:

Learning

40 hours of learning by blended mode of teaching. Blended teaching includes didactic and onsite learning.

Case Presentations

During the course each student should present **5 cases** covering the diseases prescribed in the syllabus.

Assignments
Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed Syllabus and Lecture Schedules

1. Introduction to pathophysiology and therapeutics – scope and objectives - 1 hr

2. Prescribing guidelines (Drug and dosage selection and dose calculation) for - 4 hrs
a) Pediatrics
b) Geriatrics
c) Pregnant and breast feeding women
d) Renally and hepatically challenged patients

3. Elements of anatomy, etiopathogenesis, diagnostic techniques, clinical manifestations and pharmacotherapeutics of diseases associated with Cardiovascular System - 15 hrs
(a) Hypertension
(b) Ischemic Heart diseases (Angina and Myocardial Infarction)
(c) Hyperlipidemia
(d) Congestive Heart Failure
(e) Arrhythmias

4. Elements of anatomy, Etiopathogenesis, diagnostic techniques, clinical manifestations and pharmacotherapeutics of diseases associated with Respiratory System - 12 hrs

(a) Asthma
(b) COPD
(c) Drug induced pulmonary diseases

5. Elements of anatomy Etiopathogenesis, diagnostic techniques, clinical manifestations and pharmacotherapeutics of diseases associated with Endocrine System - 8 hrs

(a) Diabetes.
(b) Thyroid diseases

Books/Refernences:
Suggested Assignments:

1.2. Pathophysiology and Pharmacotherapeutics II

Scope:

Practicing pharmacists will have the opportunity to review the case notes or prescriptions in their practice setting and able to identify and resolve the drug related problems. This will ensure the improved patient care and decreases the unnecessary health care expenditure.

Objectives:

Upon completion of the course, the student will be able to

(a) Understand the anatomy and physiology of respective system
(b) Understand the disease process
(c) Know the signs and symptoms of the disease.
(d) Appreciate the various therapeutic regimens with their advantages and disadvantages.

Course duration:

Learning

40 hours of learning by blending method.
Blended mode of education and includes didactic and onsite learning.

Case Presentations

During the course each student should present **5 cases** covering the diseases prescribed in the syllabus.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed Syllabus and Lecture Schedules

1. Elements of anatomy, Etiopathogenesis, diagnostic techniques, clinical manifestations and pharmacotherapeutics of diseases associated with CNS - 18 hr

(a) Anxiety
(b) Depression
(c) Schizophrenia,
(d) Manic depressive disorders
(e) Epilepsy,
(f) Parkinson's disease,
(g) Headaches

2. Elements of anatomy, Etiopathogenesis, diagnostic techniques, clinical manifestations and pharmacotherapeutics of diseases associated with GI Disorders - 10 hrs

(a) Dyspepsia,
(b) Acid Pepsin Disease,
(c) Inflammatory Bowel Disease.
(d) Liver disorders- Hepatitis, Gall stones, Alcoholic Liver Disease.

3. Elements of anatomy, etiopathogenesis, clinical manifestations and pharmacotherapeutics of diseases associated with hematological System - 8 hrs

(a) Erythropoietic system – Over view, Iron deficiency anemia, Megaloblastic anemia, Sideroblastic anemia, Hemolytic anemia, Venous Thromboembolism, Arterial Thromboembolism, Drug induced blood disorders.

Books and references

Suggested topics for assignment

1.3. Pharmacy Practice I

Scope

Practicing pharmacists have opportunity to provide various patient care services to improve the patient's health in community settings through counselling, health screening services, and other education programs. In hospital settings, pharmacists can ensure appropriate dispensing, education to patient, and provide all hospital pharmacy services including clinical pharmacy services such as drug information and ADR reporting.

Objectives:

Upon completion of the course, the student will be able to

(a) Understand the professional roles of pharmacists in community, hospital and clinical pharmacy areas.
(b) Understand the professional responsibilities of the pharmacists.
(c) Provide the intended services.

Course duration:

Learning

40 hours of learning by blending method. Blending method includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed Syllabus and Lecture Schedules

1. Introduction to Pharmacy Practice – Definition, patient focused approach, scope/areas of practice - **1 hour**

2. Introduction to Clinical Pharmacy - 3Hrs

a) Definition, Scope, Objectives of Clinical Pharmacy Practice

b) International v/s National scenario

c) Professional responsibilities of Clinical Pharmacists.

3. Clinical Pharmacy daily activities - 6 hrs

a) Definition, objectives and procedures of

i) Ward round participation

ii) Treatment chart review

iii) Drug information

iv) Patient counseling

v) ADR monitoring and reporting

vi) Therapeutic drug monitoring.

vii) Home Medication Review

b) **Patient Data analysis - 02 hours**

Patient case history, drug therapy evaluation, identification and resolving of drug related problems.

4. Practice Management : - 08 hrs

a. Professional practice standards - Good Pharmacy Practice – in detail including Good storage practice, good dispensing practices, etc. (national and international scenario) (for both community and hospital pharmacy)
b. Pharmacy Practice Regulations (PCI), Code of Ethics for Pharmacists
c. SOPs, writing SOPs, Documentation, writing various record formats for community and hospital pharmacy, validation of various processes in Hospital & Community Pharmacy.
d. Concept of Accreditation of Pharmacies
e. Validation concepts & instruments for community pharmacy and hospital pharmacy
f. Concept of Audits in community and hospital pharmacy

5. Hospital and Hospital Pharmacy Organisation - 6 Hrs

a) Definition of Hospital, Hospital Pharmacy, Organizational Structure of Hospital, Hospital Pharmacy, professional roles and responsibilities of hospital pharmacist.

b) Advantages, need and disadvantages/risks of Hospitalization. Nosocomial infections/HAI – worldwide scenario, statistics/prevalence, dangers, precautions to take. Problems related to hospitals, high risk environment.

c) International scenario vs Indian Scenario of Hospital Pharmacy Practice.

d) Hospital Pharmacy Practice - Requirements for functioning of hospital pharmacy, Qualification and experience requirements for pharmacists, work load statistics.

e) Standards of Pharmacies in hospitals

6. Drug Committees - 4 Hrs

Pharmacy and Therapeutics Committee, Hospital Formulary, Infection Control committee, Institutional Review Board.

7. Community Pharmacy - 8 hrs

a) Definition, scope and professional responsibilities of community pharmacist.

b) International scenario vs Indian Scenario of Community Pharmacy Practice

c) Pharmacy Assistant/Technician/Salesperson – roles and responsibilities,

d) Community pharmacist's services to other health care professionals, and to nursing homes

8. Community Pharmacy Management - 4 hrs

Selection of site, legal requirements, procurement, storage, and inventory control, product display, finance management.

Books and references
Suggested assignment topics

1.4. Pharmacy Practice II

Scope

Practicing pharmacists have opportunity to provide various patient care services to improve the patient's health in community settings through counseling, health screening services, and other education programs. In hospital settings, pharmacists can ensure appropriate dispensing, education to patient, and provide all hospital pharmacy services including clinical pharmacy services such as drug information and ADR reporting

Objectives:

Upon completion of the course, the student will be able to

a) Understand the professional roles of pharmacists in community, hospital and clinical pharmacy areas.
b) Understand the professional responsibilities of the pharmacists.
c) Provide the intended services.

Course duration:

Learning

40 hours of learning by blending method.
Blended teaching includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time of Final Examination.

Detailed syllabus and lecture wise teaching schedules

1. Hospital Pharmacy Stores Management - 04 hours

Stores Management, Drug Purchase and Procurement, Inventory Control and GPP. Management of Material and Finance.

2. Drug Dispensing and Drug Distribution - 8 hours

Drug distribution – various methods, individual order method, Floor Stock Method, Unit Dose Drug Distribution Method, Drug basket method, Distribution to ICCU/ICU/Emergency wards, Automated drug dispensing systems and devices , Distribution of Narcotic and Psychotropic substances , GPP associated with all these.

3. Central Sterile Supply Services - 2 hours

4. Prescription and prescription handling - 5 hours

a. Definition, Parts of prescriptions, good prescribing practices, legality of prescriptions, identification of drug related problems in prescriptions.
b. Prescription handling, labeling of dispensed medications (Main label, Ancillary label, pictograms), Medication usage instructions.
c. Good dispensing practices
d. Drug Interactions (Drug-Drug, Drug-Food, Drug-Lab investigations) – types, interpretation and detection, prevention, Practice on market prescriptions, Use of drug interaction software's.
e. PPIs – (Patient Package Insert) - Basic concept, Importance and beneficial use of PPIs. Scenario in India and other countries.

5. Pharmaceutical Care - 02 hours

Definition, principles and procedures of pharmaceutical care

6. Patient Counseling - 04 hours

Definition, various stages of patient counseling, barriers in counseling and strategies to overcome barriers in patient counseling. Patient information leaflets- definition, layout and design of PILs.

7. Health Screening Services - 04 hours

Definition, scope, and uses of health screening services, procedures involved in screening blood pressure, capillary blood glucose, body mass index

8. Interpretation of laboratory data - 10 hours

a) Haematological, Liver function, Renal function, thyroid function tests
b) Tests associated with cardiac disorders
c) Fluid and electrolyte balance
d) Microbiological culture sensitivity tests
e) Pulmonary Function Tests

books and references

suggested topics for assignments

1.5. Applied Pharmaceutics

Scope

This course is designed to impart a fundamental knowledge on different dosage forms and pharmacokinetic changes in the body. It helps the student to understand the basic concepts regarding, absorption, distribution, metabolism and excretion.

Objectives

Upon completion of the course, the student shall be able to—

a) Understand the formulation principles of various dosage forms
b) Understand the basic principles of stability, storage and administration of various dosage forms
c) Learn above novel drug delivery systems
d) Understand various pharmacokinetic pathways and optimize the drug therapy.
e) Understand Pro Drugs concept.

Course duration:

Learning

40 hours of learning by blended teaching. Blending teaching includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering Pharmaceutical Dosage forms and Pharmacokinetic concepts

Text Books

a. Cooper and Gunns Dispensing for pharmacy students.
b. A text book Professional Pharmacy by N. K. Jain and S. N. Sharma.
c. D.M. Brahmankar and Sunil B Jaiswal. Text Book of Biopharmaceutics and Pharmacokinetics – A treatise. Vallabh Prakashan. Delhi.

Reference Books

a) Introduction to Pharmaceutical dosage forms by Howard C. Ansel.
b) Remington's Pharmaceutical Sciences

Lecture wise program and detailed syllabus

1. Introduction to Pharmaceutical Dosage Forms - **1 hr**
2. Basics of GMP, GLP, QA, QC - **1 hr**

3. Study the following about all dosage forms : - **15 hrs**
    a. Need, advantage, disadvantages
    b. Brief of various ingredients used and need for these, basic properties of inactives. Basic overview of manufacturing without going into details.
    c. Storage, packaging requirements
    d. Possible stability and defects issues
    e. Proper use, special precautions while using, instructions to patients
    f. Bioavailability/biopharmaceutics aspects
4. Introduction to Novel drug delivery systems, instructions to be given to patients – Transdermal, infusion pumps, genetically engineered medicines, etc. - **6 hrs**
5. Introduction to Bio-Pharmaceutics - **1 hr**
6. Absorption of drugs - **3 hrs**
    a) Introduction to absorption, structure and physiology of cell membrane
    b) Factors affecting drug absorption, Absorption of drugs from extra vascular routes.
7. Distribution of Drugs - **2 hrs**
    a) Tissue permeability of drugs, Physiological barriers to drug distribution.
    b) Factors affecting drug distribution.
    c) Volume of drug distribution, Drug protein, drug tissue binding.
8. Biotransformation of drugs - **3 hrs**
    a) Drug metabolizing organs and Enzymes
    b) Phase I reactions, Phase II reactions
    c) Factors affecting biotransformation of the drugs
9. Excretion of drugs - **1 hour**
    Renal excretion of drugs, Factors affecting the renal filtration,
    Non renal routes of drug excretion
10. Prodrugs - **1 hour**
    a) Definition and applications of prodrugs
11. Bioavailability and Bioequivalence - **4 hours**
    a) Definition of bioavailability and bioequivalence
    b) Factors affecting bioavailability.
    c) Importance of BA, BE, BA Classification system, NTI drugs, care to be taken in prescribing and dispensing of such drugs

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination

1.6 Social Pharmacy – I

Scope:

Practicing pharmacists have opportunity to provide various patient care services to improve the patient's health in the society. By monitoring the health of the individuals, providing them education about health, precautions, and pharmacists can improve their professional image.

Objectives:

Upon completion of the course, the student will be able to

a) Understand the social responsibility of the pharmacists in the society
b) Understand the health policies
c) Provide health care services to patients.

Course duration:

Learning

40 hours of learning by blending method. Blending method includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts

Detailed syllabus and topics

1. Introduction to Social Pharmacy –

a) Definition and Scope - Introduction to Social Pharmacy as a discipline and its various concepts. Sociological Understanding of Health and Illness, Role of Pharmacist in Public Health - **1hr**

b) WHO Definition of health – various dimensions of health - **1 hr**

c) Introduction and broad overview of health systems, infrastructure, and functioning in India and other countries – both in Public and private sector. National health programmes in India – brief study of these and the role of pharmacist in each of these. - **5 hrs**

2. Drugs, Industry & Policies - **7 hrs**

a. Drugs and developed countries, developing countries, GATT, patents, Patents Act.
b. Pharmaceutical Industry and its activities, Classification systems of drugs, Social marketing – brief study of organizations and functioning like Medicines Sans Frontiers
c. Concept of RUM, WHO Essential Medicines, Irrational medicine use and its associated problems, etc., Evidence based medicine, STGs (Standard Treatment Guidelines)
d. National Drug Policy, National Health Policy, Pharmacy & Drug Ethics –

3. Pharmacoeconomics – Definition, types of pharmacoeconomic models, consumption of drugs, pharmaceutical pricing and reimbursement, Health Insurance - **3 hrs**

4. Pharmacoepidemiology – Definition, scope, advantages and disadvantages. - **3 hrs**

5. Health Promotion and Health education - **20 hrs**

a) Epidemiology of Communicable Diseases : Causative agents and Clinical presentations and Role of Pharmacist in prevention of communicable diseases :
   (i) Respiratory infections – chickenpox, measles, rubella, mumps, influenza (including Avian-Flu, H1N1), diphtheria, whooping cough, meningococcal meningitis, acute respiratory infections, tuberculosis
   (ii) Intestinal infections – poliomyelitis, viral hepatitis, cholera, acute diarrhoeal diseases, typhoid, food poisoning, amebiasis, worm infestations
   (iii) Arthropod-borne infections - dengue, malaria, filariasis and, chikungunya
   (iv) Zoonoses – rabies, yellow fever, Japanese encephalitis, plague, human salmonellosis, ricketsial diseases, taeniasis, hydatid disease, leishmaniasis
   (v) Surface infections – trachoma, tetanus, leprosy, STDs, HIV/AIDS
   (vi) Emerging and reemerging infectious diseases.

Text books (Theory)

1. *Social Pharmacy – Innovation and development edt. Geoff Harding, Sarah Nettleton and Kevin taylor. The Pharmaceutical Press.*
2. **Text Book of Community Pharmacy Practice. RPSGB Publication**

2nd Year

2.1 Pathophysiology and Pharmacotherapeutics III

Scope:

Practicing pharmacists will have opportunity to review the case notes or prescriptions in their practice setting and able to identify and resolve the drug related problems. This will ensure the improved patient care and decreases the unnecessary health care expenditure.

Objectives:

Upon completion of the course, the student will be able to

(a) Understand the anatomy and physiology of the respective system
(b) Understand the disease process
(c) Know the signs and symptoms of the disease.
(d) Appreciate the various therapeutic regimens with their advantages and disadvantages

Course duration:

Learning

40 hours of learning by blended teaching. Blended teaching includes didactic and onsite learning.

Case Presentations

During the course each student should present **5 cases** covering the diseases prescribed in the syllabus.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed syllabus and Lecture wise schedules

1. Infectious diseases: - 25 Hours

(a) Guidelines for the rational use of antibiotics and surgical Prophylaxis.

(b) Pathophysiology and Pharmacotherapeutics of Tuberculosis, Meningitis, Respiratory tract infections, Gastroenteritis, Endocarditis, Septicemia, Urinary tract infections, Protozoal infection-Malaria, HIV & Opportunistic infections, Fungal infections, Viral infections, Gonarrhoea and Syphillis

2 Musculoskeletal disorders - 08 Hrs

(a) Basics of Anatomy and physiology of musculoskeletal system.

(b) Pathophysiology and Pharmacotherapeutics of Rheumatoid arthritis, Osteoarthritis, Gout, Spondylitis, Systemic Lupus Erythematosus

3 Renal system - 07 Hrs

a) Basics of anatomy and physiology of Renal system

b) Pathophysiology and pharmacotherapeutics of Acute Renal Failure, Chronic Renal Failure, Renal Dialysis, Drug induced renal disorders

Books and references

Suggested topics for assignment.

2.2. Pathophysiology and Pharmacotherapeutics IV :

Scope:

Practicing pharmacists will have opportunity to review the case notes or prescriptions in their practice setting and able to identify and resolve the drug related problems. This will ensure the improved patient care and decreases the unnecessary health care expenditure.

Objectives:

Upon completion of the course, the student will be able to :

a) Understand the anatomy and physiology of the respective system
b) Understand the disease process
c) Know the signs and symptoms of the disease.
d) Appreciate the various therapeutic regimens with their advantages and disadvantages

Course duration:

Learning

40 hours of learning by blended teaching . Blended teaching includes didactic and onsite learning.

Case Presentations

During the course each student should present **5 cases** covering the diseases prescribed in the syllabus.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed Syllabus and Lecture Wise Program

1. Oncology: - 15 Hrs

Basic principles of Cancer therapy,
General introduction to cancer chemotherapeutic agents,
Chemotherapy of breast cancer, leukemia.
Management of chemotherapy induced nausea and emesis

2. Dermatology: - 7 Hrs

(a) Pathophysiology and Pharmacotherapeutics of Psoriasis, Scabies, Eczema, Impetigo

3. Women's Health - 10 Hrs

(a) Physiology of Menstrual Cycle
(b) Contraception – Physical Methods, Chemical Methods, IUDs, and Permanent methods.
(c) Disorders related to Menstrual Cycle – Polycystic ovary Syndrome, Dysmenorrhea, Premenstrual Syndrome.
(d) Obstetric Drug Therapy – Trimesters of Pregnancy, Common complaints of Pregnancy and their management – nausea, vomiting, reflex esophagitis, Diabetes mellitus, Hypertension and Preeclampsia, FDA Categorisation of drugs in Pregnancy
(e) Menopause – signs and symptoms and Management

4. **Elements of anatomy and Physiology of Vision Etiopathogenesis, diagnostic techniques, clinical manifestations and pharmacotherapeutics of diseases associated with Eye such as**

(a) Glaucoma
(b) Infectious ophthalmic diseases - **3hrs**

Books and references
Suggested topics for assignment

2.3. Pharmacy Practice III

Scope:

Practicing pharmacists have opportunity to provide various patient care services to improve the patient's health in community settings through counseling, health screening services, and other education programs. In hospital settings, pharmacists can ensure appropriate dispensing, education to patient, and providing all hospital pharmacy services including clinical pharmacy services such as drug information and Pharmacovigilance.

Objectives:

Upon completion of the course, the student will be able to

a. Understand the professional roles of pharmacists in community, hospital and clinical pharmacy areas.
b. Understand the professional responsibilities of the pharmacists.
c. Provide the intended services.

Course duration:

Learning

40 hours of learning by blending teaching. Blending teaching includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed syllabus and Lecture wise program

1. Drugs and Poison Information - 06 hrs
(a) Introduction to drug information resources available
(b) Systematic approach in answering DI queries
(c) Critical evaluation of drug information and literature
(d) Preparation of written and verbal reports
(e) Establishing a Drug Information Centre
f) Poisons information- organization & information resources
(g) Drug Information Bulletin

.

2. Pharmacovigilance - 05 hrs
(a) Scope, definition and aims of Pharmacovigilance
(b) Adverse drug reactions - Classification, mechanism, predisposing factors, causality assessment [different scales used]
(c) Reporting, evaluation, monitoring, preventing & management of ADRs
(d) Role of pharmacist in management of ADR.

3. Medication Errors - classification, consequences, prevention, and role of Pharmacist.Dispensing errors, and ways to minimize them. - **03 hrs**

4. Medication adherence - Consequences on non-adherence, role of pharmacist methods to improve adherence, compliance aids - **03 hrs**

5. Communication skills – verbal, written, Body language - **03 hrs**

6. OTC medications – definition, need, and role of Pharmacist. OTC medications in India, counseling for OTC products. Self medication and role of pharmacist in promoting safe self-medication.

- **02 hours**

7. Responding to symptoms/minor ailments - **10 hrs**

Relevant pathophysiology, common non-pharmacological and OTC drug therapy, and referral to doctor – in :Pain, GI disturbances (Nausea, Vomiting, Dyspepsia, diarrhea, constipation), Worm infestations, Pyrexia, Ophthalmic symptoms, URT infections, skin disorders, oral and dental disorders.

8. Hospital supplies – - **7 hrs**

a. Surgical items/supplies – catheters, syringes & needles, I.v. sets, Ryle's tubes, Study of Wound management, stoma and incontinence products, Surgical dressing like cotton, gauze, bandages and adhesive tapes,

b. sutures, ligatures,

c. patient care equipment – nebulizers, thermometers, .

9. Veterinary Pharmacy – introduction and Role of pharmacist in procurement and distribution of veterinary medicines - **4 hrs**

Books and references

Suggested topics for assignments

2.4. Pharmacy Practice IV

Scope:

Practicing pharmacists have opportunity to provide various patient care services to improve the patient's health in community settings through counseling, health screening services, and other education programs. In hospital settings, pharmacists can ensure appropriate dispensing, education to patient, and providing all hospital pharmacy services including clinical pharmacy services such as drug information and Pharmacovigilance.

Objectives:

Upon completion of the course, the student will be able to

a) Understand the professional roles of pharmacists in community, hospital and clinical pharmacy areas.
b) Understand the professional responsibilities of the pharmacists.
c) Provide the intended services.

Course duration:

Learning

40 hours of learning by blending method. Blending method includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed syllabus and lecture wise program

1. Health Accessories - - **05 Hrs**

Study and handling of various common health accessories handled in hospital and community pharmacy. Student should have working knowledge, uses and cautions in using these. (Wheel Chairs, Canes, Crutches, and other orthopedic aids, Bed Pans, Vaporizers, Syringes and Needles, Hot water Bottles, Clinical Thermometers, Trusses, First Aid Supplies, Family Medicine Cabinet, etc.

2. Medical gases – different gases and their use, coding and care of cylinders, delivery of gases to various parts of hospital, domiciliary oxygen services, and role of pharmacist
. - **3 hrs**

3. I.V admixure services and role of Pharmacist - **3 hrs**

4. Total Parenteral Nutrition – Definition, composition and clinical use of TPN **2 hrs**

5. Clinical Reseach - **12 hrs**

Introduction to Clinical trials
Various phases of clinical trial.
Methods of post marketing surveillance
Abbreviated New Drug Application submission
Good Clinical Practice – ICH, GCP,
- Central drug standard control organisation (CDSCO) guidelines, Schedule Y
-Composition, responsibilities, procedures of IRB / IEC
Role and responsibilities of clinical trial personnel as per ICH GC
a. Sponsor
b. Investigators
c. Clinical research associate
d. Auditors
e. Contract research coordinators
f. Regulatory authority

Designing of clinical study documents (protocol, CRF, ICF, PIC with assignment)
Informed consent Process

6. Introduction to Biostatistics - **3hrs**

7. Research in pharmacy practice areas.

8. Continuing education for pharmacists - **1 hr**

9. Compunding of Pharmaceuticals in the hospital/community pharmacy. Weights and measures, calculations involving percentage solutions, allegation, proof spirit, Isotonic solutions. Bulk compounding in hospitals, pre-packaging. - **3Hr**

10. Manufacturing of Pharmaceutical Formulations in hospital – various aspects, current status - **03 hrs**

11. Radiopharmaceuticals – Handling and Packaging, clinical usage, and role of pharmacist - **02 hrs**

12. Applications of IT and computers in pharmacy practice - **2 hrs**

13. Provision of cytotoxic chemotherapy, and various considerations/handling. Handling of cytotoxic waste and disposal.

Pharmaceutical (Medicines and allied products) waste management in hospitals, community pharmacy, and the community and the role of the pharmacist. - **3Hr**

14. Medical Devices & I.V. pumps

15. Individualised medicines, Gene therapy, Genomics & proteomics, Biochips, biosensors and MEMS micro electro mechanical systems - **2 Hr**

2.5. Pharmaceutical Jurisprudence

Scope:

A profession becomes successful when it is guided with suitable laws. This course describes about the Pharmacy Act, Drugs and Cosmetics Act, Dangerous drugs act, Medicinal and Toilet preparation act, DPCO and Professional ethics.

Course Objectives:

Upon completion of the course the student shall be able to

1. Understand various concepts of the pharmaceutical legislation in India
2. Know various rules drafted in Drug and Cosmetic Act, Pharmacy Act, NDPS Acts, relevant to pharmacy practice.
3. Know the Consumer Protection Act, PFA Act, DPCO,.
4. Understand the labeling requirements and packaging guidelines for drugs and cosmetics

Course duration:

Learning

40 hours of learning by blended teaching. Blended teaching method includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Detailed syllabus and Lecture wise Program

1. A brief review of Pharmaceutical legislations. - 01 hr

A Study of various pharmaceutical and related legislations with more emphasis on aspects relevant to community & hospital pharmacy practice in India. Study the aspects only from practical angle, with examples, case studies, etc :

2. Drugs and Cosmetics Act-1940 and Rules 1945 - 15 hrs

- Duties & Responsibilities of Drug Inspectors, other officers, and obligations of the pharmacy to them
- Brief about DTAB, DCC, Drug testing laboratories
- Various drug licences for retail pharmacy, requirements to start a pharmacy/medical store, application forms, issue of licence, display of licences, duration of licences, laws related to stocking, handling and sale of drugs and devices
- Various schedules under the Act & Rule – study in brief –those relevant to pharmacy practice
- Labelling requirements of drugs – various aspects
- Spurious, misbranded, adulterated, counterfeit drugs – various aspects related to this, how to recognize, role of the pharmacist
- Import of drugs for personal use
- Various documents to be maintained under the Act & Rules by a pharmacy
- Storage requirements, handling expired goods
- Various punishments under the Act
- Practical study of Prescription and non-prescription drugs, market samples, examine for labeling, etc.

- Laws relating to various traditional systems/ medicines approved in India
- Banning of drugs

3. Pharmacy Act – 1948 - **03 hrs**
4. Medicinal and Toilet Preparation Act-1955 - **04 hrs**
5. Narcotic Drugs and Psychotropic Substances Act – 1985 - **04 hrs**
6. Drugs and Magic Remedies (Objectionable Advertisements) Act and Rules, 1954 - **02 hrs**
7. Essential Commodities Act - **02 hrs**
8. Drugs Prices Control Order - **02hrs.**
9. Prevention of Cruelty to Animals Act, 1960 - **02 hrs**
10. Consumer Protection Act , 1986 - **02 hrs**
11. Prevention of Food Adulteration Act & Rules, laws relating to Dietary Supplements, Food supplements, etc - **02 Hrs**

12. The Infant Milk Substitutes, Feeding Bottles and Infant Foods (Regulation of Production, Supply and Distribution) Amendment Act, 2003 - **02 Hrs**

Books and references

2.6. Social Pharmacy II

Scope:

Practicing pharmacists have opportunity to provide various patient care services to improve the patient's health in the society. By monitoring the health of the individuals, providing them education about health, precautions, and pharmacists can improve their professional image.

Objectives:

Upon completion of the course, the student will be able to

a. Understand the social responsibility of the pharmacists in the society
b. Provide professional services to the patients.

Course duration:

Learning

40 hours of learning by blending method. Blending method includes didactic and onsite learning.

Assignments

Each student should complete **two assignments** covering therapeutics and pharmacy practice concepts and will be evaluated at the time Final Examination.

Syllabus and lecture wise programme

A. **Preventive care**:

1. Vaccines, and immunizations – and Role of Pharmacist – **2 hours**
2. Role of Pharmacist in Demography & Family Planning - **2 hours**
3. Mother and child health, importance of breastfeeding, ill effects of formula foods and bottle feeding, and role of Pharmacist - **4 hours**
4. Geriatrics and role of Pharmacist - **1 hour**
5. Effect of Environment on Health & Role of Pharmacist – Water pollution, safe supply of water, **1 hour**

6. Occupational diseases/illnesses and Role of Pharmacist - **1 hours**
7. Mental Health and role of Pharmacist - **1 hours**
8. Psychosocial Pharmacy : Drugs of misuse and abuse – psychotropic and narcotics, and other pharmaceuticals and chemicals, tobacco and tobacco products, alcohol. Social & psychosocial impact of these, role of pharmacist in reducing, preventing the menace.

   Tobacco cessation and role of pharmacist - **3 Hr**

9. Palliative/terminal care and role of pharmacist in handling psychosocial issues - **3Hr**
10. Care for disabled and role of pharmacist in handling psychosocial issues - **2 Hr**
11. Early intervention in hereditary diaseses, screening tests - **1 hour**

B. Nutrition and health : - **20 Hr**

1. Basics of nutrition – Macronutrients and Micronutrients, fibre – importance, sources (Plant and animal origin),
2. Calorific and nutritive values of various foods
3. Daily/recommended dietary allowance and functions of each. Balanced diets – for various individual groups. Nutrition deficiency diseases
4. Food as a medicine. Brief study of various concepts of Naturopathy.
5. Nutrition as per Ayurveda – Ayurvedic outlook to diets – as per prakruti, seasons, seasonal availability of foods, etc. Prakruti study in brief.
6. Wrong/improper foods and food habits, causes of various disease conditions, ill effects of wrong foods/fast foods, timed foods, etc – Western foods as well as Indian foods – reasons for wrong effects on body.
7. Basics of genetically modified foods – advantages, disadvantages
8. Effects of environment on foods, artificial ripening, hybridization, use of pesticides, adulteration, etc.
9. Nutrition/dietary recommendation for different disease conditions – e.g. diabetes, blood pressure, Hyperlipidemia, arthritis, renal disease, liver disease, allergies, etc.
10. Artificial sweeteners, zero calorie concept, glycemic index of foods

11. Dietary supplements, neutraceuticals, food supplements – legal standing, indications, rational use, benefits, ADRs, Drug Interactions, pharmacoeconomics.

C. First Aid Services in Community Pharmacy - **10 hours**

RECOMMENDED BOOKS

1. Clinical Pharmacy and Therapeutics - Roger and Walker, Churchill Livingstone Publication

2. Pharmacotherapy: A Pathophysiologic Approach - Joseph T. Dipiro et al. Appleton & Lange

3. Clinical Pharmacy and Therapeutics - Eric T. Herfindal, Williams and Wilkins Publication

4. Applied Therapeutics: The Clinical Use of Drugs. Lloyd Young and Koda-Kimble MA]

5. Text Book of Hospital Pharmacy by Quadry and Merchant.

6. Text Book of Clinical Pharmacy Practice. Edt. G. Parthasarathi, Karin Nyfort Hansen and Milap. C.Nahata. Orient Longman Publications.

7. Text Book of Community Pharmacy Practice. RPSGB Publication.

8. Community Pharmacy Handbook- Jonathan Waterfield

9. Community Pharmacy: Symptoms, Diagnosis and Treatement: Paul Rutter

10. Minor Illness in Major Diseases-the Clinical Manifestation in the Community: Paul Stillman

11. Sociology for Pharmacist: Tayler, Nettleton, Harding

12. Pharmacy Practice: Tayler, Harding

13. Social Pharmacy: Tayler, Geoffery

14. Stockley's Drugs Interaction: Karen Baxter

15. Cooper and Gunn : Dispensing for Pharmacy Students.

16. A text book Professional Pharmacy by N. K. Jain and S. N. Sharma.

17. Introduction to Pharmaceutical dosage forms by Howard C. Ansel.

18. Remington's Pharmaceutical Sciences

19. D.M. Brahmankar and Sunil B Jaiswal. Text Book of Biopharmaceutics and Pharmacokinetics – A treatise. Vallabh Prakashan. Delhi.

20. Biopharmaceutics by Swarbrik

21. Bio pharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi.

22. Mithal , B M. Textbook of Forensic Pharmacy. Calcutta : National; 1988.

23. Singh, KK, Editor. Beotra's the Laws of Drugs, Medicines & Cosmetics. Allahabad: Law Book House; 1984.

24. Jain, NK. A Textbook of Forensic Pharmacy. Delhi: Vallabh Prakashan ; 1995.

25. Reports of the Pharmaceutical Enquiry Committee

26. I.D.M.A., Mumbai. DPCO 1995

27. Various Reports of Amendments.

28. Deshapande, S.W. The Drugs and Magic Remedies Act, 1954 and Rules 1955. Mumbai: Susmit Publications; 1998.

29. Eastern Book Company.The Narcotic and Psychotropic Substances Act, 1985, Lucknow: Eastern; 1987.

30. Drug Information About Commonly Used Drugs: P.P.Sharma, R.Sing

ARCHNA MUDGAL, Registrar-cum-Secy.

[ADVT. III/4/Exty./101/14]

Printed by the Manager, Government of India Press, Ring Road, Mayapuri, New Delhi-110064
and Published by the Controller of Publications, Delhi-110054.

Pharmacy Council of India

New Delhi

Rules & Syllabus for the Bachelor of Pharmacy (B. Pharm) Course

---

[Framed under Regulation 6, 7 & 8 of the Bachelor of Pharmacy (B. Pharm) course regulations 2014]

CHAPTER- I: REGULATIONS

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the B. Pharm. Degree Program (CBCS)of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by Pharmacy Council of India.

2. Minimum qualification for admission

2.1 First year B. Pharm:

Candidate shall have passed 10+2 examination conducted by the respective state/central government authorities recognized as equivalent to 10+2 examination by the Association of Indian Universities (AIU) with English as one of the subjects and Physics, Chemistry, Mathematics (P.C.M) and or Biology (P.C.B / P.C.M.B.) as optional subjects individually. Any other qualification approved by the Pharmacy Council of India as equivalent to any of the above examinations.

2.2. B. Pharm lateral entry (to third semester):

A pass in D. Pharm. course from an institution approved by the Pharmacy Council of India under section 12 of the Pharmacy Act.

3. Duration of the program

The course of study for B.Pharm shall extend over a period of eight semesters (four academic years) and six semesters (three academic years) for lateral entry students. The curricula and syllabi for the program shall be prescribed from time to time by Pharmacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semestershall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, tutorial hours, practical classes, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly, the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and /or tutorial (T) hours, and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and tutorial hours, and a multiplier of half (1/2) for practical (laboratory) hours. Thus, for example, a theory course having three lectures and one tutorial per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

7.2. Minimum credit requirements

The minimum credit points required for award of a B. Pharm. degree is 208. These credits are divided into Theory courses, Tutorials, Practical, Practice School and Projectover the duration of eight semesters. The credits are distributed semester-wise as shown in Table IX. Courses generally progress in sequences, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

The lateral entry students shall get 52 credit points transferred from their D. Pharm program. Such students shall take up additional remedial courses of 'Communication Skills' (Theory and Practical) and 'Computer Applications in Pharmacy' (Theory and Practical) equivalent to 3 and 4 credit points respectively, a total of 7 credit points to attain 59 credit points, the maximum of I and II semesters.

8. Academic work

A regular record of attendance both in Theory and Practical shall be maintained by the teaching staff of respective courses.

9. Course of study

The course of study for B. Pharm shall include Semester Wise Theory & Practical as given in Table – I to VIII. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table – I to VIII.

Table-I: Course of study for semester I

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP101T	Human Anatomy and Physiology I– Theory	3	1	4
BP102T	Pharmaceutical Analysis I – Theory	3	1	4
BP103T	Pharmaceutics I – Theory	3	1	4
BP104T	Pharmaceutical Inorganic Chemistry – Theory	3	1	4
BP105T	Communication skills – Theory *	2	-	2
BP106RBT BP106RMT	Remedial Biology/ Remedial Mathematics – Theory*	2	-	2
BP107P	Human Anatomy and Physiology – Practical	4	-	2
BP108P	Pharmaceutical Analysis I – Practical	4	-	2
BP109P	Pharmaceutics I – Practical	4	-	2
BP110P	Pharmaceutical Inorganic Chemistry – Practical	4	-	2
BP111P	Communication skills – Practical*	2	-	1
BP112RBP	Remedial Biology – Practical*	2	-	1
	Total	**32/34$/36#**	**4**	**27/29$/30#**

#Applicable ONLY for the students who have studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course**.**

$Applicable ONLY for the students who have studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course**.**

* Non University Examination (NUE)

Table-II: Course of study for semester II

Course Code	Name of the course	No. of hours	Tutorial	Credit points
BP201T	Human Anatomy and Physiology II – Theory	3	1	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	3	1	4
BP203T	Biochemistry – Theory	3	1	4
BP204T	Pathophysiology – Theory	3	1	4
BP205T	Computer Applications in Pharmacy – Theory *	3	-	3
BP206T	Environmental sciences – Theory *	3	-	3
BP207P	Human Anatomy and Physiology II –Practical	4	-	2
BP208P	Pharmaceutical Organic Chemistry I– Practical	4	-	2
BP209P	Biochemistry – Practical	4	-	2
BP210P	Computer Applications in Pharmacy – Practical*	2	-	1
	Total	**32**	**4**	**29**

***Non University Examination (NUE)

Table-III: Course of study for semester III

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP301T	Pharmaceutical Organic Chemistry II – Theory	3	1	4
BP302T	Physical Pharmaceutics I – Theory	3	1	4
BP303T	Pharmaceutical Microbiology – Theory	3	1	4
BP304T	Pharmaceutical Engineering – Theory	3	1	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	-	2
BP306P	Physical Pharmaceutics I – Practical	4	-	2
BP307P	Pharmaceutical Microbiology – Practical	4	-	2
BP 308P	Pharmaceutical Engineering –Practical	4	-	2
	Total	**28**	**4**	**24**

Table-IV: Course of study for semester IV

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP401T	Pharmaceutical Organic Chemistry III– Theory	3	1	4
BP402T	Medicinal Chemistry I – Theory	3	1	4
BP403T	Physical Pharmaceutics II – Theory	3	1	4
BP404T	Pharmacology I – Theory	3	1	4
BP405T	Pharmacognosy and Phytochemistry I– Theory	3	1	4
BP406P	Medicinal Chemistry I – Practical	4	-	2
BP407P	Physical Pharmaceutics II – Practical	4		2
BP408P	Pharmacology I – Practical	4	-	2
BP409P	Pharmacognosy and Phytochemistry I – Practical	4	-	2
	Total	**31**	**5**	**28**

Table-V: Course of study for semester V

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP501T	Medicinal Chemistry II – Theory	3	1	4
BP502T	Industrial PharmacyI– Theory	3	1	4
BP503T	Pharmacology II – Theory	3	1	4
BP504T	Pharmacognosy and Phytochemistry II– Theory	3	1	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	1	4
BP506P	Industrial PharmacyI – Practical	4	-	2
BP507P	Pharmacology II – Practical	4	-	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	-	2
	Total	**27**	**5**	**26**

Table-VI: Course of study for semester VI

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP601T	Medicinal Chemistry III – Theory	3	1	4
BP602T	Pharmacology III – Theory	3	1	4
BP603T	Herbal Drug Technology – Theory	3	1	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	3	1	4
BP605T	Pharmaceutical Biotechnology – Theory	3	1	4
BP606T	Quality Assurance –Theory	3	1	4
BP607P	Medicinal chemistry III – Practical	4	-	2
BP608P	Pharmacology III – Practical	4	-	2
BP609P	Herbal Drug Technology – Practical	4	-	2
	Total	**30**	**6**	**30**

Table-VII: Course of study for semester VII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP701T	Instrumental Methods of Analysis – Theory	3	1	4
BP702T	Industrial PharmacyII – Theory	3	1	4
BP703T	Pharmacy Practice – Theory	3	1	4
BP704T	Novel Drug Delivery System – Theory	3	1	4
BP705P	Instrumental Methods of Analysis – Practical	4	-	2
BP706PS	Practice School*	12	-	6
	Total	**28**	**5**	**24**

***** Non University Examination (NUE)

Table-VIII: Course of study for semester VIII

Course code	Name of the course	No. of hours	Tutorial	Credit points
BP801T	Biostatistics and Research Methodology	3	1	4
BP802T	Social and Preventive Pharmacy	3	1	4
BP803ET	Pharma Marketing Management	3 + 3 = 6	1 + 1 = 2	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science			
BP805ET	Pharmacovigilance			
BP806ET	Quality Control and Standardization of Herbals			
BP807ET	Computer Aided Drug Design			
BP808ET	Cell and Molecular Biology			
BP809ET	Cosmetic Science			
BP810ET	Experimental Pharmacology			
BP811ET	Advanced Instrumentation Techniques			
BP812ET	Dietary Supplements and Nutraceuticals			
BP813PW	Project Work	12	-	6
	Total	**24**	**4**	**22**

Table-IX: Semester wise credits distribution

Semester	Credit Points
I	**27/29$/30#**
II	29
III	26
IV	28
V	26
VI	26
VII	24
VIII	22
Extracurricular/ Co curricular activities	01*
Total credit points for the program	**209/211$/212#**

* The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

#Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

10. Program Committee

1. The B. Pharm. program shall have a Program Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Program Committee shall be as follows:

   A senior teacher shall be the Chairperson; One Teacher from each department handling B.Pharm courses; and four student representatives of the program (one from each academic year), nominated by the Head of the institution.

3. Duties of the Program Committee:

   i. Periodically reviewing the progress of the classes.
   ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
   iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.
   iv. Communicating its recommendation to the Head of the institution on academic matters.
   v. The Program Committee shall meet at least thrice in a semester preferably at the end of each Sessionalexam (Internal Assessment) and before the end semester exam.

11. Examinations/Assessments

The scheme for internal assessment and end semester examinations is given in Table – X.

11.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to VIII shall beconducted by the university except for the subjects with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables-X: Schemes for internal assessments and end semester examinations semester wise

Semester I

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP101T	Human Anatomy and Physiology I– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP102T	Pharmaceutical Analysis I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP103T	Pharmaceutics I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP104T	Pharmaceutical Inorganic Chemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP105T	Communication skills – Theory *	5	10	1 Hr	15	35	1.5 Hrs	50
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory*	5	10	1 Hr	15	35	1.5 Hrs	50
BP107P	Human Anatomy and Physiology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP108P	Pharmaceutical Analysis I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP109P	Pharmaceutics I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP110P	Pharmaceutical Inorganic Chemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP111P	Communication skills – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
BP112RBP	Remedial Biology – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
Total		**70/75$/80#**	**115/125$/130#**	**23/24$/26# Hrs**	**185/200$/210#**	**490/525$/ 540#**	**31.5/33$/ 35# Hrs**	**675/725$/ 750#**

#Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology (RB)course.

$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics (RM)course.

* Non University Examination (NUE)

Semester II

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP201T	Human Anatomy and Physiology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP202T	Pharmaceutical Organic Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP203T	Biochemistry – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP204T	Pathophysiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP205T	Computer Applications in Pharmacy – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP206T	Environmental sciences – Theory*	10	15	1 Hr	25	50	2 Hrs	75
BP207P	Human Anatomy and Physiology II –Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP208P	Pharmaceutical Organic Chemistry I– Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP209P	Biochemistry – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP210P	Computer Applications in Pharmacy – Practical*	5	5	2 Hrs	10	15	2 Hrs	25
	Total	**80**	**125**	**20 Hrs**	**205**	**520**	**30 Hrs**	**725**

***** The subject experts at college level shall conduct examinations

Semester III

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP301T	Pharmaceutical Organic Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP302T	PhysicalPharmaceuticsI –Theory	10	15	1 Hr	25	75	3 Hrs	100
BP303T	Pharmaceutical Microbiology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP304T	Pharmaceutical Engineering – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP305P	Pharmaceutical Organic Chemistry II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP306P	Physical Pharmaceutics I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP307P	Pharmaceutical Microbiology – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP308P	Pharmaceutical Engineering – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		**60**	**100**	**20**	**160**	**440**	**28Hrs**	**600**

Semester IV

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP401T	Pharmaceutical Organic Chemistry III– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP402T	Medicinal Chemistry I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP403T	Physical Pharmaceutics II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP404T	Pharmacology I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP405T	Pharmacognosy I – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP406P	Medicinal Chemistry I – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP407P	Physical Pharmaceutics II – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP408P	Pharmacology I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP409P	Pharmacognosy I – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**70**	**115**	**21 Hrs**	**185**	**515**	**31 Hrs**	**700**

Semester V

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP501T	Medicinal Chemistry II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP502T	Industrial PharmacyI– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP503T	Pharmacology II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP504T	Pharmacognosy II – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP505T	Pharmaceutical Jurisprudence – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP506P	Industrial PharmacyI– Practical	5	10	4 Hr	15	35	4 Hrs	50
BP507P	Pharmacology II – Practical	5	10	4 Hr	15	35	4 Hrs	50
BP508P	Pharmacognosy II – Practical	5	10	4 Hr	15	35	4 Hrs	50
Total		**65**	**105**	**17 Hr**	**170**	**480**	**27 Hrs**	**650**

Semester VI

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP601T	Medicinal Chemistry III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP602T	Pharmacology III – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP603T	Herbal Drug Technology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP605T	Pharmaceutical Biotechnology– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP606T	Quality Assurance– Theory	10	15	1 Hr	25	75	3 Hrs	100
BP607P	Medicinal chemistry III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP608P	Pharmacology III – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP609P	Herbal Drug Technology – Practical	5	10	4 Hrs	15	35	4 Hrs	50
Total		**75**	**120**	**18 Hrs**	**195**	**555**	**30 Hrs**	**750**

Semester VII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP701T	Instrumental Methods of Analysis – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP702T	Industrial Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP703T	Pharmacy Practice – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP704T	Novel Drug Delivery System – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP705 P	Instrumental Methods of Analysis – Practical	5	10	4 Hrs	15	35	4 Hrs	50
BP706 PS	Practice School*	25	-	-	25	125	5 Hrs	150
Total		**70**	**70**	**8Hrs**	**140**	**460**	**21 Hrs**	**600**

***** The subject experts at college level shall conduct examinations

Semester VIII

Course code	Name of the course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
BP801T	Biostatistics and Research Methodology – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP802T	Social and Preventive Pharmacy – Theory	10	15	1 Hr	25	75	3 Hrs	100
BP803ET	Pharmaceutical Marketing – Theory	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 = 200
BP804ET	Pharmaceutical Regulatory Science – Theory							
BP805ET	Pharmacovigilance – Theory							
BP806ET	Quality Control and Standardization of Herbals – Theory							
BP807ET	Computer Aided Drug Design – Theory							
BP808ET	Cell and Molecular Biology – Theory							
BP809ET	Cosmetic Science – Theory							
BP810ET	Experimental Pharmacology – Theory							
BP811ET	Advanced Instrumentation Techniques – Theory							
BP812PW	Project Work	-	-	-	-	150	4 Hrs	150
	Total	**40**	**60**	**4 Hrs**	**100**	**450**	**16 Hrs**	**550**

11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table-XI:Scheme for awarding internal assessment: Continuous mode

Theory		
Criteria	**Maximum Marks**	
Attendance (Refer Table – XII)	4	2
Academic activities (Average of any 3 activities e.g. quiz, assignment, open book test, field work, group discussion and seminar)	3	1.5
Student – Teacher interaction	3	1.5
Total	**10**	**5**
Practical		
Attendance (Refer Table – XII)	2	
Based on Practical Records, Regular viva voce, etc.	3	
Total	**5**	

Table- XII: Guidelines for the allotment of marks for attendance

Percentage of Attendance	**Theory**	**Practical**
95 – 100	4	2
90 – 94	3	1.5
85 – 89	2	1
80 – 84	1	0.5
Less than 80	0	0

11.2.1. Sessional Exams

Two Sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical Sessional examinations is given below. The average marks of two Sessional exams shall be computed for internal assessment as per the requirements given in tables – X.

Sessional exam shall be conducted for 30 marks for theory and shall be computed for 15 marks. Similarly Sessional exam for practical shall be conducted for 40 marks and shall be computed for 10 marks.

Question paper pattern for theory Sessional examinations

For subjects having University examination

I. Multiple Choice Questions (MCQs) = 10 x 1 = 10

OR OR

Objective Type Questions (5 x 2) = 05 x 2 = 10

(Answer all the questions)

I. Long Answers (Answer 1 out of 2) = 1 x 10 = 10

II. Short Answers (Answer 2 out of 3) = 2 x 5 = 10

Total = 30 marks

For subjects having Non University Examination

I. Long Answers (Answer 1 out of 2)	=	1 x 10 = 10
II. Short Answers (Answer 4 out of 6)	=	4 x 5 = 20

Total	=	30 marks

Question paper pattern for practical sessional examinations

I. Synopsis	=	10
II. Experiments	=	25
III. Viva voce	=	05

Total	=	40 marks
		----------

12. Promotion and award of grades

A student shall be declared PASSand eligible for getting gradein a course of B.Pharm.program if he/she secures at least 50% marks in that particular course including internal assessment.For example, to be declared as PASS and to get grade, the student has to secure a minimum of 50 marks for the total of 100 including continuous mode of assessment and end semester theory examination and has to secure a minimum of 25 marks for the total 50 including internal assessment and end semester practical examination.

13. Carry forward of marks

In case a studentfails to secure the minimum 50% in any Theory or Practical course as specified in 12,then he/she shall reappear for the end semester examinationof that course. However his/her marks of the Internal Assessmentshallbe carried overand he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A studentshall have the opportunity to improvehis/her performance only oncein the Sessional exam component of the internal assessment. The re-conduct of the Sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Re-examination of end semester examinations

Reexamination ofend semester examinationshall be conducted as per the schedule given in table XIII. The exact dates of examinations shall be notified from time to time.

Table-XIII: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I, III, V and VII	November / December	May / June
II, IV, VI and VIII	May / June	November / December

Question paper pattern for end semester theory examinations

For 75 marks paper

I. Multiple Choice Questions(MCQs) = 20 x 1 = 20
OR OR
Objective Type Questions (10 x 2) = 10 x 2 = 20
(Answer all the questions)
II. Long Answers (Answer 2 out of 3) = 2 x 10 = 20
III. Short Answers (Answer 7 out of 9) = 7 x 5 = 35

Total = 75 marks

For 50 marks paper

I. Long Answers (Answer 2 out of 3) = 2 x 10 = 20
II. Short Answers (Answer 6 out of 8) = 6 x 5 = 30

Total = 50 marks

For 35 marks paper

I. Long Answers (Answer 1 out of 2) = 1 x 10 =10
II. Short Answers (Answer 5 out of 7) = 5 x 5 = 25

Total = 35 marks

Question paper pattern for end semester practical examinations

I. Synopsis = 5
II. Experiments = 25
III. Viva voce = 5

Total = 35 marks

---

16. Academic Progression:

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. Academic progression rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I, II and III semesters till the IV semester examinations. However, he/she shall not be eligible to attend the courses of V semester until all the courses of I and II semesters are successfully completed.

A student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of I, II, III and IV semesters are successfully completed.

A student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of I, II, III, IV, V and VI semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to VIII semesters within the stipulated time period as per the norms specified in 26.

A lateral entry student shall be eligible to carry forward all the courses of III, IV and V semesters till the VI semester examinations. However, he/she shall not be eligible to attend the courses of VII semester until all the courses of III and IV semesters are successfully completed.

A lateral entry student shall be eligible to carry forward all the courses of V, VI and VII semesters till the VIII semester examinations. However, he/she shall not be eligible to get the course completion certificate until all the courses of III, IV, V and VI semesters are successfully completed.

A lateral entry student shall be eligible to get his/her CGPA upon successful completion of the courses of III to VIII semesters within the stipulated time period as per the norms specified in 26.

Any student who hasgiven more than 4 chances for successful completion of I / III semester courses and more than 3 chances for successful completion of II / IV semester courses shall be permitted to attend V / VII semester classes ONLY during the subsequent academic year as the case may be. In simpler terms there shall NOT be any ODD BATCH for any semester.

Note: Grade ABshould be considered as failed and treated as one head for deciding academic progression. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course.The letter grades and their corresponding grade points are given in Table – XII.

Table – XII: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of ABand a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtainedin all the courses by the student during the semester. For example, if a student takes five courses(Theory/Practical) in a semester with credits C1, C2, C3, C4 and C5 and the student's grade pointsin these courses are G1, G2, G3, G4 and G5, respectively, and then students' SGPA is equal to:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4 + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

The SGPA is calculated to two decimal points.It should be noted that, the SGPA for any semester shall take into consideration the F and ABSgrade awarded in that semester. For example if a learner has a F or ABS grade in course 4, theSGPA shall then be computed as:

$$\text{SGPA} = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * \text{ZERO} + C_5G_5}{C_1 + C_2 + C_3 + C_4 + C_5}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the VIII semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all VIII semesters and their courses. The CGPA shall reflect the failed statusin case of F grade(s),till the course(s) is/are passed. When the course(s)is/are passedby obtaining a pass grade on subsequent examination(s) theCGPA shall only reflect the new grade and not the fail grades earned earlier.The CGPA is calculated as:

$$\text{CGPA} = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4 + C_5S_5 + C_6S_6 + C_7S_7 + C_8S_8}{C_1 + C_2 + C_3 + C_4 + C_5 + C_6 + C_7 + C_8}$$

where $C_1, C_2, C_3,\ldots$ is the total number of credits for semester I,II,III,…. and $S_1,S_2, S_3,\ldots$is the SGPA of semester I,II,III,…. .

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of. 7.50 and above
First Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a projectunder the supervision of a teacher and submit a report. The area of the project shall directly relate any one of the elective subject opted by the student in semester VIII. The project shall be carried out in group not exceeding 5 in number. The project report shall be submitted in triplicate (typed & bound copy not less than 25 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). Students shall be evaluated in groups for four hours (i.e., about half an hour for a group of five students). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done		15 Marks
Methodology adopted		20 Marks
Results and Discussions		20 Marks
Conclusions and Outcomes		20 Marks
	Total	**75 Marks**

Evaluation of Presentation:

Presentation of work		25 Marks
Communication skills		20 Marks
Question and answer skills		30 Marks
	Total	**75 Marks**

Explanation: The 75 marks assigned to the dissertation book shall be same for all the students in a group. However, the 75 marks assigned for presentation shall be awarded based on the performance of individual students in the given criteria.

22. Industrial training (Desirable)

Every candidate shall be required to work for at least 150 hours spread over four weeks in a Pharmaceutical Industry/Hospital. It includes Production unit, Quality Control department, Quality Assurance department, Analytical laboratory, Chemical manufacturing unit, Pharmaceutical R&D, Hospital (Clinical Pharmacy), Clinical Research Organization, Community Pharmacy, etc. After the Semester – VI and before the commencement of Semester – VII, and shall submit satisfactory report of such work and certificate duly signed by the authority of training organization to the head of the institute.

23. Practice School

In the VII semester, every candidate shall undergo practice school for a period of 150 hours evenly distributed throughout the semester. The student shall opt any one of the domains for practice school declared by the program committee from time to time.

At the end of the practice school, every student shall submit a printed report (in triplicate) on the practice school he/she attended (not more than 25 pages). Along with the exams of semester VII, the report submitted by the student, knowledge and skills acquired by the student through practice school shall be evaluated by the subject experts at college leveland grade point shall be awarded.

24. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the B.Pharm program shall not be eligible for award of ranks.Moreover, the candidates should have completed the B. Pharm program in minimum prescribed number of years, (four years) for the award of Ranks.

25. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

26. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

27. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

No condonation is allowed for the candidate who has more than 2 years of break up period and he/she has to rejoin the program by paying the required fees.

CHAPTER - II: SYLLABUS

Semester I

BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Course Content:

Unit I **10 hours**

- **Introduction to human body**
  Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.
- **Cellular level of organization**
  Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent b) Paracrine c) Synaptic d) Endocrine
- **Tissue level of organization**
  Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit II **10 hours**

- **Integumentary system**
  Structure and functions of skin
- **Skeletal system**
  Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system
  Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction

- **Joints**
  Structural and functional classification, types of joints movements and its articulation

Unit III **10 hours**

- **Body fluids and blood**
- Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.
- **Lymphatic system**

  Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit IV **08 hours**

Peripheral nervous system:
Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system.
Origin and functions of spinal and cranial nerves.

- **Special senses**
  Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V **07 hours**

- **Cardiovascular system**
  Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue
3. Microscopic study of muscular and nervous tissue
4. Identification of axial bones
5. Identification of appendicular bones

6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count
8. Enumeration of total red blood corpuscles (RBC) count
9. Determination of bleeding time
10. Determination of clotting time
11. Estimation of hemoglobin content
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA
4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.

6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books (Latest Editions)

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

BP102T. PHARMACEUTICAL ANALYSIS (Theory)

45 Hours

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Objectives: Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

Course Content:

UNIT-I **10 Hours**

(a) Pharmaceutical analysis- Definition and scope

i) Different techniques of analysis

ii) Methods of expressing concentration

iii) Primary and secondary standards.

iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate

(b)Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

(c)Pharmacopoeia, Sources of impurities in medicinal agents,limit tests.

UNIT-II **10 Hours**

- **Acid base titration**: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves
- **Non aqueous titration**: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III **10 Hours**

- **Precipitation titrations**: Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.
- **Complexometric titration**: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.
- **Gravimetry**: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

- Basic Principles,methods and application of diazotisation titration.

UNIT-IV **08 Hours**

Redox titrations

(a) Concepts of oxidation and reduction

(b) Types of redox titrations (Principles and applications)

Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate

UNIT-V **07 Hours**

- **Electrochemical methods of analysis**
  - **Conductometry**- Introduction, Conductivity cell, Conductometric titrations, applications.
  - **Potentiometry** - Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.
  - **Polarography** - Principle, Ilkovic equation, construction and working of dropping mercury electrode and rotating platinum electrode, applications

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I **Limit Test of the following**
- (1) Chloride
- (2) Sulphate
- (3) Iron
- (4) Arsenic

II **Preparation and standardization of**
- (1) Sodium hydroxide
- (2) Sulphuric acid
- (3) Sodium thiosulfate
- (4) Potassium permanganate
- (5) Ceric ammonium sulphate

III **Assay of the following compounds along with Standardization of Titrant**
- (1) Ammonium chloride by acid base titration
- (2) Ferrous sulphate by Cerimetry
- (3) Copper sulphate by Iodometry
- (4) Calcium gluconate by complexometry
- (5) Hydrogen peroxide by Permanganometry
- (6) Sodium benzoate by non-aqueous titration
- (7) Sodium Chloride by precipitation titration

IV **Determination of Normality by electro-analytical methods**
- (1) Conductometric titration of strong acid against strong base
- (2) Conductometric titration of strong acid and weak acid against strong base
- (3) Potentiometric titration of strong acid against strong base

Recommended Books: (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

BP103T. PHARMACEUTICS- I (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

Course Content:

UNIT – I **10 Hours**

- **Historical background and development of profession of pharmacy**: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.
- **Dosage forms:** Introduction to dosage forms, classification and definitions
- **Prescription:** Definition, Parts of prescription, handling of Prescription and Errors in prescription.
- **Posology:** Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

UNIT – II **10 Hours**

- **Pharmaceutical calculations**: Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point and molecular weight.

- **Powders:** Definition, classification, advantages and disadvantages,Simple & compound powders – official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

- **Liquid dosage forms:** Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques

UNIT – III **08 Hours**

- **Monophasic liquids:** Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.
- **Biphasic liquids:**
- **Suspensions:** Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.
- **Emulsions:** Definition, classification, emulsifying agent, test for the identification of type ofEmulsion, Methods of preparation & stability problems and methods to overcome.

UNIT – IV **08 Hours**

- **Suppositories**: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.
- **Pharmaceutical incompatibilities**: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

UNIV – V **07 Hours**

- **Semisolid dosage forms:** Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi solid dosage forms. Evaluation of semi solid dosages forms

BP109P. PHARMACEUTICSI (Practical)

3 Hours / week

1 . Syrups

a) Syrup IP'66

b) Compound syrup of Ferrous Phosphate BPC'68

2. Elixirs a) Piperazine citrate elixir

b) Paracetamol pediatric elixir

3.Linctus a) Terpin Hydrate Linctus IP'66

b) Iodine Throat Paint (Mandles Paint)

4. Solutions

a) Strong solution of ammonium acetate

b) Cresol with soap solution

c) Lugol's solution

5. Suspensions

a) Calamine lotion

b) Magnesium Hydroxide mixture

c) Aluminimum Hydroxide gel

6. Emulsions a) Turpentine Liniment

b) Liquid paraffin emulsion

7. Powders and Granules

a) ORS powder (WHO)

b) Effervescent granules

c)Dusting powder

d)Divded powders

8. Suppositories

a) Glycero gelatin suppository

b) Coca butter suppository

c) Zinc Oxide suppository

8. Semisolids

a) Sulphur ointment

b) Non staining-iodine ointment with methyl salicylate

c) Carbopal gel

9. Gargles and Mouthwashes

a) Iodine gargle

b) Chlorhexidine mouthwash

Recommended Books: (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science& Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy,Lea& Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloud and Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to

- know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals
- understand the medicinal and pharmaceutical importance of inorganic compounds

Course Content:

UNIT I **10 Hours**

- **Impurities in pharmaceutical substances:** History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate

  General methods of preparation, assay for the compounds superscripted with **asterisk (*),** properties and medicinal uses of inorganic compounds belonging to the following classes

UNIT II **10 Hours**

- **Acids, Bases and Buffers:** Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity.
- **Major extra and intracellular electrolytes**: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.
- **Dental products**: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

UNIT III **10 Hours**

- **Gastrointestinal agents**

  Acidifiers: Ammonium chloride* and Dil. HCl

  Antacid: Ideal properties of antacids, combinations of antacids, Sodium

Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture

Cathartics: Magnesium sulphate, Sodium orthophosphate, Kaolin and Bentonite

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations

UNIT IV **08 Hours**

- **Miscellaneous compounds**

  Expectorants: Potassium iodide, Ammonium chloride*.

  Emetics: Copper sulphate*, Sodium potassium tartarate

  Haematinics: Ferrous sulphate*, Ferrous gluconate

  Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite333

  Astringents: Zinc Sulphate, Potash Alum

UNIT V **07 Hours**

- **Radiopharmaceuticals**: Radio activity, Measurement of radioactivity, Properties of , , radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide I^{131}, Storage conditions, precautions & pharmaceutical application of radioactive substances.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

4 Hours / Week

I **Limit tests for following ions**

Limit test for Chlorides and Sulphates
Modified limit test for Chlorides and Sulphates
Limit test for Iron
Limit test for Heavy metals
Limit test for Lead
Limit test for Arsenic

II **Identification test**

Magnesium hydroxide
Ferrous sulphate
Sodium bicarbonate
Calcium gluconate
Copper sulphate

III **Test for purity**

Swelling power of Bentonite
Neutralizing capacity of aluminum hydroxide gel
Determination of potassium iodate and iodine in potassium Iodide

IV **Preparation of inorganic pharmaceuticals**

Boric acid
Potash alum
Ferrous sulphate

Recommended Books (Latest Editions)

1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
6. Anand & Chatwal, Inorganic Pharmaceutical Chemistry
7. Indian Pharmacopoeia

BP105T.COMMUNICATION SKILLS (Theory)

30 Hours

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives:

Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

Course content:

UNIT – I **07 Hours**

- **Communication Skills:** Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context

- **Barriers to communication:** Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers

- **Perspectives in Communication:** Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment

UNIT – II **07 Hours**

- **Elements of Communication:** Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication

- **Communication Styles:** Introduction, The Communication Styles Matrix with example for each -Direct Communication Style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style

UNIT – III **07 Hours**

- **Basic Listening Skills:** Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations
- **Effective Written Communication:** Introduction, When and When Not to Use Written Communication - Complexity of the Topic, Amount of Discussion' Required, Shades of Meaning, Formal Communication
- **Writing Effectively:** Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT – IV **05 Hours**

- **Interview Skills:** Purpose of an interview, Do's and Dont's of an interview
- **Giving Presentations:** Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT – V **04 Hours**

- **Group Discussion:** Introduction, Communication skills in group discussion, Do's and Dont's of group discussion

BP111P.COMMUNICATION SKILLS (Practical)

2 Hours / week

Thefollowing learning modules are to be conducted using wordsworth® English language lab software

Basic communication covering the following topics

Meeting People

Asking Questions

Making Friends

What did you do?

Do's and Dont's

Pronunciations covering the following topics

Pronunciation (Consonant Sounds)

Pronunciation and Nouns

Pronunciation (Vowel Sounds)

Advanced Learning

Listening Comprehension / Direct and Indirect Speech

Figures of Speech

Effective Communication

Writing Skills

Effective Writing

Interview Handling Skills

E-Mail etiquette

Presentation Skills

Recommended Books: (Latest Edition)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press, 2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson, 2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life, 2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson, 2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, Mc Graw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan Mac Millan,2009
12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill, 1999

BP 106RBT.REMEDIAL BIOLOGY (Theory)

30 Hours

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

Objectives: Upon completion of the course, the student shall be able to

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

UNIT I **07 Hours**

Living world:

- Definition and characters of living organisms
- Diversity in the living world
- Binomial nomenclature
- Five kingdoms of life and basis of classification. Salient features of Monera, Potista, Fungi, Animalia and Plantae, Virus,

Morphology of Flowering plants

- Morphology of different parts of flowering plants – Root, stem, inflorescence, flower, leaf, fruit, seed.
- General Anatomy of Root, stem, leaf of monocotyledons & Dicotylidones.

UNIT II **07 Hours**

Body fluids and circulation

- Composition of blood, blood groups, coagulation of blood
- Composition and functions of lymph
- Human circulatory system
- Structure of human heart and blood vessels
- Cardiac cycle, cardiac output and ECG

Digestion and Absorption

- Human alimentary canal and digestive glands
- Role of digestive enzymes
- Digestion, absorption and assimilation of digested food

Breathing and respiration

- Human respiratory system
- Mechanism of breathing and its regulation
- Exchange of gases, transport of gases and regulation of respiration
- Respiratory volumes

UNIT III **07 Hours**

Excretory products and their elimination

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

Neural control and coordination

- Definition and classification of nervous system
- Structure of a neuron
- Generation and conduction of nerve impulse
- Structure of brain and spinal cord
- Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata

Chemical coordination and regulation

- Endocrine glands and their secretions
- Functions of hormones secreted by endocrine glands

Human reproduction

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

UNIT IV **05 Hours**

Plants and mineral nutrition:

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNIT V **04 Hours**

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development

- Phases and rate of plant growth, Condition of growth,Introduction to plant growth regulators

Cell - The unit of life

- Structure and functions of cell and cell organelles.Cell division

Tissues

- Definition, types of tissues, location and functions.

Text Books

a. Text book of Biology by S. B. Gokhale
b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books

a. A Text book of Biology by B.V. Sreenivasa Naidu
b. A Text book of Biology by Naidu and Murthy
c. Botany for Degree students By A.C.Dutta.
d.Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan.
e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

BP112RBP.REMEDIAL BIOLOGY (Practical)

30 Hours

1. Introduction to experiments in biology
   a) Study of Microscope
   b) Section cutting techniques
   c) Mounting and staining
   d) Permanent slide preparation
2. Study of cell and its inclusions
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues pertinent to Stem, Root Leaf, seed, fruit and flower
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Reference Books

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof .M.J.H.Shafi

BP 106RMT.REMEDIAL MATHEMATICS (Theory)

30 Hours

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Objectives: Upon completion of the course the student shall be able to:-

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

Course Content:

UNIT – I **06 Hours**

- **Partial fraction**

Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction , Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics

- **Logarithms**

Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

- **Function***:*

Real Valued function, Classification of real valued functions,

- **Limits and continuity** :

Introduction , Limit of a function, Definition of limit of a function ($\in$ - δ definition) , $\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \to 0} \frac{\sin\theta}{\theta} = 1,$

UNIT –II **06 Hours**

- **Matrices and Determinant:**

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants , Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix , Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear of equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley–Hamilton theorem,Applicationof Matrices in solving Pharmacokinetic equations

UNIT – III **06 Hours**

- **Calculus**

Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function , Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of x^n *w.r.t*x,where *n* is any rational number, Derivative of e^x,, Derivative of $\log_e x$, Derivative of a^x,Derivative of trigonometric functions from first principles **(without Proof)**, Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application

UNIT – IV **06 Hours**

- **Analytical Geometry**

Introduction: Signs of the Coordinates, Distance formula,

Straight Line : Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line

Integration:

Introduction, Definition, Standard formulae, Rules of integration , Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application

UNIT-V **06 Hours**

- **Differential Equations** : Some basic definitions, Order and degree, Equations in separable form , Homogeneous equations, Linear Differential equations, Exact equations, **Application in solving Pharmacokinetic equations**
- **Laplace Transform** : Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, **Application in solving Chemical kinetics and Pharmacokinetics equations**

Recommended Books (Latest Edition)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

Semester II

BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to:

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Course Content:

Unit I **10 hours**

- **Nervous system**

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid.structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts,reflex activity)

Unit II **06 hours**

- **Digestive system**

Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine

and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

- **Energetics**

  Formation and role of ATP, Creatinine Phosphate and BMR.

Unit III

- **Respiratory system** **10 hours**

  Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration

  Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

- **Urinary system**
  Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit IV **10 hours**

- **Endocrine system**
  Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal
  gland, pancreas, pineal gland, thymus and their disorders.

Unit V **09 hours**

- **Reproductive system**

  Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition

- **Introduction to genetics**

  Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance

BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject**.**

1. To study the integumentary and special senses using specimen, models, etc.,
2. To study the nervous system using specimen, models, etc.,
3. To study the endocrine system using specimen, models, etc
4. To demonstrate the general neurological examination
5. To demonstrate the function of olfactory nerve
6. To examine the different types of taste.
7. To demonstrate the visual acuity
8. To demonstrate the reflex activity
9. Recording of body temperature
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index .
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co,Riverview,MI USA

4. Text book of Medical Physiology- Arthur C,Guyton andJohn.E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brothers medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brothers medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books:

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterrje ,Academic Publishers Kolkata

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY –I (Theory)

45 Hours

Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT-I **07 Hours**

- **Classification, nomenclature and isomerism**

  Classification of Organic Compounds

  Common and IUPAC systems of nomenclature of organic compounds

  (up to 10 Carbons open chain and carbocyclic compounds)

Structural isomerisms in organic compounds

UNIT-II10 Hours

- **Alkanes*, Alkenes* and Conjugated dienes***

  SP^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins.

  Stabilities of alkenes, SP^2 hybridization in alkenes

  E_1 and E_2 reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeffs orientation and evidences. E_1 verses E_2 reactions, Factors affecting E_1 and E_2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti Markownikoff's orientation.

  Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement

UNIT-III10 Hours

- **Alkyl halides***

  SN_1 and SN_2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.

  SN_1 versus SN_2 reactions, Factors affecting SN_1 and SN_2 reactions

  Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

- **Alcohols*-** Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-IV10 Hours

- **Carbonyl compounds* (Aldehydes and ketones)**

  Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.

UNIT-V **08 Hours**

- **Carboxylic acids***

  Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids ,amide and ester

  Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid

- **Aliphatic amines* -** Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)

4 Hours / week

1. Systematic qualitative analysis of unknown organic compounds like
    1. Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
    2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test
    3. Solubility test
    4. Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
    5. Melting point/Boiling point of organic compounds
    6. Identification of the unknown compound from the literature using melting point/ boiling point.
    7. Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling point.
    8. Minimum 5 unknown organic compounds to be analysed systematically.
2. Preparation of suitable solid derivatives from organic compounds
3. Construction of molecular models

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
9. Reaction and reaction mechanism by Ahluwaliah/Chatwal.

BP203 T. BIOCHEMISTRY (Theory)

45 Hours

Scope: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

Objectives: Upon completion of course student shell able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

Course Content:

UNIT I **08 Hours**

- **Biomolecules**

  Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

- **Bioenergetics**

  Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

  Energy rich compounds; classification; biological significances of ATP and cyclic AMP

UNIT II **10 Hours**

- **Carbohydrate metabolism**

  Glycolysis – Pathway, energetics and significance

  Citric acid cycle- Pathway, energetics and significance

  HMP shunt and its significance; Glucose-6-Phosphate dehydrogenase (G6PD) deficiency

  Glycogen metabolism Pathways and glycogen storage diseases (GSD)

  Gluconeogenesis- Pathway and its significance

  Hormonal regulation of blood glucose level and Diabetes mellitus

- **Biological oxidation**

  Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation

Inhibitors ETC and oxidative phosphorylation/Uncouplers

UNIT III **10 Hours**

- **Lipid metabolism**

  -Oxidation of saturated fatty acid (Palmitic acid)

Formation and utilization of ketone bodies; ketoacidosis

De novo synthesis of fatty acids (Palmitic acid)

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

- **Amino acid metabolism**

  General reactions of amino acid metabolism: Transamination, deamination & decarboxylation, urea cycle and its disorders

  Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)

  Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline

  Catabolism of heme; hyperbilirubinemia and jaundice

UNIT IV **10 Hours**

- **Nucleic acid metabolism and genetic information transfer**

  Biosynthesis of purine and pyrimidine nucleotides

  Catabolism of purine nucleotides and Hyperuricemia and Gout disease

  Organization of mammalian genome

  Structure of DNA and RNA and their functions

  DNA replication (semi conservative model)

  Transcription or RNA synthesis

  Genetic code, Translation or Protein synthesis and inhibitors

UNIT V **07 Hours**

- **Enzymes**

  Introduction, properties, nomenclature and IUB classification of enzymes

  Enzyme kinetics (Michaelis plot, Line Weaver Burke plot)

  Enzyme inhibitors with examples

  Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation

  Therapeutic and diagnostic applications of enzymes and isoenzymes

  Coenzymes –Structure and biochemical functions

BP 209 P. BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch)
2. Identification tests for Proteins (albumin and Casein)
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method)
4. Qualitative analysis of urine for abnormal constituents
5. Determination of blood creatinine
6. Determination of blood sugar
7. Determination of serum total cholesterol
8. Preparation of buffer solution and measurement of pH
9. Study of enzymatic hydrolysis of starch
10. Determination of Salivary amylase activity
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

1. Principles of Biochemistry by Lehninger.
2. Harper's Biochemistry by Robert K. Murry, Daryl K. Granner and Victor W. Rodwell.
3. Biochemistry by Stryer.
4. Biochemistry by D. Satyanarayan and U.Chakrapani
5. Textbook of Biochemistry by Rama Rao.
6. Textbook of Biochemistry by Deb.
7. Outlines of Biochemistry by Conn and Stumpf
8. Practical Biochemistry by R.C. Gupta and S. Bhargavan.
9. Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition)
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.

BP 204T.PATHOPHYSIOLOGY (THEORY)

45Hours

Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes.This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the subject student shall be able to –

1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Course content:

Unit I **10Hours**

- **Basic principles of Cell injury and Adaptation:**
  Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury**,**Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage)**,**Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia)**,**Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis &Alkalosis,Electrolyte imbalance

- **Basic mechanism involved in the process of inflammation and repair:**
  Introduction, Clinical signs of inflammation, Different types of Inflammation,Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's,Mediators of inflammation,Basic principles of wound healing in the skin,Pathophysiology of Atherosclerosis

Unit II **10Hours**

- **Cardiovascular System:**
  Hypertension, congestive heart failure, ischemic heart disease (angina,myocardial infarction, atherosclerosis and arteriosclerosis)
- **Respiratory system:**Asthma, Chronic obstructive airways diseases.
- **Renal system:**Acute and chronic renal failure .

Unit II **10Hours**

- **Haematological Diseases:**
  Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, hereditary acquired anemia, hemophilia
- **Endocrine system:** Diabetes, thyroid diseases, disorders of sex hormones
- **Nervous system:** Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.
- **Gastrointestinal system:** Peptic Ulcer
-

Unit IV **8 Hours**

- Inflammatory bowel diseases, jaundice, hepatitis (A,B,C,D,E,F) alcoholic liver disease.
- **Disease of bones and joints:** Rheumatoid arthritis, osteoporosis and gout
- **Principles of cancer:** classification, etiology and pathogenesis of cancer
- **Diseases of bones and joints:**Rheumatoid Arthritis, Osteoporosis,Gout

- **Principles of Cancer:** Classification, etiology and pathogenesis of Cancer

Unit V **7 Hours**

- **Infectious diseases:**Meningitis,Typhoid, Leprosy, Tuberculosis

Urinary tract infections

- **Sexually transmitted diseases:**AIDS, Syphilis, Gonorrhea

Recommended Books (Latest Editions)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
2. Harsh Mohan; Text book of Pathology; 6th edition; India; Jaypee Publications; 2010.
3. Laurence B, Bruce C, Bjorn K. ; Goodman Gilman's The Pharmacological Basis of Therapeutics; 12th edition; New York; McGraw-Hill; 2011.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor's Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore;1991 [1990 printing].
6. Nicki R. Colledge, Brian R. Walker, Stuart H. Ralston;Davidson's Principles and Practice of Medicine; 21st edition; London; ELBS/Churchill Livingstone; 2010.
7. Guyton A, John .E Hall; Textbook of Medical Physiology; 12th edition; WB Saunders Company; 2010.
8. Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey; Pharmacotherapy: A Pathophysiological Approach; 9th edition; London; McGraw-Hill Medical; 2014.
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.
10. Roger Walker, Clive Edwards; Clinical Pharmacy and Therapeutics; 3rd edition; London; Churchill Livingstone publication; 2003.

Recommended Journals

1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs (2 Hrs/Week)

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

Objectives: Upon completion of the course the student shall be able to

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

Course content:

UNIT – I **06 hours**

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, binary addition, binary subtraction – One's complement ,Two's complement method, binary multiplication, binary division

Concept of I nformation Systems and Software : Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project

UNIT –II **06 hours**

Web technologies:Introduction to HTML, XML,CSS and Programming languages, introduction to web servers and Server Products

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database

UNIT – III **06 hours**

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring

Diagnostic System, Lab-diagnostic System, Patient Monitoring System, Pharma Information System

UNIT – IV **06 hours**

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V **06 hours**

Computers as data analysis in Preclinical development:
Chromatographic dada analysis(CDS), Laboratory Information management System (LIMS) and Text Information Management System(TIMS)

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3 Retrieve the information of a drug and its adverse effects using online tools
4 Creating mailing labels Using Label Wizard , generating label in MS WORD
5 Create a database in MS Access to store the patient information with the required fields Using access
6. Design a form in MS Access to view, add, delete and modify the patient record in the database
7. Generating report and printing the report from patient database
8. Creating invoice table using – MS Access
9. Drug information storage and retrieval using MS Access
10. Creating and working with queries in MS Access
11. Exporting Tables, Queries, Forms and Reports to web pages
12. Exporting Tables, Queries, Forms and Reports to XML pages

Recommended books (Latest edition):

1. Computer Application in Pharmacy – William E.Fassett –Lea and Febiger, 600 South Washington Square, USA, (215) 922-1330.
2. Computer Application in Pharmaceutical Research and Development –Sean Ekins – Wiley-Interscience, A John Willey and Sons, INC., Publication, USA
3. Bioinformatics (Concept, Skills and Applications) – S.C.Rastogi-CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi – 110 002(INDIA)
4. Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath – Cary N.Prague – Wiley Dreamtech India (P) Ltd., 4435/7, Ansari Road, Daryagani, New Delhi - 110002

BP 206 T. ENVIRONMENTAL SCIENCES (Theory)

30 hours

Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives: Upon completion of the course the student shall be able to**:**

1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.
6. Strive to attain harmony with Nature.

Course content:

Unit-I **10hours**

The Multidisciplinary nature of environmental studies

Natural Resources

Renewable and non-renewable resources:

Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II **10hours**

Ecosystems

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Unit- III **10hours**

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Brunner R.C., 1989, Hazardous Waste Incineration, McGraw Hill Inc. 480p
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
6. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Publ. House, Mumbai, 1196p
7. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
8. Down of Earth, Centre for Science and Environment

SEMESTER III

BP301T. PHARMACEUTICAL ORGANIC CHEMISTRY –II (Theory)

45 Hours

Scope: This subject deals with general methods of preparation and reactions of some organic compounds. Reactivity of organic compounds are also studied here. The syllabus emphasizes on mechanisms and orientation of reactions. Chemistry of fats and oils are also included in the syllabus.

Objectives: Upon completion of the course the student shall be able to

1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. prepare organic compounds

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained

To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences

UNIT I **10 Hours**

- **Benzene and its derivatives**
  - **A.** Analytical, synthetic and other evidences in the derivation of structure of benzene, Orbital picture, resonance in benzene, aromatic characters, Huckel's rule
  - **B.** Reactions of benzene - nitration, sulphonation, halogenation-reactivity, Friedelcrafts alkylation- reactivity, limitations, Friedelcrafts acylation.
  - **C.** Substituents, effect of substituents on reactivity and orientation of mono substituted benzene compounds towards electrophilic substitution reaction
  - **D.** Structure and uses of DDT, Saccharin, BHC and Chloramine

UNIT II **10 Hours**

- **Phenols*** - Acidity of phenols, effect of substituents on acidity, qualitative tests, Structure and uses of phenol, cresols, resorcinol, naphthols
- **Aromatic Amines* -** Basicity of amines, effect of substituents on basicity, and synthetic uses of aryl diazonium salts
- **Aromatic Acids* –**Acidity, effect of substituents on acidity and important reactions of benzoic acid.

UNIT III

10 Hours

- **Fats and Oils**

a. Fatty acids – reactions.

b. Hydrolysis, Hydrogenation, Saponification and Rancidity of oils, Drying oils.

c. Analytical constants – Acid value, Saponification value, Ester value, Iodine value, Acetyl value, Reichert Meissl (RM) value – significance and principle involved in their determination.

UNIT IV **08 Hours**

- **Polynuclear hydrocarbons:**

a. Synthesis, reactions

b. Structure and medicinal uses of Naphthalene, Phenanthrene, Anthracene, Diphenylmethane, Triphenylmethane and their derivatives

UNIT V **07 Hours**

- **Cyclo alkanes***

Stabilities – Baeyer's strain theory, limitation of Baeyer's strain theory, Coulson and Moffitt's modification, Sachse Mohr's theory (Theory of strainless rings), reactions of cyclopropane and cyclobutane only

BP305P. PHARMACEUTICAL ORGANIC CHEMISTRY -II (Practical)

4 Hrs/week

I Experiments involving laboratory techniques

- Recrystallization
- Steam distillation

II Determination of following oil values (including standardization of reagents)

- Acid value
- Saponification value
- Iodine value

III **Preparation of compounds**

- Benzanilide/Phenyl benzoate/Acetanilide from Aniline/ Phenol /Aniline by acylation reaction.
- 2,4,6-Tribromo aniline/Para bromo acetanilide from Aniline/
- Acetanilide by halogenation (Bromination) reaction.
- 5-Nitro salicylic acid/Meta di nitro benzene from Salicylic acid / Nitro benzene by nitration reaction.
- Benzoic acid from Benzyl chloride by oxidation reaction.
- Benzoic acid/ Salicylic acid from alkyl benzoate/ alkyl salicylate by hydrolysis reaction.
- 1-Phenyl azo-2-napthol from Aniline by diazotization and coupling reactions.
- Benzil from Benzoin by oxidation reaction.
- Dibenzal acetone from Benzaldehyde by Claison Schmidt reaction
- Cinnammic acid from Benzaldehyde by Perkin reaction
- *P*-Iodo benzoic acid from *P*-amino benzoic acid

Recommended Books (Latest Editions)

1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar , Volume-I
3. Textbook of Organic Chemistry by B.S. Bahl & Arun Bahl.
4. Organic Chemistry by P.L.Soni
5. Practical Organic Chemistry by Mann and Saunders.
6. Vogel's text book of Practical Organic Chemistry
7. Advanced Practical organic chemistry by N.K.Vishnoi.

8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.

BP302T. PHYSICAL PHARMACEUTICS-I (Theory)

45Hours

Scope: The course deals with the various physica and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **10 Hours**

Solubility of drugs: Solubility expressions, mechanisms of solute solvent interactions, ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, diffusion principles in biological systems. Solubility of gas in liquids, solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions. Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

UNIT-II **10Hours**

States of Matter and properties of matter: State of matter, changes in the state of matter, latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols – inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation, dielectric constant, dipole moment, dissociation constant, determinations and applications

UNIT-III **08 Hours**

Surface and interfacial phenomenon: Liquid interface, surface & interfacial tensions,

surface free energy, measurement of surface & interfacial tensions, spreading coefficient, adsorption at liquid interfaces, surface active agents, HLB Scale, solubilisation, detergency, adsorption at solid interface.

UNIT-IV **08Hours**

Complexation and protein binding: Introduction, Classification of Complexation, Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

UNIT-V **07 Hours**

pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

BP306P. PHYSICAL PHARMACEUTICS – I (Practical)

4 Hrs/week

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hasselbalch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl_4 and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of surface tension of given liquids by drop count and drop weight method
7. Determination of HLB number of a surfactant by saponification method
8. Determination of Freundlich and Langmuir constants using activated char coal
9. Determination of critical micellar concentration of surfactants
10. Determination of stability constant and donor acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor acceptor ratio of Cupric-Glycine complex by pH titration method

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin
2. Experimental Pharmaceutics by Eugene, Parott.
3. Tutorial Pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical Calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical Dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory Manual of Physical Pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
9. Physical Pharmaceutics by C.V.S. Subramanyam
10. Test book of Physical Phramacy, by Gaurav Jain & Roop K. Khar

BP 303 T. PHARMACEUTICAL MICROBIOLOGY (Theory)

45Hours

Scope:

- Study of all categories of microorganisims especially for the production of alchol antibiotics, vaccines, vitamins enzymes etc..

Objectives: Upon completion of the subject student shall be able to;

1. Understand methods of identification, cultivation and preservation of various microorganisms
2. To understand the importance and implementation of sterlization in pharmaceutical processing and industry
3. Learn sterility testing of pharmaceutical products.
4. Carried out microbiological standardization of Pharmaceuticals.
5. Understand the cell culture technology and its applications in pharmaceutical industries.

Course content:

Unit I **10 Hours**

Introduction, history of microbiology, its branches, scope and its importance.
Introduction to Prokaryotes and Eukaryotes
Study of ultra-structure and morphological classification of bacteria, nutritional requirements, raw materials used for culture media and physical parameters for growth, growth curve, isolation and preservation methods for pure cultures, cultivation of anaerobes, quantitative measurement of bacterial growth (total & viable count).
Study of different types of phase constrast microscopy, dark field microscopy and electron microscopy.

Unit II **10 Hours**

Identification of bacteria using staining techniques (simple, Gram's &Acid fast staining) and biochemical tests (IMViC).

Study of principle, procedure, merits, demerits and applications of physical, chemical gaseous,radiation and mechanical method of sterilization.

Evaluation of the efficiency of sterilization methods.

Equipments employed in large scale sterilization.

Sterility indicators.

Unit III **10 Hours**

Study of morphology, classification, reproduction/replication and cultivation of Fungi and Viruses.

Classification and mode of action of disinfectants

Factors influencing disinfection, antiseptics and their evaluation. For bacteriostatic and bactericidal actions

Evaluation of bactericidal & Bacteriostatic.

Sterility testing of products (solids, liquids, ophthalmic and other sterile products) according to IP, BP and USP.

Unit IV **08 Hours**

Designing of aseptic area, laminar flow equipments; study of different sources of contamination in an aseptic area and methods of prevention, clean area classification.
Principles and methods of different microbiological assay. Methods for standardization of antibiotics, vitamins and amino acids.
Assessment of a new antibiotic.

Unit V **07Hours**

Types of spoilage, factors affecting the microbial spoilage of pharmaceutical products, sources and types of microbial contaminants, assessment of microbial contamination and spoilage.

Preservation of pharmaceutical products using antimicrobial agents, evaluation of microbial stability of formulations.

Growth of animal cells in culture, general procedure for cell culture, Primary, established and transformed cell cultures.

Application of cell cultures in pharmaceutical industry and research.

BP 307P.PHARMACEUTICAL MICROBIOLOGY (Practical)

4 Hrs/week

1. Introduction and study of different equipments and processing, e.g., B.O.D. incubator, laminar flow, aseptic hood, autoclave, hot air sterilizer, deep freezer, refrigerator, microscopes used in experimental microbiology.
2. Sterilization of glassware, preparation and sterilization of media.
3. Sub culturing of bacteria and fungus. Nutrient stabs and slants preparations.
4. Staining methods- Simple, Grams staining and acid fast staining (Demonstration with practical).
5. Isolation of pure culture of micro-organisms by multiple streak plate technique and other techniques.
6. Microbiological assay of antibiotics by cup plate method and other methods
7. Motility determination by Hanging drop method.
8. Sterility testing of pharmaceuticals.
9. Bacteriological analysis of water
10. Biochemical test.

Recommended Books (Latest edition)

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. I.P., B.P., U.S.P.- latest editions.
10. Ananthnarayan : Text Book of Microbiology, Orient-Longman, Chennai
11. Edward: Fundamentals of Microbiology.
12. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
13. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company

BP 304 T. PHARMACEUTICAL ENGINEERING (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the art and science of various unit operations used in pharmaceutical industry.

Objectives: Upon completion of the course student shall be able:

1. To know various unit operations used in Pharmaceutical industries.
2. To understand the material handling techniques.
3. To perform various processes involved in pharmaceutical manufacturing process.
4. To carry out various test to prevent environmental pollution.
5. To appreciate and comprehend significance of plant lay out design for optimum use of resources.
6. To appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

Course content:

UNIT-I **10 Hours**

- **Flow of fluids:** Types of manometers, Reynolds number and its significance, Bernoulli's theorem and its applications, Energy losses, Orifice meter, Venturimeter, Pitot tube and Rotometer.
- **Size Reduction:** Objectives, Mechanisms & Laws governing size reduction, factors affecting size reduction, principles, construction, working, uses, merits and demerits of Hammer mill, ball mill, fluid energy mill, Edge runner mill & end runner mill.
- **Size Separation:** Objectives, applications & mechanism of size separation, official standards of powders, sieves, size separation Principles, construction, working, uses, merits and demerits of Sieve shaker, cyclone separator, Air separator, Bag filter & elutriation tank.

UNIT-II **10 Hours**

- **Heat Transfer:** Objectives, applications & Heat transfer mechanisms. Fourier's law, Heat transfer by conduction, convection & radiation. Heat interchangers & heat exchangers.

- **Evaporation:** Objectives, applications and factors influencing evaporation, differences between evaporation and other heat process. principles, construction, working, uses, merits and demerits of Steam jacketed kettle, horizontal tube evaporator, climbing film evaporator, forced circulation evaporator, multiple effect evaporator& Economy of multiple effect evaporator.

- **Distillation:** Basic Principles and methodology of simple distillation,flash distillation, fractional distillation, distillation under reduced pressure, steam distillation & molecular distillation

UNIT- III **08 Hours**

- **Drying:** Objectives, applications & mechanism of drying process, measurements & applications of Equilibrium Moisture content, rate of drying curve. principles, construction, working, uses, merits and demerits of Tray dryer, drum dryer spray dryer, fluidized bed dryer, vacuum dryer, freeze dryer.

- **Mixing:** Objectives, applications & factors affecting mixing, Difference between solid and liquid mixing, mechanism of solid mixing, liquids mixing and semisolids mixing. Principles, Construction, Working, uses, Merits and Demerits of Double cone blender, twin shell blender, ribbon blender, Sigma blade mixer, planetary mixers, Propellers, Turbines, Paddles & Silverson Emulsifier,

UNIT-IV **08 Hours**

- **Filtration:** Objectives, applications, Theories & Factors influencing filtration, filter aids, filter medias. Principle, Construction, Working, Uses, Merits and demerits of plate & frame filter, filter leaf, rotary drum filter, Meta filter & Cartridge filter, membrane filters and Seidtz filter.
- **Centrifugation:** Objectives, principle & applications of Centrifugation, principles, construction, working, uses, merits and demerits of Perforated basket centrifuge, Non-perforated basket centrifuge, semi continuous centrifuge & super centrifuge.

UNIT- V **07 Hours**

- **Materials of pharmaceutical plant construction, Corrosion and its prevention:** Factors affecting during materials selected for Pharmaceutical plant construction, Theories of corrosion, types of corrosion and there prevention. Ferrous and nonferrous metals, inorganic and organic non metals, basic of material handling systems.

Recommended Books: (Latest Editions)

1. Introduction to chemical engineering – Walter L Badger & Julius Banchero, Latest edition.
2. Solid phase extraction, Principles, techniques and applications by Nigel J.K. Simpson- Latest edition.
3. Unit operation of chemical engineering – Mcabe Smith, Latest edition.
4. Pharmaceutical engineering principles and practices – C.V.S Subrahmanyam et al., Latest edition.
5. Remington practice of pharmacy- Martin, Latest edition.
6. Theory and practice of industrial pharmacy by Lachmann., Latest edition.
7. Physical pharmaceutics- C.V.S Subrahmanyam et al., Latest edition.
8. Cooper and Gunn's Tutorial pharmacy, S.J. Carter, Latest edition.

BP308P - PHARMACEUTICAL ENGINEERING (Practical)

4 Hours/week

I. Determination of radiation constant of brass, iron, unpainted and painted glass.
II. Steam distillation – To calculate the efficiency of steam distillation.
III. To determine the overall heat transfer coefficient by heat exchanger.
IV. Construction of drying curves (for calcium carbonate and starch).
V. Determination of moisture content and loss on drying.
VI. Determination of humidity of air – i) From wet and dry bulb temperatures –use of Dew point method.
VII. Description of Construction working and application of Pharmaceutical Machinery such as rotary tablet machine, fluidized bed coater, fluid energy mill, de humidifier.
VIII. Size analysis by sieving – To evaluate size distribution of tablet granulations – Construction of various size frequency curves including arithmetic andlogarithmic probability plots.
IX. Size reduction: To verify the laws of size reduction using ball mill and determining Kicks, Rittinger's, Bond's coefficients, power requirement and critical speed of Ball Mill.
X. Demonstration of colloid mill, planetary mixer, fluidized bed dryer, freeze dryer and such othermajor equipment.
XI. Factors affecting Rate of Filtration and Evaporation (Surface area, Concentration and Thickness/ viscosity
XII. To study the effect of time on the Rate of Crystallization.
XIII. To calculate the uniformity Index for given sample by using Double Cone Blender.

SEMESTER IV

BP401T. PHARMACEUTICAL ORGANIC CHEMISTRY –III (Theory)

45 Hours

Scope: This subject imparts knowledge on stereo-chemical aspects of organic compounds and organic reactions, important named reactions, chemistry of important hetero cyclic compounds. It also emphasizes on medicinal and other uses of organic compounds.

Objectives: At the end of the course, the student shall be able to

1. understand the methods of preparation and properties of organic compounds
2. explain the stereo chemical aspects of organic compounds and stereo chemical reactions
3. know the medicinal uses and other applications of organic compounds

Course Content:

Note: To emphasize on definition, types, mechanisms, examples, uses/applications

UNIT-I **10 Hours**

Stereo isomerism

Optical isomerism –

Optical activity, enantiomerism, diastereoisomerism, meso compounds

Elements of symmetry, chiral and achiral molecules

DL system of nomenclature of optical isomers, sequence rules, RS system of nomenclature of optical isomers

Reactions of chiral molecules

Racemic modification and resolution of racemic mixture.

Asymmetric synthesis: partial and absolute

UNIT-II **10 Hours**

Geometrical isomerism

Nomenclature of geometrical isomers (Cis Trans, EZ, Syn Anti systems)

Methods of determination of configuration of geometrical isomers.

Conformational isomerism in Ethane, n-Butane and Cyclohexane.

Stereo isomerism in biphenyl compounds (Atropisomerism) and conditions for optical activity.

Stereospecific and stereoselective reactions

UNIT-III **10 Hours**

Heterocyclic compounds:

Nomenclature and classification

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrrole, Furan, and Thiophene

Relative aromaticity and reactivity of Pyrrole, Furan and Thiophene

UNIT-IV **8 Hours**

Synthesis, reactions and medicinal uses of following compounds/derivatives

Pyrazole, Imidazole, Oxazole and Thiazole.

Pyridine, Quinoline, Isoquinoline, Acridine and Indole. Basicity of pyridine

Synthesis and medicinal uses of Pyrimidine, Purine, azepines and their derivatives

UNIT-V **07 Hours**

Reactions of synthetic importance

Metal hydride reduction ($NaBH_4$ and $LiAlH_4$), Clemmensen reduction, Birch reduction, Wolff Kishner reduction.

Oppenauer-oxidation and Dakin reaction.

Beckmanns rearrangement and Schmidt rearrangement.

Claisen-Schmidt condensation

Recommended Books (Latest Editions)

1. Organic chemistry by I.L. Finar, Volume-I & II.
2. A text book of organic chemistry – Arun Bahl, B.S. Bahl.
3. Heterocyclic Chemistry by Raj K. Bansal
4. Organic Chemistry by Morrison and Boyd
5. Heterocyclic Chemistry by T.L. Gilchrist

BP402T. MEDICINAL CHEMISTRY – I (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. understand the chemistry of drugs with respect to their pharmacological activity
2. understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. know the Structural Activity Relationship (SAR) of different class of drugs
4. write the chemical synthesis of some drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Introduction to Medicinal Chemistry

History and development of medicinal chemistry

Physicochemical properties in relation to biological action

Ionization, Solubility, Partition Coefficient, Hydrogen bonding, Protein binding, Chelation, Bioisosterism, Optical and Geometrical isomerism.

Drug metabolism

Drug metabolism principles- Phase I and Phase II.

Factors affecting drug metabolism including stereo chemical aspects.

UNIT- II **10 Hours**

Drugs acting on Autonomic Nervous System

Adrenergic Neurotransmitters:

Biosynthesis and catabolism of catecholamine.

Adrenergic receptors (Alpha & Beta) and their distribution.

Sympathomimetic agents: SAR of Sympathomimetic agents

Direct acting: Nor-epinephrine, Epinephrine, Phenylephrine*, Dopamine,

Methyldopa, Clonidine, Dobutamine, Isoproterenol, Terbutaline, Salbutamol*, Bitolterol, Naphazoline, Oxymetazoline and Xylometazoline.

- Indirect acting agents: Hydroxyamphetamine, Pseudoephedrine, Propylhexedrine.
- Agents with mixed mechanism: Ephedrine, Metaraminol.

Adrenergic Antagonists:

Alpha adrenergic blockers: Tolazoline*, Phentolamine, Phenoxybenzamine, Prazosin, Dihydroergotamine, Methysergide.

Beta adrenergic blockers: SAR of beta blockers, Propranolol*, Metibranolol, Atenolol, Betazolol, Bisoprolol, Esmolol, Metoprolol, Labetolol, Carvedilol.

UNIT-III **10 Hours**

Cholinergic neurotransmitters:

Biosynthesis and catabolism of acetylcholine.

Cholinergic receptors (Muscarinic & Nicotinic) and their distribution.

Parasympathomimetic agents: SAR of Parasympathomimetic agents

Direct acting agents: Acetylcholine, Carbachol*, Bethanechol, Methacholine, Pilocarpine.

Indirect acting/ Cholinesterase inhibitors (Reversible & Irreversible): Physostigmine, Neostigmine*, Pyridostigmine, Edrophonium chloride, Tacrine hydrochloride, Ambenonium chloride, Isofluorphate, Echothiophate iodide, Parathione, Malathion.

Cholinesterase reactivator: Pralidoxime chloride.

Cholinergic Blocking agents: SAR of cholinolytic agents

Solanaceous alkaloids and analogues: Atropine sulphate, Hyoscyamine sulphate, Scopolamine hydrobromide, Homatropine hydrobromide, Ipratropium bromide*.

Synthetic cholinergic blocking agents: Tropicamide, Cyclopentolate hydrochloride, Clidinium bromide, Dicyclomine hydrochloride*, Glycopyrrolate, Methantheline bromide, Propantheline bromide, Benztropine mesylate, Orphenadrine citrate, Biperidine hydrochloride, Procyclidine hydrochloride*, Tridihexethyl chloride, Isopropamide iodide, Ethopropazine hydrochloride.

UNIT- IV **08 Hours**

Drugs acting on Central Nervous System

A. Sedatives and Hypnotics:

Benzodiazepines: SAR of Benzodiazepines, Chlordiazepoxide, Diazepam*, Oxazepam, Chlorazepate, Lorazepam, Alprazolam, Zolpidem

Barbiturtes: SAR of barbiturates, Barbital*, Phenobarbital, Mephobarbital, Amobarbital, Butabarbital, Pentobarbital, Secobarbital

Miscelleneous:

Amides & imides: Glutethmide.

Alcohol & their carbamate derivatives: Meprobomate, Ethchlorvynol.

Aldehyde & their derivatives: Triclofos sodium, Paraldehyde.

B. Antipsychotics

Phenothiazeines: SAR of Phenothiazeines - Promazine hydrochloride, Chlorpromazine hydrochloride*, Triflupromazine, Thioridazine hydrochloride, Piperacetazine hydrochloride, Prochlorperazine maleate, Trifluoperazine hydrochloride.

Ring Analogues of Phenothiazeines: Chlorprothixene, Thiothixene, Loxapine succinate, Clozapine.

Fluro buterophenones: Haloperidol, Droperidol, Risperidone.

Beta amino ketones: Molindone hydrochloride.

Benzamides: Sulpieride.

C. Anticonvulsants: SAR of Anticonvulsants**,** mechanism of anticonvulsant action

Barbiturates: Phenobarbitone, Methabarbital. **Hydantoins:**

Phenytoin*, Mephenytoin, Ethotoin **Oxazolidine diones:**

Trimethadione, Paramethadione **Succinimides:**

Phensuximide, Methsuximide, Ethosuximide* **Urea and**

monoacylureas: Phenacemide, Carbamazepine*

Benzodiazepines: Clonazepam

Miscellaneous: Primidone, Valproic acid , Gabapentin, Felbamate

UNIT – V **07 Hours**

Drugs acting on Central Nervous System

General anesthetics:

Inhalation anesthetics: Halothane*, Methoxyflurane, Enflurane, Sevoflurane, Isoflurane, Desflurane.

Ultra short acting barbitutrates: Methohexital sodium*, Thiamylal sodium, Thiopental sodium.

Dissociative anesthetics: Ketamine hydrochloride.*

Narcotic and non-narcotic analgesics

Morphine and related drugs: SAR of Morphine analogues, Morphine sulphate, Codeine, Meperidine hydrochloride, Anilerdine hydrochloride, Diphenoxylate hydrochloride, Loperamide hydrochloride, Fentanyl citrate*, Methadone hydrochloride*, Propoxyphene hydrochloride, Pentazocine, Levorphanol tartarate.

Narcotic antagonists: Nalorphine hydrochloride, Levallorphan tartarate, Naloxone hydrochloride.

Anti-inflammatory agents: Sodium salicylate, Aspirin, Mefenamic acid*, Meclofenamate, Indomethacin, Sulindac, Tolmetin, Zomepriac, Diclofenac, Ketorolac, Ibuprofen*, Naproxen, Piroxicam, Phenacetin, Acetaminophen, Antipyrine, Phenylbutazone.

BP406P. MEDICINAL CHEMISTRY – I (Practical)

4 Hours/Week

I	**Preparation of drugs/ intermediates**
1	1,3-pyrazole
2	1,3-oxazole
3	Benzimidazole
4	Benztriazole
5	2,3- diphenyl quinoxaline
6	Benzocaine
7	Phenytoin
8	Phenothiazine
9	Barbiturate
II	**Assay of drugs**
1	Chlorpromazine
2	Phenobarbitone
3	Atropine
4	Ibuprofen
5	Aspirin
6	Furosemide
III	**Determination of Partition coefficient for any two drugs**

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP 403 T. PHYSICAL PHARMACEUTICS-II (Theory)

45Hours

Scope: The course deals with the various physica and physicochemical properties, and principles involved in dosage forms/formulations. Theory and practical components of the subject help the student to get a better insight into various areas of formulation research and development, and stability studies of pharmaceutical dosage forms.

Objectives: Upon the completion of the course student shall be able to

1. Understand various physicochemical properties of drug molecules in the designing the dosage forms
2. Know the principles of chemical kinetics & to use them for stability testing nad determination of expiry date of formulations
3. Demonstrate use of physicochemical properties in the formulation development and evaluation of dosage forms.

Course Content:

UNIT-I **07 Hours**

Colloidal dispersions: Classification of dispersed systems & their general characteristics, size & shapes of colloidal particles, classification of colloids & comparative account of their general properties. Optical, kinetic & electrical properties. Effect of electrolytes, coacervation, peptization& protective action.

UNIT-II **10 Hours**

Rheology: Newtonian systems, law of flow, kinematic viscosity, effect of temperature, non-Newtonian systems, pseudoplastic, dilatant, plastic, thixotropy, thixotropy in formulation, determination of viscosity, capillary, falling Sphere, rotational viscometers

Deformation of solids: Plastic and elastic deformation, Heckel equation, Stress, Strain, Elastic Modulus

UNIT-III **10 Hours**

Coarse dispersion: Suspension, interfacial properties of suspended particles, settling in suspensions, formulation of flocculated and deflocculated suspensions. Emulsions and theories of emulsification, microemulsion and multiple emulsions; Stability of emulsions, preservation of emulsions, rheological properties of emulsions and emulsion formulation by HLB method.

UNIT-IV **10Hours**

Micromeretics: Particle size and distribution, mean particle size, number and weight distribution, particle number, methods for determining particle size by different methods, counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

UNIT-V **10 Hours**

Drug stability: Reaction kinetics: zero, pseudo-zero, first & second order, units of basic rate constants, determination of reaction order. Physical and chemical factors influencing the chemical degradation of pharmaceutical product: temperature, solvent, ionic strength, dielectric constant, specific & general acid base catalysis, Simple numerical problems. Stabilization of medicinal agents against common reactions like hydrolysis & oxidation. Accelerated stability testing in expiration dating of pharmaceutical dosage forms. Photolytic degradation and its prevention

BP 407P. PHYSICAL PHARMACEUTICS- II (Practical)

3 Hrs/week

1. Determination of particle size, particle size distribution using sieving method
2. Determination of particle size, particle size distribution using Microscopic method
3. Determination of bulk density, true density and porosity
4. Determine the angle of repose and influence of lubricant on angle of repose
5. Determination of viscosity of liquid using Ostwald's viscometer
6. Determination sedimentation volume with effect of different suspending agent
7. Determination sedimentation volume with effect of different concentration of single suspending agent
8. Determination of viscosity of semisolid by using Brookfield viscometer
9. Determination of reaction rate constant first order.
10. Determination of reaction rate constant second order
11. Accelerated stability studies

Recommended Books: (Latest Editions)

1. Physical Pharmacy by Alfred Martin, Sixth edition
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea & Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, Marcel Dekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical Pharmaceutics by Ramasamy C, and Manavalan R.

BP 404 T. PHARMACOLOGY-I (Theory)

45 Hrs

Scope: The main purpose of the subject is to understand what drugs do to the living organisms and how their effects can be applied to therapeutics. The subject covers the information about the drugs like, mechanism of action, physiological and biochemical effects (pharmacodynamics) as well as absorption, distribution, metabolism and excretion (pharmacokinetics) along with the adverse effects, clinical uses, interactions, doses, contraindications and routes of administration of different classes of drugs.

Objectives: Upon completion of this course the student should be able to

1. Understand the pharmacological actions of different categories of drugs
2. Explain the mechanism of drug action at organ system/sub cellular/ macromolecular levels.
3. Apply the basic pharmacological knowledge in the prevention and treatment of various diseases.
4. Observe the effect of drugs on animals by simulated experiments
5. Appreciate correlation of pharmacology with other bio medical sciences

Course Content:

UNIT-I **08 hours**

1. General Pharmacology

a. Introduction to Pharmacology- Definition, historical landmarks and scope of pharmacology, nature and source of drugs, essential drugs concept and routes of drug administration, Agonists, antagonists(competitive and non competitive), spare receptors, addiction, tolerance, dependence, tachyphylaxis, idiosyncrasy, allergy.

b. Pharmacokinetics- Membrane transport, absorption, distribution, metabolism and excretion of drugs .Enzyme induction, enzyme inhibition, kinetics of elimination

UNIT-II **12 Hours**

General Pharmacology

a. Pharmacodynamics- Principles and mechanisms of drug action. Receptor theories and classification of receptors, regulation of receptors. drug receptors interactions signal transduction mechanisms, G-protein–coupled receptors, ion channel receptor, transmembrane enzyme linked receptors, transmembrane JAK-STAT binding receptor and receptors that regulate transcription factors, dose response relationship, therapeutic index, combined effects of drugs and factors modifying drug action.
b. Adverse drug reactions.
c. Drug interactions (pharmacokinetic and pharmacodynamic)
d. Drug discovery and clinical evaluation of new drugs -Drug discovery phase, preclinical evaluation phase, clinical trial phase, phases of clinical trials and pharmacovigilance.

UNIT-III **10 Hours**

2. Pharmacology of drugs acting on peripheral nervous system

a. Organization and function of ANS.

b.Neurohumoral transmission,co-transmission and classification of neurotransmitters.

c. Parasympathomimetics, Parasympatholytics, Sympathomimetics, sympatholytics.

d. Neuromuscular blocking agents and skeletal muscle relaxants (peripheral).

e. Local anesthetic agents.

f. Drugs used in myasthenia gravis and glaucoma

UNIT-IV **08 Hours**

3. Pharmacology of drugs acting on central nervous system

a. Neurohumoral transmission in the C.N.S.special emphasis on importance of various neurotransmitters like with GABA, Glutamate, Glycine, serotonin, dopamine.

b. General anesthetics and pre-anesthetics**.**

c. Sedatives, hypnotics and centrally acting muscle relaxants.

d. Anti-epileptics

e. Alcohols and disulfiram

UNIT-V **07 Hours**

3. Pharmacology of drugs acting on central nervous system

a. Psychopharmacological agents: Antipsychotics, antidepressants, anti-anxiety agents, anti-manics and hallucinogens.

b. Drugs used in Parkinsons disease and Alzheimer's disease.

c. CNS stimulants and nootropics.

d. Opioid analgesics and antagonists

e. Drug addiction, drug abuse, tolerance and dependence.

BP 408 P.PHARMACOLOGY-I (Practical)

4Hrs/Week

1. Introduction to experimental pharmacology.
2. Commonly used instruments in experimental pharmacology.
3. Study of common laboratory animals.
4. Maintenance of laboratory animals as per CPCSEA guidelines.
5. Common laboratory techniques. Blood withdrawal, serum and plasma separation, anesthetics and euthanasia used for animal studies.
6. Study of different routes of drugs administration in mice/rats.
7. Study of effect of hepatic microsomal enzyme inducers on the phenobarbitone sleeping time in mice.
8. Effect of drugs on ciliary motility of frog oesophagus
9. Effect of drugs on rabbit eye.
10. Effects of skeletal muscle relaxants using rota-rod apparatus.
11. Effect of drugs on locomotor activity using actophotometer.
12. Anticonvulsant effect of drugs by MES and PTZ method.
13. Study of stereotype and anti-catatonic activity of drugs on rats/mice.
14. Study of anxiolytic activity of drugs using rats/mice.
15. Study of local anesthetics by different methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology,.Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology

6. K.D.Tripathi. Essentials of Medical Pharmacology, JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.

7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher

8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,

9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.

10. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,

BP 405 T.PHARMACOGNOSY AND PHYTOCHEMISTRY I (Theory)

45 Hours

Scope: The subject involves the fundamentals of Pharmacognosy like scope, classification of crude drugs, their identification and evaluation, phytochemicals present in them and their medicinal properties.

Objectives: Upon completion of the course, the student shall be able

1. to know the techniques in the cultivation and production of crude drugs
2. to know the crude drugs, their uses and chemical nature
3. know the evaluation techniques for the herbal drugs
4. to carry out the microscopic and morphological evaluation of crude drugs

Course Content:

UNIT-I **10 Hours**

Introduction to Pharmacognosy:

(a) Definition, history, scope and development of Pharmacognosy

(b) Sources of Drugs – Plants, Animals, Marine & Tissue culture

(c) Organized drugs, unorganized drugs (dried latex, dried juices, dried extracts, gums and mucilages, oleoresins and oleo- gum -resins).

Classification of drugs:

Alphabetical, morphological, taxonomical, chemical, pharmacological, chemo and sero taxonomical classification of drugs

Quality control of Drugs of Natural Origin:

Adulteration of drugs of natural origin. Evaluation by organoleptic, microscopic, physical, chemical and biological methods and properties.

Quantitative microscopy of crude drugs including lycopodium spore method, leafconstants, camera lucida and diagrams of microscopic objects to scale with camera lucida.

UNIT-II **10 Hours**

Cultivation, Collection, Processing and storage of drugs of natural origin:

Cultivation and Collection of drugs of natural origin

Factors influencing cultivation of medicinal plants.

Plant hormones and their applications.

Polyploidy, mutation and hybridization with reference to medicinal plants

Conservation of medicinal plants

UNIT-III **07 Hours**

Plant tissue culture:

Historical development of plant tissue culture, types of cultures, Nutritional requirements, growth and their maintenance.

Applications of plant tissue culture in pharmacognosy.

Edible vaccines

UNIT IV **10 Hours**

Pharmacognosy in various systems of medicine:

Role of Pharmacognosy in allopathy and traditional systems of medicine namely, Ayurveda, Unani, Siddha, Homeopathy and Chinese systems of medicine.

Introduction to secondary metabolites:

Definition, classification, properties and test for identification of Alkaloids, Glycosides, Flavonoids, Tannins, Volatile oil and Resins

UNIT V **08 Hours**

Study of biological source, chemical nature and uses of drugs of natural origin containing following drugs

Plant Products:

Fibers - Cotton, Jute, Hemp

Hallucinogens, Teratogens, Natural allergens

Primary metabolites:

General introduction, detailed study with respect to chemistry, sources, preparation, evaluation, preservation, storage, therapeutic used and commercial utility as Pharmaceutical Aids and/or Medicines for the following Primary metabolites:

Carbohydrates: Acacia, Agar, Tragacanth, Honey

Proteins and Enzymes : Gelatin, casein, proteolytic enzymes (Papain, bromelain, serratiopeptidase, urokinase, streptokinase, pepsin).

Lipids(Waxes, fats, fixed oils) : Castor oil, Chaulmoogra oil, Wool Fat, Bees Wax

Marine Drugs:

Novel medicinal agents from marine sources

BP408 P. PHARMACOGNOSY AND PHYTOCHEMISTRY I (Practical)

4 Hours/Week

1. Analysis of crude drugs by chemical tests: **(**i)Tragaccanth (ii) Acacia (iii)Agar (iv) Gelatin (v) starch (vi) Honey (vii) Castor oil
2. Determination of stomatal number and index
3. Determination of vein islet number, vein islet termination and paliside ratio.
4. Determination of size of starch grains, calcium oxalate crystals by eye piece micrometer
5. Determination of Fiber length and width
6. Determination of number of starch grains by Lycopodium spore method
7. Determination of Ash value
8. Determination of Extractive values of crude drugs
9. Determination of moisture content of crude drugs
10. Determination of swelling index and foaming

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Tyler, V.E., Brady, L.R. and Robbers, J.E., Pharmacognosy, 9th Edn., Lea and Febiger, Philadelphia, 1988.
3. Text Book of Pharmacognosy by T.E. Wallis
4. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
5. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
6. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
7. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
8. Practical Pharmacognosy: C.K. Kokate, Purohit, Gokhlae
9. Anatomy of Crude Drugs by M.A. Iyengar

SEMESTER V

BP501T. MEDICINAL CHEMISTRY – II (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasizes on structure activity relationships of drugs, importance of physicochemical properties and metabolism of drugs. The syllabus also emphasizes on chemical synthesis of important drugs under each class.

Objectives: Upon completion of the course the student shall be able to

1. Understand the chemistry of drugs with respect to their pharmacological activity
2. Understand the drug metabolic pathways, adverse effect and therapeutic value of drugs
3. Know the Structural Activity Relationship of different class of drugs
4. Study the chemical synthesis of selected drugs

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted (*)

UNIT- I **10 Hours**

Antihistaminic agents: Histamine, receptors and their distribution in the humanbody

H_1–antagonists: Diphenhydramine hydrochloride*, Dimenhydrinate, Doxylamines cuccinate, Clemastine fumarate, Diphenylphyraline hydrochloride, Tripelenamine hydrochloride, Chlorcyclizine hydrochloride, Meclizine hydrochloride, Buclizine hydrochloride, Chlorpheniramine maleate, Triprolidine hydrochloride*, Phenidamine tartarate, Promethazine hydrochloride*, Trimeprazine tartrate, Cyproheptadine hydrochloride, Azatidine maleate, Astemizole, Loratadine, Cetirizine, Levocetrazine Cromolyn sodium

H_2-antagonists: Cimetidine*, Famotidine, Ranitidin.

Gastric Proton pump inhibitors: Omeprazole, Lansoprazole, Rabeprazole, Pantoprazole

Anti-neoplastic agents:

Alkylating agents: Meclorethamine*, Cyclophosphamide, Melphalan,

Chlorambucil, Busulfan, Thiotepa

Antimetabolites: Mercaptopurine*, Thioguanine, Fluorouracil, Floxuridine, Cytarabine, Methotrexate*, Azathioprine

Antibiotics: Dactinomycin, Daunorubicin, Doxorubicin, Bleomycin

Plant products: Etoposide, Vinblastin sulphate, Vincristin sulphate

Miscellaneous: Cisplatin, Mitotane.

UNIT – II **10 Hours**

Anti-anginal:

Vasodilators: Amyl nitrite, Nitroglycerin*, Pentaerythritol tetranitrate, Isosorbide dinitrite*, Dipyridamole.

Calcium channel blockers: Verapamil, Bepridil hydrochloride, Diltiazem hydrochloride, Nifedipine, Amlodipine, Felodipine, Nicardipine, Nimodipine.

Diuretics:

Carbonic anhydrase inhibitors: Acetazolamide*, Methazolamide, Dichlorphenamide.

Thiazides: Chlorthiazide*, Hydrochlorothiazide, Hydroflumethiazide, Cyclothiazide,

Loop diuretics: Furosemide*, Bumetanide, Ethacrynic acid.

Potassium sparing Diuretics: Spironolactone, Triamterene, Amiloride.

Osmotic Diuretics: Mannitol

Anti-hypertensive Agents: Timolol, Captopril, Lisinopril, Enalapril, Benazepril hydrochloride, Quinapril hydrochloride, Methyldopate hydrochloride,* Clonidine hydrochloride, Guanethidine monosulphate, Guanabenz acetate, Sodium nitroprusside, Diazoxide, Minoxidil, Reserpine, Hydralazine hydrochloride.

UNIT- III **10 Hours**

Anti-arrhythmic Drugs: Quinidine sulphate, Procainamide hydrochloride, Disopyramide phosphate*, Phenytoin sodium, Lidocaine hydrochloride, Tocainide hydrochloride, Mexiletine hydrochloride, Lorcainide hydrochloride, Amiodarone, Sotalol.

Anti-hyperlipidemic agents: Clofibrate, Lovastatin, Cholesteramine and Cholestipol

Coagulant & Anticoagulants: Menadione, Acetomenadione, Warfarin*, Anisindione, clopidogrel

Drugs used in Congestive Heart Failure: Digoxin, Digitoxin, Nesiritide, Bosentan, Tezosentan.

UNIT- IV **08 Hours**

Drugs acting on Endocrine system

Nomenclature, Stereochemistry and metabolism of steroids

Sex hormones: Testosterone, Nandralone, Progestrones, Oestriol, Oestradiol, Oestrione, Diethyl stilbestrol.
Drugs for erectile dysfunction: Sildenafil, Tadalafil.
Oral contraceptives: Mifepristone, Norgestril, Levonorgestrol
Corticosteroids: Cortisone, Hydrocortisone, Prednisolone, Betamethasone, Dexamethasone
Thyroid and antithyroid drugs: L-Thyroxine, L-Thyronine, Propylthiouracil, Methimazole.

UNIT – V **07 Hours**

Antidiabetic agents:

Insulin and its preparations

Sulfonyl ureas: Tolbutamide*, Chlorpropamide, Glipizide, Glimepiride.

Biguanides: Metformin.

Thiazolidinediones: Pioglitazone, Rosiglitazone.

Meglitinides: Repaglinide, Nateglinide.

Glucosidase inhibitors: Acrabose, Voglibose.

Local Anesthetics: SAR of Local anesthetics

Benzoic Acid derivatives; Cocaine, Hexylcaine, Meprylcaine, Cyclomethycaine, Piperocaine.

Amino Benzoic acid derivatives: Benzocaine*, Butamben, Procaine*, Butacaine, Propoxycaine, Tetracaine, Benoxinate.

Lidocaine/Anilide derivatives: Lignocaine, Mepivacaine, Prilocaine, Etidocaine.

Miscellaneous: Phenacaine, Diperodon, Dibucaine.*

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.
7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1to 5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP 502 T. Industrial PharmacyI (Theory)

45 Hours

Scope: Course enables the student to understand and appreciate the influence of pharmaceutical additives and various pharmaceutical dosage forms on the performance of the drug product.

Objectives: Upon completion of the course the student shall be able to

1. Know the various pharmaceutical dosage forms and their manufacturing techniques.
2. Know various considerations in development of pharmaceutical dosage forms
3. Formulate solid, liquid and semisolid dosage forms and evaluate them for their quality

Course content:

3 hours/ week

UNIT-I **07 Hours**

Preformulation Studies: Introduction to preformulation, goals and objectives, study of physicochemical characteristics of drug substances.

a. Physical properties: Physical form (crystal & amorphous), particle size, shape, flow properties, solubility profile (pKa, pH, partition coefficient), polymorphism

b. Chemical Properties: Hydrolysis, oxidation, reduction, racemisation, polymerization

BCS classification of drugs & its significant

Application of preformulation considerations in the development of solid, liquid oral and parenteral dosage forms and its impact on stability of dosage forms.

UNIT-II **10 Hours**

Tablets:

a. Introduction, ideal characteristics of tablets, classification of tablets. Excipients, Formulation of tablets, granulation methods, compression and processing problems. Equipments and tablet tooling.

b. Tablet coating: Types of coating, coating materials, formulation of coating composition, methods of coating, equipment employed and defects in coating.

c. Quality control tests: In process and finished product tests

Liquid orals: Formulation and manufacturing consideration of syrups and elixirs suspensions and emulsions; Filling and packaging; evaluation of liquid orals official in pharmacopoeia

UNIT-III **08 Hours**

Capsules:

a. ***Hard gelatin capsules:*** Introduction, Production of hard gelatin capsule shells. size of capsules, Filling, finishing and special techniques of formulation of hard gelatin capsules, manufacturing defects. In process and final product quality control tests for capsules.

b. ***Soft gelatin capsules:*** Nature of shell and capsule content, size of capsules,importance of base adsorption and minim/gram factors, production, in process and final product quality control tests. Packing, storage and stability testing of soft gelatin capsules and their applications.

Pellets: Introduction, formulation requirements, pelletization process, equipments for manufacture of pellets

UNIT-IV **10 Hours**

Parenteral Products:

a. Definition, types, advantages and limitations. Preformulation factors and essential requirements, vehicles, additives, importance of isotonicity

b. Production procedure, production facilities and controls,
aseptic processing

c. Formulation of injections, sterile powders, large volume parenterals and lyophilized products.

d. Containers and closures selection, filling and sealing of ampoules, vials and infusion fluids. Quality control tests of parenteral products.

Ophthalmic Preparations: Introduction, formulation considerations; formulation of eye drops, eye ointments and eye lotions; methods of preparation; labeling, containers; evaluation of ophthalmic preparations

UNIT-V **10 Hours**

Cosmetics: Formulation and preparation of the following cosmetic preparations: lipsticks, shampoos, cold cream and vanishing cream, tooth pastes, hair dyes and sunscreens.

Pharmaceutical Aerosols: Definition, propellants, containers, valves, types of aerosol systems; formulation and manufacture of aerosols; Evaluation of aerosols; Quality control and stability studies.

Packaging Materials Science: Materials used for packaging of pharmaceutical products, factors influencing choice of containers, legal and official requirements for containers, stability aspects of packaging materials, quality control tests.

BP 506 P. Industrial PharmacyI (Practical)

4 Hours/week

1. Preformulation studies on paracetamol/asparin/or any other drug
2. Preparation and evaluation of Paracetamol tablets
3. Preparation and evaluation of Aspirin tablets
4. Coating of tablets- film coating of tables/granules
5. Preparation and evaluation of Tetracycline capsules
6. Preparation of Calcium Gluconate injection
7. Preparation of Ascorbic Acid injection
8. Qulaity control test of (as per IP) marketed tablets and capsules
9. Preparation of Eye drops/ and Eye ointments
10. Preparation of Creams (cold / vanishing cream)
11. Evaluation of Glass containers (as per IP)

Recommended Books: (Latest Editions)

1. Pharmaceutical dosage forms - Tablets, volume 1 -3 by H.A. Liberman, Leon Lachman &J.B.Schwartz
2. Pharmaceutical dosage form - Parenteral medication vol- 1&2 by Liberman & Lachman
3. Pharmaceutical dosage form disperse system VOL-1 by Liberman & Lachman
4. Modern Pharmaceutics by Gilbert S. Banker & C.T. Rhodes, 3rd Edition
5. Remington: The Science and Practice of Pharmacy, 20th edition Pharmaceutical Science (RPS)
6. Theory and Practice of Industrial Pharmacy by Liberman & Lachman
7. Pharmaceutics- The science of dosage form design by M.E.Aulton, Churchill livingstone, Latest edition
8. Introduction to Pharmaceutical Dosage Forms by H. C.Ansel, Lea &Febiger, Philadelphia, 5thedition, 2005
9. Drug stability - Principles and practice by Cartensen & C.J. Rhodes, 3rd Edition, Marcel Dekker Series, Vol 107.

BP503.T. PHARMACOLOGY-II (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on different systems of body and in addition,emphasis on the basic concepts of bioassay.

Objectives: Upon completion of this course the student should be able to

1. Understand the mechanism of drug action and its relevance in the treatment of different diseases
2. Demonstrate isolation of different organs/tissues from the laboratory animals by simulated experiments
3. Demonstrate the various receptor actions using isolated tissue preparation
4. Appreciate correlation of pharmacology with related medical sciences

Course Content:

UNIT-I **10hours**

1. Pharmacology of drugs acting on cardio vascular system

a. Introduction to hemodynamic and electrophysiology of heart.
b. Drugs used in congestive heart failure
c. Anti-hypertensive drugs.
d. Anti-anginal drugs.
e. Anti-arrhythmic drugs.
f. Anti-hyperlipidemic drugs.

UNIT-II **10hours**

1. Pharmacology of drugs acting on cardio vascular system

a. Drug used in the therapy of shock.
b. Hematinics, coagulants and anticoagulants.
c. Fibrinolytics and anti-platelet drugs
d. Plasma volume expanders

2. Pharmacology of drugs acting on urinary system

a. Diuretics
b. Anti-diuretics.

UNIT-III **10hours**

3. Autocoids and related drugs

a. Introduction to autacoids and classification
b. Histamine, 5-HT and their antagonists.
c. Prostaglandins, Thromboxanes and Leukotrienes.
d. Angiotensin, Bradykinin and Substance P.
e. Non-steroidal anti-inflammatory agents
f. Anti-gout drugs
g. Antirheumatic drugs

UNIT-IV **08hours**

5. Pharmacology of drugs acting on endocrine system

a. Basic concepts in endocrine pharmacology.
b. Anterior Pituitary hormones- analogues and their inhibitors.
c. Thyroid hormones- analogues and their inhibitors.
d. Hormones regulating plasma calcium level- Parathormone, Calcitonin and Vitamin-D.
d. Insulin, Oral Hypoglycemic agents and glucagon.
e. ACTH and corticosteroids.

UNIT-V **07hours**

5. Pharmacology of drugs acting on endocrine system

a. Androgens and Anabolic steroids.
b. Estrogens, progesterone and oral contraceptives.
c. Drugs acting on the uterus.

6. Bioassay

a. Principles and applications of bioassay.
b.Types of bioassay
c. Bioassay of insulin, oxytocin, vasopressin, ACTH,d-tubocurarine,digitalis, histamine and 5-HT

BP 507 P. PHARMACOLOGY-II (Practical)

4Hrs/Week

1. Introduction to *in-vitro* pharmacology and physiological salt solutions.
2. Effect of drugs on isolated frog heart.
3. Effect of drugs on blood pressure and heart rate of dog.
4. Study of diuretic activity of drugs using rats/mice.
5. DRC of acetylcholine using frog rectus abdominis muscle.
6. Effect of physostigmine and atropine on DRC of acetylcholine using frog rectus abdominis muscle and rat ileum respectively.
7. Bioassay of histamine using guinea pig ileum by matching method.
8. Bioassay of oxytocin using rat uterine horn by interpolation method.
9. Bioassay of serotonin using rat fundus strip by three point bioassay.
10. Bioassay of acetylcholine using rat ileum/colon by four point bioassay.
11. Determination of PA_2 value of prazosin using rat anococcygeus muscle (by Schilds plot method).
12. Determination of PD_2 value using guinea pig ileum.
13. Effect of spasmogens and spasmolytics using rabbit jejunum.
14. Anti-inflammatory activity of drugs using carrageenan induced paw-edema model.
15. Analgesic activity of drug using central and peripheral methods

Note: All laboratory techniques and animal experiments are demonstrated by simulated experiments by softwares and videos

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill.
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs, The Point Lippincott Williams & Wilkins.
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology.
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher
8. Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert.
9. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata.
10. Kulkarni SK. Handbook of experimental pharmacology. Vallabh Prakashan.

BP504 T. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Theory)

45Hours

Scope: The main purpose of subject is to impart the students the knowledge of how the secondary metabolites are produced in the crude drugs, how to isolate and identify and produce them industrially. Also this subject involves the study of producing the plants and phytochemicals through plant tissue culture, drug interactions and basic principles of traditional system of medicine

Objectives: Upon completion of the course, the student shall be able

1. to know the modern extraction techniques, characterization and identification of the herbal drugs and phytoconstituents
2. to understand the preparation and development of herbal formulation.
3. to understand the herbal drug interactions
4. to carryout isolation and identification of phytoconstituents

Course Content:

UNIT-I **7 Hours**

Metabolic pathways in higher plants and their determination

a) Brief study of basic metabolic pathways and formation of different secondary metabolites through these pathways- Shikimic acid pathway, Acetate pathways and Amino acid pathway.
b) Study of utilization of radioactive isotopes in the investigation of Biogenetic studies.

UNIT-II **14 Hours**

General introduction, composition, chemistry & chemical classes, biosources, therapeutic uses and commercial applications of following

secondary metabolites:

Alkaloids: Vinca, Rauwolfia, Belladonna, Opium,
Phenylpropanoids and Flavonoids: Lignans, Tea, Ruta
Steroids, Cardiac Glycosides & Triterpenoids: Liquorice, Dioscorea, Digitalis
Volatile oils: Mentha, Clove, Cinnamon, Fennel, Coriander,
Tannins: Catechu, Pterocarpus
Resins: Benzoin, Guggul, Ginger, Asafoetida, Myrrh, Colophony
Glycosides: Senna, Aloes, Bitter Almond
Iridoids, Other terpenoids & Naphthaquinones: Gentian, Artemisia, taxus, carotenoids

UNIT-III **06 Hours**

Isolation, Identification and Analysis of Phytoconstituents

a) Terpenoids: Menthol, Citral, Artemisin
b) Glycosides: Glycyrhetinic acid & Rutin
c) Alkaloids: Atropine,Quinine,Reserpine,Caffeine
d) Resins: Podophyllotoxin, Curcumin

UNIT-IV **10 Hours**

Industrial production, estimation and utilization of the following phytoconstituents: Forskolin, Sennoside, Artemisinin, Diosgenin, Digoxin, Atropine, Podophyllotoxin, Caffeine, Taxol, Vincristine and Vinblastine

UNIT V **8 Hours**

Basics of Phytochemistry

Modern methods of extraction, application of latest techniques like Spectroscopy, chromatography and electrophoresis in the isolation, purification and identification of crude drugs.

BP 508 P. PHARMACOGNOSY AND PHYTOCHEMISTRY II (Practical)

4 Hours/Week

1. Morphology, histology and powder characteristics & extraction & detection of: Cinchona, Cinnamon, Senna, Clove, Ephedra, Fennel and Coriander
2. Exercise involving isolation & detection of active principles
   a. Caffeine - from tea dust.
   b. Diosgenin from Dioscorea
   c. Atropine from Belladonna
   d. Sennosides from Senna
3. Separation of sugars by Paper chromatography
4. TLC of herbal extract
5. Distillation of volatile oils and detection of phytoconstitutents by TLC
6. Analysis of crude drugs by chemical tests: **(**i) Asafoetida (ii) Benzoin (iii) Colophony (iv) Aloes (v) Myrrh

Recommended Books: (Latest Editions)

1. W.C.Evans, Trease and Evans Pharmacognosy, 16th edition, W.B. Sounders & Co., London, 2009.
2. Mohammad Ali. Pharmacognosy and Phytochemistry, CBS Publishers & Distribution, New Delhi.
3. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (2007), 37th Edition, Nirali Prakashan, New Delhi.
4. Herbal drug industry by R.D. Choudhary (1996), Ist Edn, Eastern Publisher, New Delhi.
5. Essentials of Pharmacognosy, Dr.SH.Ansari, IInd edition, Birla publications, New Delhi, 2007
6. Herbal Cosmetics by H.Pande, Asia Pacific Business press, Inc, New Delhi.
7. A.N. Kalia, Textbook of Industrial Pharmacognosy, CBS Publishers, New Delhi, 2005.
8. R Endress, Plant cell Biotechnology, Springer-Verlag, Berlin, 1994.
9. Pharmacognosy & Pharmacobiotechnology. James Bobbers, Marilyn KS, VE Tylor.
10. The formulation and preparation of cosmetic, fragrances and flavours.
11. Remington's Pharmaceutical sciences.
12. Text Book of Biotechnology by Vyas and Dixit.
13. Text Book of Biotechnology by R.C. Dubey.

BP 505 T. PHARMACEUTICAL JURISPRUDENCE (Theory)

45 Hours

Scope: This course is designed to impart basic knowledge on important legislations related to the profession of pharmacy in India.

Objectives: Upon completion of the course, the student shall be able to understand:

1. The Pharmaceutical legislations and their implications in the development and marketing of pharmaceuticals.
2. Various Indian pharmaceutical Acts and Laws
3. The regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
4. The code of ethics during the pharmaceutical practice

Course Content:

UNIT-I **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945:

Objectives, Definitions, Legal definitions of schedules to the Act and Rules

Import of drugs – Classes of drugs and cosmetics prohibited from import, Import under license or permit. Offences and penalties**.**

Manufacture of drugs – Prohibition of manufacture and sale of certain drugs,

Conditions for grant of license and conditions of license for manufacture of drugs, Manufacture of drugs for test, examination and analysis, manufacture of new drug, loan license and repacking license.

UNIT-II **10 Hours**

Drugs and Cosmetics Act, 1940 and its rules 1945.

Detailed study of Schedule G, H, M, N, P,T,U, V, X, Y, Part XII B, Sch F & DMR (OA)

Sale of Drugs – Wholesale, Retail sale and Restricted license. Offences and penalties

Labeling & Packing of drugs- General labeling requirements and specimen labels for drugs and cosmetics, List of permitted colors. Offences and penalties.

Administration of the Act and Rules – Drugs Technical Advisory Board, Central drugs Laboratory, Drugs Consultative Committee, Government drug analysts, Licensing authorities, controlling authorities, Drugs Inspectors

UNIT-III **10 Hours**

- **Pharmacy Act –1948**: Objectives, Definitions, Pharmacy Council of India; its constitution and functions, Education Regulations, State and Joint state pharmacy councils; constitution and functions, Registration of Pharmacists, Offences and

Penalties

- **Medicinal and Toilet Preparation Act –1955**: Objectives, Definitions, Licensing, Manufacture In bond and Outside bond, Export of alcoholic preparations, Manufacture of Ayurvedic, Homeopathic, Patent & Proprietary Preparations. Offences and Penalties.
- **Narcotic Drugs and Psychotropic substances Act-1985 and Rules**: Objectives, Definitions, Authorities and Officers, Constitution and Functions of narcotic & Psychotropic Consultative Committee, National Fund for Controlling the Drug Abuse, Prohibition, Control and Regulation, opium poppy cultivation and production of poppy straw, manufacture, sale and export of opium, Offences and Penalties

UNIT-IV **08 Hours**

- **Study of Salient Features of Drugs and Magic Remedies Act and its rules:** Objectives, Definitions, Prohibition of certain advertisements, Classes of Exempted advertisements, Offences and Penalties
- **Prevention of Cruelty to animals Act-1960:** Objectives, Definitions, Institutional Animal Ethics Committee, CPCSEA guidelines for Breeding and Stocking of Animals, Performance of Experiments, Transfer and acquisition of animals for experiment, Records, Power to suspend or revoke registration, Offences and Penalties
- **National Pharmaceutical Pricing Authority:** Drugs Price Control Order (DPCO)-2013. Objectives, Definitions, Sale prices of bulk drugs, Retail price of formulations, Retail price and ceiling price of scheduled formulations, National List of Essential Medicines (NLEM)

UNIT-V **07 Hours**

- **Pharmaceutical Legislations –** A brief review, Introduction, Study of drugs enquiry committee, Health survey and development committee, Hathi committee and Mudaliar committee
- **Code of Pharmaceutical ethics** D efinition, Pharmacist in relation to his job, trade, medical profession and his profession, Pharmacist's oath
- **Medical Termination of Pregnancy Act**
- **Right to Information Act**
- **Introduction to Intellectual Property Rights (IPR)**

Recommended books: (Latest Edition)

1. Forensic Pharmacy by B. Suresh

2. Text book of Forensic Pharmacy by B.M. Mithal
3. Hand book of drug law-by M.L. Mehra
4. A text book of Forensic Pharmacy by N.K. Jain
5. Drugs and Cosmetics Act/Rules by Govt. of India publications.
6. Medicinal and Toilet preparations act 1955 by Govt. of India publications.
7. Narcotic drugs and psychotropic substances act by Govt. of India publications
8. Drugs and Magic Remedies act by Govt. of India publication
9.Bare Acts of the said laws published by Government. Reference books (Theory)

SEMESTER VI

BP601T. MEDICINAL CHEMISTRY – III (Theory)

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure, chemistry and therapeutic value of drugs. The subject emphasis on modern techniques of rational drug design like quantitative structure activity relationship (QSAR), Prodrug concept, combinatorial chemistry and Computer aided drug design (CADD). The subject also emphasizes on the chemistry, mechanism of action, metabolism, adverse effects, Structure Activity Relationships (SAR), therapeutic uses and synthesis of important drugs.

Objectives: Upon completion of the course student shall be able to

1. Understand the importance of drug design and different techniques of drug design.
2. Understand the chemistry of drugs with respect to their biological activity.
3. Know the metabolism, adverse effects and therapeutic value of drugs.
4. Know the importance of SAR of drugs.

Course Content:

Study of the development of the following classes of drugs, Classification, mechanism of action, uses of drugs mentioned in the course, Structure activity relationship of selective class of drugs as specified in the course and synthesis of drugs superscripted by (*)

UNIT – I **10 Hours**

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

-Lactam antibiotics: Penicillin, Cepholosporins, - Lactamase inhibitors, Monobactams

Aminoglycosides: Streptomycin, Neomycin, Kanamycin

Tetracyclines: Tetracycline,Oxytetracycline, Chlortetracycline, Minocycline, Doxycycline

UNIT – II **10 Hours**

Antibiotics

Historical background, Nomenclature, Stereochemistry, Structure activity relationship, Chemical degradation classification and important products of the following classes.

Macrolide: Erythromycin Clarithromycin, Azithromycin.

Miscellaneous: Chloramphenicol*, Clindamycin.

Prodrugs: Basic concepts and application of prodrugs design.

Antimalarials: Etiology of malaria.

Quinolines: SAR, Quinine sulphate, Chloroquine*, Amodiaquine, Primaquine phosphate, Pamaquine*, Quinacrine hydrochloride, Mefloquine.

Biguanides and dihydro triazines: Cycloguanil pamoate, Proguanil.

Miscellaneous: Pyrimethamine, Artesunete, Artemether, Atovoquone.

UNIT – III **10 Hours**

Anti-tubercular Agents

Synthetic anti tubercular agents: Isoniozid*, Ethionamide, Ethambutol, Pyrazinamide, Para amino salicylic acid.*

Anti tubercular antibiotics: Rifampicin, Rifabutin, Cycloserine Streptomycine, Capreomycin sulphate.

Urinary tract anti-infective agents

Quinolones: SAR of quinolones, Nalidixic Acid,Norfloxacin, Enoxacin, Ciprofloxacin*, Ofloxacin, Lomefloxacin, Sparfloxacin, Gatifloxacin, Moxifloxacin

Miscellaneous: Furazolidine, Nitrofurantoin*, Methanamine.

Antiviral agents:

Amantadine hydrochloride, Rimantadine hydrochloride, Idoxuridine trifluoride, Acyclovir*, Gancyclovir, Zidovudine, Didanosine, Zalcitabine, Lamivudine, Loviride, Delavirding, Ribavirin, Saquinavir, Indinavir, Ritonavir.

UNIT – IV **08 Hours**

Antifungal agents:

Antifungal antibiotics: Amphotericin-B, Nystatin, Natamycin, Griseofulvin.

Synthetic Antifungal agents: Clotrimazole, Econazole, Butoconazole, Oxiconazole Tioconozole, Miconazole*, Ketoconazole, Terconazole, Itraconazole, Fluconazole, Naftifine hydrochloride, Tolnaftate*.

Anti-protozoal Agents: Metronidazole*, Tinidazole, Ornidazole, Diloxanide, Iodoquinol, Pentamidine Isethionate, Atovaquone, Eflornithine.

Anthelmintics: Diethylcarbamazine citrate*, Thiabendazole, Mebendazole*, Albendazole, Niclosamide, Oxamniquine, Praziquantal, Ivermectin.

Sulphonamides and Sulfones

Historical development, chemistry, classification and SAR of Sulfonamides: Sulphamethizole, Sulfisoxazole, Sulphamethizine, Sulfacetamide*, Sulphapyridine, Sulfamethoxaole*, Sulphadiazine, Mefenide acetate, Sulfasalazine.

Folate reductase inhibitors: Trimethoprim*, Cotrimoxazole.

Sulfones: Dapsone*.

UNIT – V **07 Hours**

Introduction to Drug Design

Various approaches used in drug design.

Physicochemical parameters used in quantitative structure activity relationship (QSAR) such as partition coefficient, Hammet's electronic parameter, Tafts steric parameter and Hansch analysis.

Pharmacophore modeling and docking techniques.

Combinatorial Chemistry: Concept and applications of combinatorial chemistry: solid phase and solution phase synthesis.

BP607P. MEDICINAL CHEMISTRY- III (Practical)

4 Hours / week

I Preparation of drugs and intermediates

1 Sulphanilamide

2 7-Hydroxy, 4-methyl coumarin

3 Chlorobutanol

4 Triphenyl imidazole

5 Tolbutamide

6 Hexamine

II Assay of drugs

1 Isonicotinic acid hydrazide

2 Chloroquine

3 Metronidazole

4 Dapsone

5 Chlorpheniramine maleate

6 Benzyl penicillin

III Preparation of medicinally important compounds or intermediates by Microwave irradiation technique

IV Drawing structures and reactions using chem draw®

V Determination of physicochemical properties such as logP, clogP, MR, Molecular weight, Hydrogen bond donors and acceptors for class of drugs course content using drug design software Drug likeliness screening (Lipinskies RO5)

Recommended Books (Latest Editions)

1. Wilson and Giswold's Organic medicinal and Pharmaceutical Chemistry.
2. Foye's Principles of Medicinal Chemistry.
3. Burger's Medicinal Chemistry, Vol I to IV.
4. Introduction to principles of drug design- Smith and Williams.
5. Remington's Pharmaceutical Sciences.
6. Martindale's extra pharmacopoeia.

7. Organic Chemistry by I.L. Finar, Vol. II.
8. The Organic Chemistry of Drug Synthesis by Lednicer, Vol. 1-5.
9. Indian Pharmacopoeia.
10. Text book of practical organic chemistry- A.I.Vogel.

BP602 T. PHARMACOLOGY-III (Theory)

45 Hours

Scope: This subject is intended to impart the fundamental knowledge on various aspects (classification, mechanism of action, therapeutic effects, clinical uses, side effects and contraindications) of drugs acting on respiratory and gastrointestinal system, infectious diseases, immuno-pharmacology and in addition,emphasis on the principles of toxicology and chronopharmacology.

Objectives: Upon completion of this course the student should be able to:

1. understand the mechanism of drug action and its relevance in the treatment of different infectious diseases
2. comprehend the principles of toxicology and treatment of various poisoningsand
3. appreciate correlation of pharmacology with related medical sciences.

Course Content:

UNIT-I **10hours**

1. Pharmacology of drugs acting on Respiratory system

a. Anti -asthmatic drugs
b. Drugs used in the management of COPD
c. Expectorants and antitussives
d. Nasal decongestants
e. Respiratory stimulants

2. Pharmacology of drugs acting on the Gastrointestinal Tract

a. Antiulcer agents.
b. Drugs for constipation and diarrhoea.
c. Appetite stimulants and suppressants.
d. Digestants and carminatives.
e. Emetics and anti-emetics.

UNIT-II **10hours**

3. Chemotherapy

a. General principles of chemotherapy.

b. Sulfonamides and cotrimoxazole.

c. Antibiotics- Penicillins, cephalosporins, chloramphenicol, macrolides, quinolones and fluoroquinolins, tetracycline and aminoglycosides

UNIT-III **10hours**

3. Chemotherapy

a. Antitubercular agents

b. Antileprotic agents

c. Antifungal agents

d. Antiviral drugs

e.Anthelmintics

f. Antimalarial drugs

g. Antiamoebic agents

UNIT-IV **08hours**

3. Chemotherapy

l. Urinary tract infections and sexually transmitted diseases.

m. Chemotherapy of malignancy.

4. Immunopharmacology

a. Immunostimulants

b. Immunosuppressant

Protein drugs, monoclonal antibodies, target drugs to antigen, biosimilars

UNIT-V **07hours**

5. Principles of toxicology

a. Definition and basic knowledge of acute, subacute and chronic toxicity.

b. Definition and basic knowledge of genotoxicity, carcinogenicity, teratogenicity and mutagenicity

c. General principles of treatment of poisoning

d. Clinical symptoms and management of barbiturates, morphine, organophosphosphorus compound and lead, mercury and arsenic poisoning.

6. Chronopharmacology

a. Definition of rhythm and cycles.

b. Biological clock and their significance leading to chronotherapy.

BP 608 P. PHARMACOLOGY-III (Practical)

4Hrs/Week

1. Dose calculation in pharmacological experiments
2. Antiallergic activity by mast cell stabilization assay
3. Study of anti-ulcer activity of a drug using pylorus ligand (SHAY) rat model and NSAIDS induced ulcer model.
4. Study of effect of drugs on gastrointestinal motility
5. Effect of agonist and antagonists on guinea pig ileum
6. Estimation of serum biochemical parameters by using semi- autoanalyser
7. Effect of saline purgative on frog intestine
8. Insulin hypoglycemic effect in rabbit
9. Test for pyrogens (rabbit method)
10. Determination of acute oral toxicity (LD50) of a drug from a given data
11. Determination of acute skin irritation / corrosion of a test substance
12. Determination of acute eye irritation / corrosion of a test substance
13. Calculation of pharmacokinetic parameters from a given data
14. Biostatistics methods in experimental pharmacology(student's t test, ANOVA)
15. Biostatistics methods in experimental pharmacology (Chi square test, Wilcoxon Signed Rank test)

**Experiments are demonstrated by simulated experiments/videos*

Recommended Books (Latest Editions)

1. Rang H. P., Dale M. M., Ritter J. M., Flower R. J., Rang and Dale's Pharmacology, Churchil Livingstone Elsevier
2. Katzung B. G., Masters S. B., Trevor A. J., Basic and clinical pharmacology, Tata Mc Graw-Hill
3. Goodman and Gilman's, The Pharmacological Basis of Therapeutics
4. Marry Anne K. K., Lloyd Yee Y., Brian K. A., Robbin L.C., Joseph G. B., Wayne A. K., Bradley R.W., Applied Therapeutics, The Clinical use of Drugs. The Point Lippincott Williams & Wilkins
5. Mycek M.J, Gelnet S.B and Perper M.M. Lippincott's Illustrated Reviews-Pharmacology
6. K.D.Tripathi. Essentials of Medical Pharmacology, , JAYPEE Brothers Medical Publishers (P) Ltd, New Delhi.
7. Sharma H. L., Sharma K. K., Principles of Pharmacology, Paras medical publisher Modern Pharmacology with clinical Applications, by Charles R.Craig& Robert,
8. Ghosh MN. Fundamentals of Experimental Pharmacology. Hilton & Company, Kolkata,
9. Kulkarni SK. Handbook of experimental pharmacology. VallabhPrakashan,
10. N.Udupa and P.D. Gupta, Concepts in Chronopharmacology.

BP 603 T. HERBAL DRUG TECHNOLOGY (Theory)

45 hours

Scope: This subject gives the student the knowledge of basic understanding of herbal drug industry, the quality of raw material, guidelines for quality of herbal drugs, herbal cosmetics, natural sweeteners, nutraceutical etc. The subject also emphasizes on Good Manufacturing Practices (GMP), patenting and regulatory issues of herbal drugs

Objectives: Upon completion of this course the student should be able to:

1. understand raw material as source of herbal drugs from cultivation to herbal drug product
2. know the WHO and ICH guidelines for evaluation of herbal drugs
3. know the herbal cosmetics, natural sweeteners, nutraceuticals
4. appreciate patenting of herbal drugs, GMP .

Course content:

UNIT-I **11 Hours**

Herbs as raw materials

Definition of herb, herbal medicine, herbal medicinal product, herbal drug preparation
Source of Herbs
Selection, identification and authentication of herbal materials
Processing of herbal raw material

Biodynamic Agriculture

Good agricultural practices in cultivation of medicinal plants including Organic farming.
Pest and Pest management in medicinal plants: Biopesticides/Bioinsecticides.

Indian Systems of Medicine

a) Basic principles involved in Ayurveda, Siddha, Unani and Homeopathy
b) Preparation and standardization of Ayurvedic formulations viz Aristas and Asawas, Ghutika,Churna, Lehya and Bhasma.

UNIT-II **7 Hours**

Nutraceuticals

General aspects, Market, growth, scope and types of products available in the market. Health benefits and role of Nutraceuticals in ailments like Diabetes, CVS diseases, Cancer, Irritable bowel syndrome and various Gastro intestinal diseases.
Study of following herbs as health food: Alfaalfa, Chicory, Ginger, Fenugreek, Garlic, Honey, Amla, Ginseng, Ashwagandha, Spirulina

Herbal-Drug and Herb-Food Interactions: General introduction to interaction and classification. Study of following drugs and their possible side effects and interactions: Hypercium, kava-kava, Ginkobiloba, Ginseng, Garlic, Pepper & Ephedra.

UNIT-III **10 Hours**

Herbal Cosmetics

Sources and description of raw materials of herbal origin used via, fixed oils, waxes, gums colours, perfumes, protective agents, bleaching agents, antioxidants in products such as skin care, hair care and oral hygiene products.

Herbal excipients:
Herbal Excipients – Significance of substances of natural origin as excipients – colorants, sweeteners, binders, diluents, viscosity builders, disintegrants, flavors & perfumes.

Herbal formulations :
Conventional herbal formulations like syrups, mixtures and tablets and Novel dosage forms like phytosomes

UNIT- IV **10 Hours**

Evaluation of Drugs WHO & ICH guidelines for the assessment of herbal drugs
Stability testing of herbal drugs.

Patenting and Regulatory requirements of natural products:
a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.

Regulatory Issues - Regulations in India (ASU DTAB, ASU DCC), Regulation of manufacture of ASU drugs - Schedule Z of Drugs & Cosmetics Act for ASU drugs.

UNIT-V **07 Hours**

General Introduction to Herbal Industry
Herbal drugs industry: Present scope and future prospects.
A brief account of plant based industries and institutions involved in work on medicinal and aromatic plants in India.

Schedule T – Good Manufacturing Practice of Indian systems of medicine
Components of GMP (Schedule – T) and its objectives
Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records.

BP 609 P. HERBAL DRUG TECHNOLOGY (Practical)

4 hours/ week

1. To perform preliminary phytochemical screening of crude drugs.
2. Determination of the alcohol content of Asava and Arista
3. Evaluation of excipients of natural origin
4. Incorporation of prepared and standardized extract in cosmetic formulations like creams, lotions and shampoos and their evaluation.
5. Incorporation of prepared and standardized extract in formulations like syrups, mixtures and tablets and their evaluation as per Pharmacopoeial requirements.
6. Monograph analysis of herbal drugs from recent Pharmacopoeias
7. Determination of Aldehyde content
8. Determination of Phenol content
9. Determination of total alkaloids

Recommended Books: (Latest Editions)

1. Textbook of Pharmacognosy by Trease & Evans.
2. Textbook of Pharmacognosy by Tyler, Brady & Robber.
3. Pharmacognosy by Kokate, Purohit and Gokhale
4. Essential of Pharmacognosy by Dr.S.H.Ansari
5. Pharmacognosy & Phytochemistry by V.D.Rangari
6. Pharmacopoeal standards for Ayurvedic Formulation (Council of Research in Indian Medicine & Homeopathy)
7. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.

BP 604 T. BIOPHARMACEUTICS AND PHARMACOKINETICS (Theory)

45 Hours

Scope: This subject is designed to impart knowledge and skills of Biopharmaceutics and pharmacokinetics and their applications in pharmaceutical development, design of dose and dosage regimen and in solving the problems arised therein.

Objectives: Upon completion of the course student shall be able to:

1. Understand the basic concepts in biopharmaceutics and pharmacokinetics and their significance.
2. Use of plasma drug concentration-time data to calculate the pharmacokinetic parameters to describe the kinetics of drug absorption, distribution, metabolism, excretion, elimination.
3. To understand the concepts of bioavailability and bioequivalence of drug products and their significance.

4. Understand various pharmacokinetic parameters, their significance & applications.

Course Content:

UNIT-I **10 Hours**

Introduction to Biopharmaceutics

Absorption; Mechanisms of drug absorption through GIT, factors influencing drug absorption though GIT, absorption of drug from Non per oral extra-vascular routes, **Distribution** Tissue permeability of drugs, binding of drugs, apparent, volume of drug distribution, plasma and tissue protein binding of drugs, factors affecting protein-drug binding. Kinetics of protein binding, Clinical significance of protein binding of drugs

UNIT- II **10 Hours**

Elimination: Drug metabolism and basic understanding metabolic pathways renal excretion of drugs, factors affecting renal excretion of drugs, renal clearance, Non renal routes of drug excretion of drugs

Bioavailability and Bioequivalence: Definition and Objectives of bioavailability, absolute and relative bioavailability, measurement of bioavailability, *in-vitro* drug dissolution models, *in-vitro-in-vivo* correlations, bioequivalence studies, methods to enhance the dissolution rates and bioavailability of poorly soluble drugs.

UNIT- III **10 Hours**

Pharmacokinetics: Definition and introduction to Pharmacokinetics, Compartment models, Non compartment models, physiological models, One compartment open model. (a). Intravenous Injection (Bolus) (b). Intravenous infusion and (c) Extra vascular administrations. Pharmacokinetics parameters - K_E ,t1/2,Vd,AUC,Ka, Clt and CL_R- definitions methods of eliminations, understanding of their significance and application

UNIT- IV **08 Hours**

Multicompartment models: Two compartment open model. IV bolus
Kinetics of multiple dosing, steady state drug levels, calculation of loading and mainetnance doses and their significance in clinical settins.

UNIT- V **07 Hours**

Nonlinear Pharmacokinetics: a. Introduction, b. Factors causing Non-linearity.
c. Michaelis-menton method of estimating parameters, Explanation with example of drugs.

Recommended Books: (Latest Editions)

1. Biopharmaceutics and Clinical Pharmacokinetics by, Milo Gibaldi.
2. Biopharmaceutics and Pharmacokinetics; By Robert F Notari
3. Applied biopharmaceutics and pharmacokinetics, Leon Shargel and Andrew B.C.YU 4th edition,Prentice-Hall Inernational edition.USA
4. Bio pharmaceutics and Pharmacokinetics-A Treatise, By D. M. Brahmankar and Sunil B.Jaiswal,Vallabh Prakashan Pitampura, Delhi
5. Pharmacokinetics: By Milo Glbaldi Donald, R. Mercel Dekker Inc.
6. Hand Book of Clinical Pharmacokinetics, By Milo Gibaldi and Laurie Prescott by ADIS Health Science Press.
7. Biopharmaceutics; By Swarbrick
8. Clinical Pharmacokinetics, Concepts and Applications: By Malcolm Rowland and
9. Thomas, N. Tozen, Lea and Febrger, Philadelphia, 1995.
10. Dissolution, Bioavailability and Bioequivalence, By Abdou H.M, Mack, Publishing Company,Pennsylvania 1989.
11. Biopharmaceutics and Clinical Pharmacokinetics-An introduction 4th edition Revised and expanded by Rebort F Notari Marcel Dekker Inn, New York and Basel, 1987.
12. Remington's Pharmaceutical Sciences, By Mack Publishing Company, Pennsylvnia

BP 605 T. PHARMACEUTICAL BIOTECHNOLOGY (Theory)

45 Hours

Scope:

- Biotechnology has a long promise to revolutionize the biological sciences and technology.
- Scientific application of biotechnology in the field of genetic engineering, medicine and fermentation technology makes the subject interesting.
- Biotechnology is leading to new biological revolutions in diagnosis, prevention and cure of diseases, new and cheaper pharmaceutical drugs.
- Biotechnology has already produced transgenic crops and animals and the future promises lot more.
- It is basically a research-based subject.

Objectives: Upon completion of the subject student shall be able to;

1. Understanding the importance of Immobilized enzymes in Pharmaceutical Industries
2. Genetic engineering applications in relation to production of pharmaceuticals
3. Importance of Monoclonal antibodies in Industries
4. Appreciate the use of microorganisms in fermentation technology

Unit I **10 Hours**

a) Brief introduction to Biotechnology with reference to Pharmaceutical Sciences.

b) Enzyme Biotechnology- Methods of enzyme immobilization and applications.

c) Biosensors- Working and applications of biosensors in Pharmaceutical Industries.

d) Brief introduction to Protein Engineering.

e) Use of microbes in industry. Production of Enzymes- General consideration - Amylase, Catalase, Peroxidase, Lipase, Protease, Penicillinase.

f) Basic principles of genetic engineering.

Unit II **10 Hours**

a) Study of cloning vectors, restriction endonucleases and DNA ligase.

b) Recombinant DNA technology. Application of genetic engineering in medicine.

c) Application of r DNA technology and genetic engineering in the production of:

i) Interferon ii) Vaccines- hepatitis- B iii) Hormones-Insulin.

d) Brief introduction to PCR

Unit III **10 Hours**

Types of immunity- humoral immunity, cellular immunity

a) Structure of Immunoglobulins

b) Structure and Function of MHC

c) Hypersensitivity reactions, Immune stimulation and Immune suppressions.

d) General method of the preparation of bacterial vaccines, toxoids, viral vaccine, antitoxins, serum-immune blood derivatives and other products relative to immunity.

e) Storage conditions and stability of official vaccines

f) Hybridoma technology- Production, Purification and Applications

g) Blood products and Plasma Substituties.

Unit IV **08Hours**

a) Immuno blotting techniques- ELISA, Western blotting, Southern blotting.

b) Genetic organization of Eukaryotes and Prokaryotes

c) Microbial genetics including transformation, transduction, conjugation, plasmids and transposons.

d) Introduction to Microbial biotransformation and applications.

e) Mutation: Types of mutation/mutants.

Unit V **07 Hours**

a) Fermentation methods and general requirements, study of media, equipments, sterilization methods, aeration process, stirring.

b) Large scale production fermenter design and its various controls.

c) Study of the production of - penicillins, citric acid, Vitamin B12, Glutamic acid, Griseofulvin,

d) Blood Products: Collection, Processing and Storage of whole human blood, dried human plasma, plasma Substituties.

Recommended Books (Latest edition):

1. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
2. RA Goldshy et. al., : Kuby Immunology.
3. J.W. Goding: Monoclonal Antibodies.
4. J.M. Walker and E.B. Gingold: Molecular Biology and Biotechnology by Royal

Society of Chemistry.
5. Zaborsky: Immobilized Enzymes, CRC Press, Degraland, Ohio.
6. S.B. Primrose: Molecular Biotechnology (Second Edition) Blackwell Scientific Publication.
7. Stanbury F., P., Whitakar A., and Hall J., S., Principles of fermentation technology, 2nd edition, Aditya books Ltd., New Delhi

BP606TPHARMACEUTICAL QUALITY ASSURANCE (Theory)

45 Hours

Scope: This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It deals with the important aspects like cGMP, QC tests, documentation, quality certifications and regulatory affairs.

Objectives: Upon completion of the course student shall be able to:

- understand the cGMP aspects in a pharmaceutical industry
- appreciate the importance of documentation
- understand the scope of quality certifications applicable to pharmaceutical industries
- understand the responsibilities of QA & QC departments

Course content:

UNIT – I **10 Hours**

Quality Assurance and Quality Management concepts: Definition and concept of Quality control, Quality assurance and GMP

Total Quality Management (TQM): Definition, elements, philosophies

ICH Guidelines: purpose, participants, process of harmonization, Brief overview of QSEM, with special emphasis on Q-series guidelines, ICH stability testing guidelines

Quality by design (QbD): Definition, overview, elements of QbD program, tools

ISO 9000 & ISO14000: Overview, Benefits, Elements, steps for registration

NABL accreditation : Principles and procedures

UNIT - II **10 Hours**

Organization and personnel: Personnel responsibilities, training, hygiene and personal records.

Premises: Design, construction and plant layout, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination.

Equipments and raw materials: Equipment selection, purchase specifications, maintenance, purchase specifications and maintenance of stores for raw materials.

UNIT – III **10 Hours**

Quality Control: Quality control test for containers, rubber closures and secondary packing

materials.

Good Laboratory Practices: General Provisions, Organization and Personnel, Facilities, Equipment, Testing Facilities Operation, Test and Control Articles, Protocol for Conduct of a Nonclinical Laboratory Study, Records and Reports, Disqualification of Testing Facilities

UNIT – IV **08 Hours**

Complaints: Complaints and evaluation of complaints, Handling of return good, recalling and waste disposal.

Document maintenance in pharmaceutical industry: Batch Formula Record, Master Formula Record, SOP, Quality audit, Quality Review and Quality documentation, Reports and documents, distribution records.

UNIT – V **07 Hours**

Calibration and Validation: Introduction, definition and general principles of calibration, qualification and validation, importance and scope of validation, types of validation, validation master plan. Calibration of pH meter, Qualification of UV-Visible spectrophotometer, General principles of Analytical method Validation.

Warehousing: Good warehousing practice, materials management

Recommended Books: (Latest Edition)

1. Quality Assurance Guide by organization of Pharmaceutical Products of India.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69.
3. Quality Assurance of Pharmaceuticals- A compendium of Guide lines and Related materials Vol I WHO Publications.
4. A guide to Total Quality Management- Kushik Maitra and Sedhan K Ghosh
5. How to Practice GMP's – P P Sharma.
6. ISO 9000 and Total Quality Management – Sadhank G Ghosh
7. The International Pharmacopoeia – Vol I, II, III, IV- General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excipients and Dosage forms
8. Good laboratory Practices – Marcel Deckker Series
9. ICH guidelines, ISO 9000 and 14000 guidelines

SEMESTER VII

BP701T. INSTRUMENTAL METHODS OF ANALYSIS (Theory)

45 Hours

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart a fundamental knowledge on the principles and instrumentation of spectroscopic and chromatographic technique. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

1. Understand the interaction of matter with electromagnetic radiations and its applications in drug analysis
2. Understand the chromatographic separation and analysis of drugs.
3. Perform quantitative & qualitative analysis of drugs using various analytical instruments.

Course Content:

UNIT –I **10 Hours**

UV Visible spectroscopy

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect on absorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi component analysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic states, internal and external conversions, factors affecting fluorescence, quenching, instrumentation and applications

UNIT –II **10 Hours**

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, sample handling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golay cell, Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Flame Photometry-Principle, interferences, instrumentation and applications

Atomic absorption spectroscopy- Principle, interferences, instrumentation and applications

Nepheloturbidometry- Principle, instrumentation and applications

UNIT –III **10 Hours**

Introduction to chromatography

Adsorption and partition column chromatography-Methodology, advantages, disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values, advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques, advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniques of paper, gel, capillary electrophoresis, applications

UNIT –IV **08 Hours**

Gas chromatography - Introduction, theory, instrumentation, derivatization, temperature programming, advantages, disadvantages and applications

High performance liquid chromatography (HPLC)-Introduction, theory, instrumentation, advantages and applications.

UNIT –V **07 Hours**

Ion exchange chromatography- Introduction, classification, ion exchange resins, properties, mechanism of ion exchange process, factors affecting ion exchange, methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications

Affinity chromatography- Introduction, theory, instrumentation and applications

BP705P. INSTRUMENTAL METHODS OF ANALYSIS (Practical)

4 Hours/Week

1. Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2. Estimation of dextrose by colorimetry
3. Estimation of sulfanilamide by colorimetry
4. Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5. Assay of paracetamol by UV- Spectrophotometry
6. Estimation of quinine sulfate by fluorimetry
7. Study of quenching of fluorescence
8. Determination of sodium by flame photometry
9. Determination of potassium by flame photometry
10. Determination of chlorides and sulphates by nephelo turbidometry
11. Separation of amino acids by paper chromatography
12. Separation of sugars by thin layer chromatography
13. Separation of plant pigments by column chromatography
14. Demonstration experiment on HPLC
15. Demonstration experiment on Gas Chromatography

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

BP 702 T. INDUSTRIAL PHARMACYII (Theory)

45 Hours

Scope: This course is designed to impart fundamental knowledge on pharmaceutical product development and translation from laboratory to market

Objectives: Upon completion of the course, the student shall be able to:

1. Know the process of pilot plant and scale up of pharmaceutical dosage forms
2. Understand the process of technology transfer from lab scale to commercial batch
3. Know different Laws and Acts that regulate pharmaceutical industry
4. Understand the approval process and regulatory requirements for drug products

Course Content:

UNIT-I **10 Hours**

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

UNIT-II **10 Hours**

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

UNIT-III **10 Hours**

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatory authorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs Professionals

Regulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

UNIT-IV **08 Hours**

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

UNIT-V **07 Hours**

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and State Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Recommended Books: (Latest Editions)

1. Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory_ Affairs.
2. International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php
3. Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for Prescription Drugs, Medical Devices, and Biologics' Second Edition.
4. Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

BP 703T. PHARMACY PRACTICE (Theory)

45 Hours

Scope: In the changing scenario of pharmacy practice in India, for successful practice of Hospital Pharmacy, the students are required to learn various skills like drug distribution, drug information, and therapeutic drug monitoring for improved patient care. In community pharmacy, students will be learning various skills such as dispensing of drugs, responding to minor ailments by providing suitable safe medication, patient counselling for improved patient care in the community set up.

Objectives: Upon completion of the course, the student shall be able to

1. know various drug distribution methods in a hospital
2. appreciate the pharmacy stores management and inventory control
3. monitor drug therapy of patient through medication chart review and clinical review
4. obtain medication history interview and counsel the patients
5. identify drug related problems
6. detect and assess adverse drug reactions
7. interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease states
8. know pharmaceutical care services
9. do patient counseling in community pharmacy;
10. appreciate the concept of Rational drug therapy.

Unit I: **10 Hours**

a) Hospital and it's organization

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

b) Hospital pharmacy and its organization

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, adverse interactions, and pharmacokinetic drug interactions, Methods for detecting

drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

d) Community Pharmacy

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

Unit II: 10 Hours

a) Drug distribution system in a hospital

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

b) Hospital formulary

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital formulary.

c) Therapeutic drug monitoring

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

d) Medication adherence

Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

e) Patient medication history interview

Need for the patient medication history interview, medication interview forms.

f) Community pharmacy management

Financial, materials, staff, and infrastructure requirements.

Unit III: 10 Hours

a) Pharmacy and therapeutic committee

Organization, functions, Policies of the pharmacy and therapeutic committee in including drugs into formulary, inpatient and outpatient prescription, automatic stop order, and emergency drug list preparation.

b) Drug information services

Drug and Poison information centre, Sources of drug information, Computerised services, and storage and retrieval of information.

c) Patient counseling

Definition of patient counseling; steps involved in patient counseling, and Special cases that require the pharmacist

d) Education and training program in the hospital

Role of pharmacist in the education and training program, Internal and external training program, Services to the nursing homes/clinics, Code of ethics for community pharmacy, and Role of pharmacist in the interdepartmental communication and community health education.

e) Prescribed medication order and communication skills

Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

Unit IV 8 Hours

a) Budget preparation and implementation

Budget preparation and implementation

b) Clinical Pharmacy

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions and responsibilities of clinical pharmacist, Drug therapy monitoring - medication chart review, clinical review, pharmacist intervention, Ward round participation, Medication history and Pharmaceutical care.

Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

c) Over the counter (OTC) sales

Introduction and sale of over the counter, and Rational use of common over the counter medications.

Unit V 7 Hours

a) Drug store management and inventory control

Organisation of drug store, types of materials stocked and storage conditions, Purchase and inventory control: principles, purchase procedure, purchase order, procurement and stocking, Economic order quantity, Reorder quantity level, and Methods used for the analysis of the drug expenditure

b) Investigational use of drugs

Description, principles involved, classification, control, identification, role of hospital pharmacist, advisory committee.

c) Interpretation of Clinical Laboratory Tests

Blood chemistry, hematology, and urinalysis

Recommended Books (Latest Edition):

1. Merchant S.H. and Dr. J.S.Quadry. *A textbook of hospital pharmacy*, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.
2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. *A textbook of Clinical Pharmacy Practice- essential concepts and skills,* 1st ed. Chennai: Orient Longman Private Limited; 2004.
3. William E. Hassan. *Hospital pharmacy*, 5th ed. Philadelphia: Lea & Febiger; 1986.
4. Tipnis Bajaj. *Hospital Pharmacy*, 1st ed. Maharashtra: Career Publications; 2008.
5. Scott LT. *Basic skills in interpreting laboratory data*, 4thed. American Society of Health System Pharmacists Inc; 2009.
6. Parmar N.S. *Health Education and Community Pharmacy,* 18th ed. India: CBS Publishers & Distributers; 2008.

Journals:

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

BP 704T: NOVEL DRUG DELIVERY SYSTEMS (Theory)

45 Hours

Scope: This subject is designed to impart basic knowledge on the area of novel drug delivery systems.

Objectives: Upon completion of the course student shall be able

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation

Course content:

Unit-I **10 Hours**

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates.Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

Unit-II **10 Hours**

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implantsand osmotic pump

Unit-III **10 Hours**

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

Unit-IV **08 Hours**

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

Unit-V **07 Hours**

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications

Recommended Books: (Latest Editions)

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)
5. International Journal of Pharmaceutics (Elsevier Sciences)

SEMESTER VIII

BP801T. BIOSTATISITCS AND RESEARCH METHODOLOGY (Theory)

45 Hours

Scope: To understand the applications of Biostatics in Pharmacy. This subject deals with descriptive statistics, Graphics, Correlation, Regression, logistic regression Probability theory, Sampling technique, Parametric tests, Non Parametric tests, ANOVA, Introduction to Design of Experiments, Phases of Clinical trials and Observational and Experimental studies, SPSS, R and MINITAB statistical software's, analyzing the statistical data using Excel**.**

Objectives: Upon completion of the course the student shall be able to

- Know the operation of M.S. Excel, SPSS, R and MINITAB®, DoE (Design of Experiment)
- Know the various statistical techniques to solve statistical problems
- Appreciate statistical techniques in solving the problems**.**

Course content:

Unit-I **10 Hours**

Introduction: Statistics, Biostatistics, Frequency distribution

Measures of central tendency: Mean, Median, Mode- Pharmaceutical examples

Measures of dispersion: Dispersion, Range, standard deviation, Pharmaceutical problems

Correlation: Definition, Karl Pearson's coefficient of correlation, Multiple correlation - Pharmaceuticals examples

Unit-II **10 Hours**

Regression: Curve fitting by the method of least squares, fitting the lines y= a + bx and x = a + by, Multiple regression, standard error of regression– Pharmaceutical Examples

Probability: Definition of probability, Binomial distribution, Normal distribution, Poisson's distribution, properties - problems

Sample, Population, large sample, small sample, Null hypothesis, alternative hypothesis, sampling, essence of sampling, types of sampling, Error-I type, Error-II type, Standard error of mean (SEM) - Pharmaceutical examples

Parametric test: t-test(Sample, Pooled or Unpaired and Paired) , ANOVA, (One way and Two way), Least Significance difference

Unit-III **10 Hours**

Non Parametric tests: Wilcoxon Rank Sum Test, Mann-Whitney U test, Kruskal-Wallis test, Friedman Test

Introduction to Research: Need for research, Need for design of Experiments, Experiential Design Technique, plagiarism

Graphs: Histogram, Pie Chart, Cubic Graph, response surface plot, Counter Plot graph

Designing the methodology: Sample size determination and Power of a study, Report writing and presentation of data, Protocol, Cohorts studies, Observational studies, Experimental studies, Designing clinical trial, various phases.

Unit-IV **8 Hours**

Blocking and confounding system for Two-level factorials

Regression modeling: Hypothesis testing in Simple and Multiple regressionmodels

Introduction to Practical components of Industrial and Clinical Trials Problems: Statistical Analysis Using Excel, SPSS, MINITAB®, DESIGN OF EXPERIMENTS, R - Online Statistical Software's to Industrial and Clinical trial approach

Unit-V **7Hours**

Design and Analysis of experiments:

Factorial Design: Definition, 2^2, 2^3design. Advantage of factorial design

Response Surface methodology: Central composite design, Historical design, Optimization Techniques

Recommended Books (Latest edition):

1. Pharmaceutical statistics- Practical and clinical applications, Sanford Bolton, publisher Marcel Dekker Inc. NewYork.
2. Fundamental of Statistics – Himalaya Publishing House- S.C.Guptha
3. Design and Analysis of Experiments –PHI Learning Private Limited, R. Pannerselvam,
4. Design and Analysis of Experiments – Wiley Students Edition, Douglas and C. Montgomery

BP 802T SOCIAL AND PREVENTIVE PHARMACY

Hours: 45

Scope:
The purpose of this course is to introduce to students a number of health issues and their challenges. This course also introduced a number of national health programmes. The roles of the pharmacist in these contexts are also discussed.

Objectives:
After the successful completion of this course, the student shall be able to:

- Acquire high consciousness/realization of current issuesrelated to health and pharmaceutical problems within the country and worldwide.
- Have a critical way of thinking based on current healthcare development.
- Evaluate alternative ways of solving problems related tohealth and pharmaceutical issues

Course content:

Unit I: 10 Hours

Concept of health and disease: Definition, concepts and evaluation of public health. Understanding the concept of prevention and control of disease, social causes of diseases and social problems of the sick.

Social and health education: Food in relation to nutrition and health, Balanced diet, Nutritional deficiencies, Vitamin deficiencies, Malnutrition and its prevention.

Sociology and health: Socio cultural factors related to health and disease, Impact of urbanization on health and disease, Poverty and health

Hygiene and health: personal hygiene and health care; avoidable habits

Unit II: 10 Hours

Preventive medicine: General principles of prevention and control of diseases such as cholera, SARS, Ebola virus, influenza, acute respiratory infections, malaria, chicken guinea, dengue, lymphatic filariasis, pneumonia, hypertension, diabetes mellitus, cancer, drug addiction-drug substance abuse

Unit III: 10 Hours

National health programs, its objectives, functioning and outcome of the following: HIV AND AIDS control programme, TB, Integrated disease surveillance program (IDSP), National leprosy control programme, National mental health program, National

programme for prevention and control of deafness, Universal immunization programme, National programme for control of blindness, Pulse polio programme.

Unit IV: **08 Hours**

National health intervention programme for mother and child, National family welfare programme, National tobacco control programme, National Malaria Prevention Program, National programme for the health care for the elderly, Social health programme; role of WHO in Indian national program

Unit V: **07 Hours**

Community services in rural, urban and school health: Functions of PHC, Improvement in rural sanitation, national urban health mission, Health promotion and education in school.

Recommended Books (Latest edition)*:*

1. Short Textbook of Preventive and Social Medicine, Prabhakara GN, 2nd Edition, 2010, ISBN: 9789380704104, JAYPEE Publications
2. Textbook of Preventive and Social Medicine (Mahajan and Gupta), Edited by Roy Rabindra Nath, Saha Indranil, 4th Edition, 2013, ISBN: 9789350901878, JAYPEE Publications
3. Review of Preventive and Social Medicine (Including Biostatistics), Jain Vivek, 6th Edition, 2014, ISBN: 9789351522331, JAYPEE Publications
4. Essentials of Community Medicine—A Practical Approach, Hiremath Lalita D, Hiremath Dhananjaya A, 2nd Edition, 2012, ISBN: 9789350250440, JAYPEE Publications
5. Park Textbook of Preventive and Social Medicine, K Park, 21st Edition, 2011, ISBN-14: 9788190128285, BANARSIDAS BHANOT PUBLISHERS.
6. Community Pharmacy Practice, Ramesh Adepu, BSP publishers, Hyderabad

Recommended Journals:

1. Research in Social and Administrative Pharmacy, Elsevier, Ireland

BP803ET. PHARMA MARKETING MANAGEMENT (Theory)

45 Hours

Scope:

The pharmaceutical industry not only needs highly qualified researchers, chemists and, technical people, but also requires skilled managers who can take the industry forward by managing and taking the complex decisions which are imperative for the growth of the industry. The Knowledge and Know-how of marketing management groom the people for taking a challenging role in Sales and Product management.

Course Objective: The course aims to provide an understanding of marketing concepts and techniques and their applications in the pharmaceutical industry.

Unit I **10 Hours**

Marketing:

Definition, general concepts and scope of marketing; Distinction between marketing & selling; Marketing environment; Industry and competitive analysis; Analyzing consumer buying behavior; industrial buying behavior.

Pharmaceutical market:

Quantitative and qualitative aspects; size and composition of the market; demographic descriptions and socio-psychological characteristics of the consumer; market segmentation& targeting.Consumer profile; Motivation and prescribing habits of the physician; patients' choice of physician and retail pharmacist.Analyzing the Market;Role of market research.

Unit II **10 Hours**

Product decision:

Classification, product line and product mix decisions, product life cycle,product portfolio analysis; product positioning; New product decisions; Product branding, packaging and labeling decisions, Product management in pharmaceutical industry.

Unit III **10 Hours**

Promotion:

Methods, determinants of promotional mix, promotional budget; An overview of personal selling, advertising, direct mail, journals, sampling, retailing, medical exhibition, public relations, online promotional techniques for OTC Products.

Unit IV **10 Hours**

Pharmaceutical marketing channels:

Designing channel, channel members, selecting the appropriate channel, conflict in channels, physical distribution management: Strategic importance, tasks in physical distribution management.

Professional sales representative (PSR):

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR.

Unit V **10 Hours**

Pricing:

Meaning, importance, objectives, determinants of price; pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order)and NPPA (National Pharmaceutical Pricing Authority).

Emerging concepts in marketing:

Vertical & Horizontal Marketing; RuralMarketing; Consumerism; Industrial Marketing; Global Marketing.

Recommended Books: (Latest Editions)

1. Philip Kotler and Kevin Lane Keller: Marketing Management, Prentice Hall of India, New Delhi
2. Walker, Boyd and Larreche : Marketing Strategy- Planning and Implementation, Tata MC GrawHill, New Delhi.
3. Dhruv Grewal and Michael Levy: Marketing, Tata MC Graw Hill
4. Arun Kumar and N Menakshi: Marketing Management, Vikas Publishing, India
5. Rajan Saxena: Marketing Management; Tata MC Graw-Hill (India Edition)
6. Ramaswamy, U.S & Nanakamari, S: Marketing Managemnt:Global Perspective, IndianContext,Macmilan India, New Delhi.
7. Shanker, Ravi: Service Marketing, Excell Books, New Delhi
8. Subba Rao Changanti, Pharmaceutical Marketing in India (GIFT – Excel series) Excel Publications.

BP804 ET: PHARMACEUTICAL REGULATORY SCIENCE (Theory)

45Hours

Scope: This course is designed to impart the fundamental knowledge on the regulatory requirements for approval of new drugs, and drug products in regulated markets of India & other countries like US, EU, Japan, Australia,UK etc. It prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products.

Objectives: Upon completion of the subject student shall be able to;

1. Know about the process of drug discovery and development
2. Know the regulatory authorities and agencies governing the manufacture and sale of pharmaceuticals
3. Know the regulatory approval process and their registration in Indian and international markets

Course content:

Unit I **10Hours**

New Drug Discovery and development

Stages of drug discovery, Drug development process, pre-clinical studies, non-clinical activities, clinical studies, Innovator and generics, Concept of generics, Generic drug product development.

Unit II **10Hours**

Regulatory Approval Process

Approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA). Changes to an approved NDA / ANDA.

Regulatory authorities and agencies

Overview of regulatory authorities of India, United States, European Union, Australia, Japan, Canada (Organization structure and types of applications)

Unit III **10Hours**

Registration of Indian drug product in overseas market

Procedure for export of pharmaceutical products, Technical documentation, Drug Master Files (DMF), Common Technical Document (CTD), electronic Common Technical

Document (eCTD), ASEAN Common Technical Document (ACTD)research.

Unit IV **08Hours**

Clinical trials

Developing clinical trial protocols, Institutional Review Board / Independent Ethics committee - formation and working procedures, Informed consent process and procedures, GCP obligations of Investigators, sponsors & Monitors, Managing and Monitoring clinical trials, Pharmacovigilance - safety monitoring in clinical trials

Unit V **07Hours**

Regulatory Concepts

Basic terminology, guidance, guidelines, regulations, Laws and Acts, Orange book, Federal Register, Code of Federal Regulatory, Purple book

Recommended books (Latest edition):

1. Drug Regulatory Affairs by Sachin Itkar, Dr. N.S. Vyawahare, Nirali Prakashan.
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences,Vol.185. Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
5. FDA Regulatory Affairs: a guide for prescription drugs, medical devices, and biologics /edited by Douglas J. Pisano, David Mantus.
6. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
7. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
8. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
9. Drugs: From Discovery to Approval, Second Edition By Rick Ng

BP 805T: PHARMACOVIGILANCE (Theory)

45 hours

Scope: This paper will provide an opportunity for the student to learn about development of pharmacovigilance as a science, basic terminologies used in pharmacovigilance, global scenario of Pharmacovigilance, train students on establishing pharmacovigilance programme in an organization, various methods that can be used to generate safety data and signal detection. This paper also develops the skills of classifying drugs, diseases and adverse drug reactions.

Objectives:

At completion of this paper it is expected that students will be able to (know, do, and appreciate):

1. Why drug safety monitoring is important?
2. History and development of pharmacovigilance
3. National and international scenario of pharmacovigilance
4. Dictionaries, coding and terminologies used in pharmacovigilance
5. Detection of new adverse drug reactions and their assessment
6. International standards for classification of diseases and drugs
7. Adverse drug reaction reporting systems and communication in pharmacovigilance
8. Methods to generate safety data during pre clinical, clinical and post approval phases of drugs' life cycle
9. Drug safety evaluation in paediatrics, geriatrics, pregnancy and lactation
10. Pharmacovigilance Program of India (PvPI) requirement for ADR reporting in India
11. ICH guidelines for ICSR, PSUR, expedited reporting, pharmacovigilance planning
12. CIOMS requirements for ADR reporting
13. Writing case narratives of adverse events and their quality.

Course Content

Unit I **10 Hours**

Introduction to Pharmacovigilance

- History and development of Pharmacovigilance
- Importance of safety monitoring of Medicine
- WHO international drug monitoring programme
- Pharmacovigilance Program of India(PvPI)

Introduction to adverse drug reactions

- Definitions and classification of ADRs
- Detection and reporting
- Methods in Causality assessment
- Severity and seriousness assessment
- Predictability and preventability assessment
- Management of adverse drug reactions

Basic terminologies used in pharmacovigilance

- Terminologies of adverse medication related events
- Regulatory terminologies

Unit II **10 hours**

Drug and disease classification

- Anatomical, therapeutic and chemical classification of drugs
- International classification of diseases
- Daily defined doses
- International Non proprietary Names for drugs

Drug dictionaries and coding in pharmacovigilance

- WHO adverse reaction terminologies
- MedDRA and Standardised MedDRA queries
- WHO drug dictionary
- Eudravigilance medicinal product dictionary

Information resources in pharmacovigilance

- Basic drug information resources
- Specialised resources for ADRs

Establishing pharmacovigilance programme

- Establishing in a hospital
- Establishment & operation of drug safety department in industry
- Contract Research Organisations (CROs)
- Establishing a national programme

Unit III **10 Hours**

Vaccine safety surveillance

- Vaccine Pharmacovigilance
- Vaccination failure
- Adverse events following immunization

Pharmacovigilance methods

- Passive surveillance – Spontaneous reports and case series
- Stimulated reporting
- Active surveillance – Sentinel sites, drug event monitoring and registries
- Comparative observational studies – Cross sectional study, case control study and cohort study
- Targeted clinical investigations

Communication in pharmacovigilance

- Effective communication in Pharmacovigilance
- Communication in Drug Safety Crisis management
- Communicating with Regulatory Agencies, Business Partners, Healthcare facilities & Media

Unit IV **8 Hours**

Safety data generation

- Pre clinical phase
- Clinical phase
- Post approval phase (PMS)

ICH Guidelines for Pharmacovigilance

- Organization and objectives of ICH
- Expedited reporting
- Individual case safety reports
- Periodic safety update reports
- Post approval expedited reporting
- Pharmacovigilance planning
- Good clinical practice in pharmacovigilance studies

Unit V **7 hours**

Pharmacogenomics of adverse drug reactions

- Genetics related ADR with example focusing PK parameters.

Drug safety evaluation in special population

- Paediatrics
- Pregnancy and lactation
- Geriatrics

CIOMS

- CIOMS Working Groups
- CIOMS Form

CDSCO (India) and Pharmacovigilance

- D&C Act and Schedule Y
- Differences in Indian and global pharmacovigilance requirements

Recommended Books (Latest edition):

1. Textbook of Pharmacovigilance: S K Gupta, Jaypee Brothers, Medical Publishers.
2. Practical Drug Safety from A to Z By Barton Cobert, Pierre Biron, Jones and Bartlett Publishers.
3. Mann's Pharmacovigilance:Elizabeth B. Andrews, Nicholas, Wiley Publishers.
4. Stephens' Detection of New Adverse Drug Reactions: John Talbot, Patrick Walle, Wiley Publishers.
5. An Introduction to Pharmacovigilance: Patrick Waller,Wiley Publishers.
6. Cobert's Manual of Drug Safety and Pharmacovigilance: Barton Cobert,Jones& Bartlett Publishers.
7. Textbook of Pharmacoepidemiolog edited by Brian L. Strom, Stephen E Kimmel, Sean Hennessy,Wiley Publishers.
8. A Textbook of Clinical Pharmacy Practice -Essential Concepts and Skills:G. Parthasarathi, Karin NyfortHansen,Milap C. Nahata
9. National Formulary of India
10. Text Book of Medicine by Yashpal Munjal

11. Text book of Pharmacovigilance: concept and practice by GP Mohanta and PK Manna

12. http://www.whoumc.org/DynPage.aspx?id=105825&mn1=7347&mn2=7259&mn3=7297
13. http://www.ich.org/
14. http://www.cioms.ch/
15. http://cdsco.nic.in/
16. http://www.who.int/vaccine_safety/en/
17. http://www.ipc.gov.in/PvPI/pv_home.html

BP 806 ET. QUALITY CONTROL AND STANDARDIZATION OF HERBALS (Theory)

Scope: In this subject the student learns about the various methods and guidelines for evaluation and standardization of herbs and herbal drugs. The subject also provides an opportunity for the student to learn cGMP, GAP and GLP in traditional system of medicines.

Objectives: Upon completion of the subject student shall be able to;

1. know WHO guidelines for quality control of herbal drugs
2. know Quality assurance in herbal drug industry
3. know the regulatory approval process and their registration in Indian and international markets
4. appreciate EU and ICH guidelines for quality control of herbal drugs

Unit I **10 hours**

Basic tests for drugs – Pharmaceutical substances, Medicinal plants materials and dosage forms

WHO guidelines for quality control of herbal drugs.

Evaluation of commercial crude drugs intended for use

Unit II **10 hours**

Quality assurance in herbal drug industry of cGMP, GAP, GMP and GLP in traditional system of medicine.

WHO Guidelines on current good manufacturing Practices (cGMP) for Herbal Medicines

WHO Guidelines on GACP for Medicinal Plants.

Unit III **10 hours**

EU and ICH guidelines for quality control of herbal drugs.

Research Guidelines for Evaluating the Safety and Efficacy of Herbal Medicines

Unit IV **08 hours**

Stability testing of herbal medicines.Application of various chromatographic techniques in standardization of herbal products.

Preparation of documents for new drug application and export registration

GMP requirements and Drugs & Cosmetics Act provisions.

Unit V **07 hours**

Regulatory requirements for herbal medicines.

WHO guidelines on safety monitoring of herbal medicines in pharmacovigilance systems

Comparison of various Herbal Pharmacopoeias.

Role of chemical and biological markers in standardization of herbal products

Recommended Books: (Latest Editions

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Rangari, V.D., Text book of Pharmacognosy and Phytochemistry Vol. I , Carrier Pub., 2006.
4. Aggrawal, S.S., Herbal Drug Technology. Universities Press, 2002.
5. EMEA. Guidelines on Quality of Herbal Medicinal Products/Traditional Medicinal Products,
6. Mukherjee, P.W. Quality Control of Herbal Drugs: An Approach to Evaluation of Botanicals. Business Horizons Publishers, New Delhi, India, 2002.
7. Shinde M.V., Dhalwal K., Potdar K., Mahadik K. Application of quality control principles to herbal drugs. International Journal of Phytomedicine 1(2009); p. 4-8.
8. WHO. Quality Control Methods for Medicinal Plant Materials, World Health Organization, Geneva, 1998. WHO. Guidelines for the Appropriate Use of Herbal Medicines. WHO Regional Publications, Western Pacific Series No 3, WHO Regional office for the Western Pacific, Manila, 1998.
9. WHO. The International Pharmacopeia, Vol. 2: Quality Specifications, 3rd edn. World Health Organization, Geneva, 1981.
10. WHO. Quality Control Methods for Medicinal Plant Materials. World Health Organization, Geneva, 1999.
11. WHO. WHO Global Atlas of Traditional, Complementary and Alternative Medicine. 2 vol. set. Vol. 1 contains text and Vol. 2, maps. World Health Organization, Geneva, 2005.
12. WHO. Guidelines on Good Agricultural and Collection Practices (GACP) for Medicinal Plants. World Health Organization, Geneva, 2004.

BP 807 ET. COMPUTER AIDED DRUG DESIGN (Theory)

45 Hours

Scope: This subject is designed to provide detailed knowledge of rational drug design process and various techniques used in rational drug design process.

Objectives: Upon completion of the course, the student shall be able to understand

- Design and discovery of lead molecules
- The role of drug design in drug discovery process
- The concept of QSAR and docking
- Various strategies to develop new drug like molecules.
- The design of new drug molecules using molecular modeling software

Course Content:

UNIT-I **10 Hours**

Introduction to Drug Discovery and Development

Stages of drug discovery and development

Lead discovery and Analog Based Drug Design

Rational approaches to lead discovery based on traditional medicine, Random screening, Non-random screening, serendipitous drug discovery, lead discovery based on drug metabolism, lead discovery based on clinical observation.

Analog Based Drug Design: Bioisosterism, Classification, Bioisosteric replacement. Any three case studies

UNIT-II **10 Hours**

Quantitative Structure Activity Relationship (QSAR)

SAR versus QSAR, History and development of QSAR, Types of physicochemical parameters, experimental and theoretical approaches for the determination of physicochemical parameters such as Partition coefficient, Hammet's substituent constant and Tafts steric constant. Hansch analysis, Free Wilson analysis, 3D-QSAR approaches like COMFA and COMSIA.

UNIT-III **10 Hours**

Molecular Modeling and virtual screening techniques

Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,

Molecular docking: Rigid docking, flexible docking, manual docking, Docking based screening. *De novo* drug design.

UNIT-IV **08 Hours**

Informatics & Methods in drug design

Introduction to Bioinformatics, chemoinformatics. ADME databases, chemical, biochemical and pharmaceutical databases.

UNIT-V **07 Hours**

Molecular Modeling: Introduction to molecular mechanics and quantum mechanics.Energy Minimization methods and Conformational Analysis, global conformational minima determination.

Recommended Books (Latest Editions)

1. Robert GCK, ed., "Drug Action at the Molecular Level" University Prak Press Baltimore.
2. Martin YC. "Quantitative Drug Design" Dekker, New York.
3. Delgado JN, Remers WA eds "Wilson & Gisvolds's Text Book of Organic Medicinal & Pharmaceutical Chemistry" Lippincott, New York.
4. Foye WO "Principles of Medicinal chemistry 'Lea & Febiger.
5. Koro lkovas A, Burckhalter JH. "Essentials of Medicinal Chemistry" Wiley Interscience.
6. Wolf ME, ed "The Basis of Medicinal Chemistry, Burger's Medicinal Chemistry" John Wiley & Sons, New York.
7. Patrick Graham, L., An Introduction to Medicinal Chemistry, Oxford University Press.
8. Smith HJ, Williams H, eds, "Introduction to the principles of Drug Design" Wright Boston.
9. Silverman R.B. "The organic Chemistry of Drug Design and Drug Action" Academic Press New York.

BP808ET: CELL AND MOLECULAR BIOLOGY (Elective subject)

45 Hours

Scope:

- Cell biology is a branch of biology that studies cells – their physiological properties, their structure, the organelles they contain, interactions with their environment, their life cycle, division, death and cell function.
- This is done both on a microscopic and molecular level.
- Cell biology research encompasses both the great diversity of single-celled organisms like bacteria and protozoa, as well as the many specialized cells in multi-cellular organismssuch as humans, plants, and sponges.

Objectives: Upon completion of the subject student shall be able to;

- Summarize cell and molecular biology history.
- Summarize cellular functioning and composition.
- Describe the chemical foundations of cell biology.
- Summarize the DNA properties of cell biology.
- Describe protein structure and function.
- Describe cellular membrane structure and function.
- Describe basic molecular genetic mechanisms.
- Summarize the Cell Cycle

Course content:

Unit I **10Hours**

a) Cell and Molecular Biology: Definitions theory and basics and Applications.
b) Cell and Molecular Biology: History and Summation.
c) Properties of cells and cell membrane.
d) Prokaryotic versus Eukaryotic
e) Cellular Reproduction
f) Chemical Foundations – an Introduction and Reactions (Types)

Unit II **10 Hours**

a) DNA and the Flow of Molecular Information
b) DNA Functioning
c) DNA and RNA
d) Types of RNA
e) Transcription and Translation

Unit III **10 Hours**

a) Proteins: Defined **and** Amino Acids
b) Protein Structure

c) Regularities in Protein Pathways
d) Cellular Processes
e) Positive Control and significance of Protein Synthesis

Unit IV **08 Hours**

a) Science of Genetics
b) Transgenics and Genomic Analysis
c) Cell Cycle analysis
d) Mitosis and Meiosis
e) Cellular Activities and Checkpoints

Unit V **07 Hours**

a) Cell Signals: Introduction
b) Receptors for Cell Signals
c) Signaling Pathways: Overview
d) Misregulation of Signaling Pathways
e) Protein-Kinases: Functioning

Recommended Books (latest edition):

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn., Industrial Microbiology, 4th edition, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. Malcolm Harris, Balliere Tindall and Cox: Pharmaceutical Microbiology.
5. Rose: Industrial Microbiology.
6. Probisher, Hinsdill et al: Fundamentals of Microbiology, 9th ed. Japan
7. Cooper and Gunn's: Tutorial Pharmacy, CBS Publisher and Distribution.
8. Peppler: Microbial Technology.
9. Edward: Fundamentals of Microbiology.
10. N.K.Jain: Pharmaceutical Microbiology, Vallabh Prakashan, Delhi
11. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company
12. B.R. Glick and J.J. Pasternak: Molecular Biotechnology: Principles and Applications of RecombinantDNA: ASM Press Washington D.C.
13. RA Goldshy et. al., : Kuby Immunology.

BP809ET. COSMETIC SCIENCE(Theory)

45Hours

UNIT I **10Hours**

Classification of cosmetic and cosmeceutical products

Definition of cosmetics as per Indian and EU regulations, Evolution of cosmeceuticals from cosmetics, cosmetics as quasi and OTC drugs

Cosmetic excipients: Surfactants, rheology modifiers, humectants, emollients, preservatives. Classification and application

Skin: Basic structure and function of skin.

Hair: Basic structure of hair. Hair growth cycle.

Oral Cavity: Common problem associated with teeth and gums**.**

UNIT II **10 Hours**

Principles of formulation and building blocks of skin care products:

Face wash,

Moisturizing cream, Cold Cream, Vanishing cream and their advantages and disadvantages.Application of these products in formulation of cosmecuticals.

Antiperspants & deodorants- Actives & mechanism of action.

Principles of formulation and building blocks of Hair care products:

Conditioning shampoo, Hair conditioner,anti-dandruff shampoo.

Hair oils.

Chemistry and formulation of Para-phylene diamine based hair dye.

Principles of formulation and building blocks of oral care products:

Toothpaste for bleeding gums, sensitive teeth. Teeth whitening, Mouthwash.

UNIT III **10 Hours**

Sun protection, Classification of Sunscreens and SPF.

Role of herbs in cosmetics:

Skin Care: Aloe and turmeric

Hair care: Henna and amla.

Oral care: Neem and clove

Analytical cosmetics: BIS specification and analytical methods for shampoo, skin-cream and toothpaste**.**

UNIT IV **08 Hours**.

Principles of Cosmetic Evaluation:Principles of sebumeter, corneometer. Measurement of TEWL, Skin Color, Hair tensile strength, Hair combing properties

Soaps,and syndet bars. Evolution and skin benfits.

UNIT V **07 Hours**

Oily and dry skin, causes leading to dry skin, skin moisturisation. Basic understanding of the terms Comedogenic, dermatitis.

Cosmetic problems associated with Hair and scalp: Dandruff, Hair fall causes

Cosmetic problems associated with skin: blemishes, wrinkles, acne, prickly heat and body odor.

Antiperspirants and Deodorants- Actives and mechanism of action

References

1) Harry's Cosmeticology, Wilkinson, Moore, Seventh Edition, George Godwin.
2) Cosmetics – Formulations, Manufacturing and Quality Control, P.P. Sharma, 4th Edition, Vandana Publications Pvt. Ltd., Delhi.
3) Text book of cosmelicology by Sanju Nanda & Roop K. Khar, Tata Publishers.

BP810 ET. PHARMACOLOGICAL SCREENING METHODS

45 Hours

Scope: This subject is designed to impart the basic knowledge of preclinical studies in experimental animals including design, conduct and interpretations of results.

Objectives

Upon completion of the course the student shall be able to,

- Appreciate the applications of various commonly used laboratory animals.
- Appreciate and demonstrate the various screening methods used in preclinical research
- Appreciate and demonstrate the importance of biostatistics and researchmethodology
- Design and execute a research hypothesis independently

Unit –I	**08 Hours**
Laboratory Animals: Study of CPCSEA and OECD guidelines for maintenance, breeding and conduct of experiments on laboratory animals, Common lab animals: Description and applications of different species and strains of animals. Popular transgenic and mutant animals. Techniques for collection of blood and common routes of drug administration in laboratory animals, Techniques of blood collection and euthanasia.	
Unit –II	**10 Hours**
Preclinical screening models a. Introduction: Dose selection, calculation and conversions, preparation of drug solution/suspensions, grouping of animals and importance of sham negative and positive control groups. Rationale for selection of animal species and sex for the study. b. **Study of screening animal models for** Diuretics, nootropics, anti-Parkinson's,antiasthmatics, **Preclinical screening models:** for CNS activity- analgesic, antipyretic,anti-inflammatory, general anaesthetics, sedative and hypnotics, antipsychotic, antidepressant, antiepileptic, antiparkinsonism, alzheimer's disease	

Unit –III **Preclinical screening models:** for ANS activity, sympathomimetics, sympatholytics, parasympathomimetics, parasympatholytics, skeletal muscle relaxants, drugs acting on eye, local anaethetics	
Unit –IV **Preclinical screening models:** for CVS activity- antihypertensives, diuretics, antiarrhythmic, antidyslepidemic, anti aggregatory, coagulants, and anticoagulants Preclinical screening models for other important drugs like antiulcer, antidiabetic, anticancer and antiasthmatics.	
Research methodology and Bio-statistics Selection of research topic, review of literature, research hypothesis and study design Pre-clinical data analysis and interpretation using Students 't' test and One-way ANOVA. Graphical representation of data	**05 Hours**

Recommended Books (latest edition):

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. CPCSEA guidelines for laboratory animal facility.
4. Drug discovery and Evaluation by Vogel H.G.
5. Drug Screening Methods by Suresh Kumar Gupta and S. K. Gupta
6. Introduction to biostatistics and research methods by PSS Sundar Rao and J Richard

BP 811 ET. ADVANCED INSTRUMENTATION TECHNIQUES

45 Hours

Scope: This subject deals with the application of instrumental methods in qualitative and quantitative analysis of drugs. This subject is designed to impart advanced knowledge on the principles and instrumentation of spectroscopic and chromatographic hyphenated techniques. This also emphasizes on theoretical and practical knowledge on modern analytical instruments that are used for drug testing.

Objectives: Upon completion of the course the student shall be able to

- understand the advanced instruments used and its applications in drug analysis
- understand the chromatographic separation and analysis of drugs.
- understand the calibration of various analytical instruments
- know analysis of drugs using various analytical instruments.

Course Content:

UNIT-I **10 Hours**

Nuclear Magnetic Resonance spectroscopy

Principles of H-NMR and C-NMR, chemical shift, factors affecting chemical shift, coupling constant, Spin - spin coupling, relaxation, instrumentation and applications

Mass Spectrometry- Principles, Fragmentation, Ionization techniques – Electron impact, chemical ionization, MALDI, FAB, Analyzers-Time of flight and Quadrupole, instrumentation, applications

UNIT-II **10 Hours**

Thermal Methods of Analysis: Principles, instrumentation and applications of ThermogravimetricAnalysis (TGA), Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC)

X-Ray Diffraction Methods: Origin of X-rays, basic aspects of crystals, X-ray

Crystallography, rotating crystal technique, single crystal diffraction,powder diffraction, structural elucidation and applications.

UNIT-III **10 Hours**

Calibration and validation-as per ICH and USFDA guidelines

Calibration of following Instruments

Electronic balance, UV-Visible spectrophotometer, IR spectrophotometer,

Fluorimeter, Flame Photometer, HPLC and GC

UNIT-IV **08 Hours**

Radio immune assay: Importance, various components, Principle, different methods, Limitation and Applications of Radio immuno assay

Extraction techniques:General principle and procedure involved in the solid phase extraction and liquid-liquid extraction

UNIT-V **07 Hours**

Hyphenated techniques-LC-MS/MS, GC-MS/MS, HPTLC-MS.

Recommended Books (Latest Editions)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

BP 812 ET. DIETARY SUPPLEMENTS AND NUTRACEUTICALS

No. of hours :3 **Tutorial:1** **Credit point:4**

Scope :

This subject covers foundational topic that are important for understanding the need and requirements of dietary supplements among different groups in the population.

Objective:

This module aims to provide an understanding of the concepts behind the theoretical applications of dietary supplements. By the end of the course, students should be able to :

1. Understand the need of supplements by the different group of people to maintain healthy life.
2. Understand the outcome of deficiencies in dietary supplements.
3. Appreciate the components in dietary supplements and the application.
4. Appreciate the regulatory and commercial aspects of dietary supplements including health claims.

UNIT I **07 hours**

a. Definitions of Functional foods, Nutraceuticals and Dietary supplements. Classification of Nutraceuticals, Health problems and diseases that can be prevented or cured by Nutraceuticals i.e. weight control, diabetes, cancer, heart disease, stress, osteoarthritis, hypertension etc.
b. Public health nutrition, maternal and child nutrition, nutrition and ageing, nutrition education in community.
c. Source, Name of marker compounds and their chemical nature, Medicinal uses and health benefits of following used as nutraceuticals/functional foods: Spirulina, Soyabean, Ginseng, Garlic, Broccoli, Gingko, Flaxseeds

UNIT II **15 hours**

Phytochemicals as nutraceuticals: Occurrence and characteristic features(chemical nature medicinal benefits) of following

a) Carotenoids- and -Carotene, Lycopene, Xanthophylls, leutin
b) Sulfides: Diallyl sulfides, Allyl trisulfide.
c) Polyphenolics: Reservetrol
d) Flavonoids- Rutin , Naringin, Quercitin, Anthocyanidins, catechins, Flavones
e) Prebiotics / Probiotics.: Fructo oligosaccharides, Lacto bacillum
f) Phyto estrogens : Isoflavones, daidzein, Geebustin, lignans
g) Tocopherols
h) Proteins, vitamins, minerals, cereal, vegetables and beverages as functional foods: oats, wheat bran, rice bran, sea foods, coffee, tea and the like.

UNIT III **07 hours**

a) Introduction to free radicals: Free radicals, reactive oxygen species, production of free radicals in cells, damaging reactions of free radicals on lipids, proteins, Carbohydrates, nucleic acids.

b) Dietary fibres and complex carbohydrates as functional food ingredients..

UNIT IV **10 hours**

a) Free radicals in Diabetes mellitus, Inflammation, Ischemic reperfusion injury, Cancer, Atherosclerosis, Free radicals in brain metabolism and pathology, kidney damage, muscle damage. Free radicals involvement in other disorders. Free radicals theory of ageing.

b) Antioxidants: Endogenous antioxidants – enzymatic and nonenzymatic antioxidant defence, Superoxide dismutase, catalase, Glutathione peroxidase, Glutathione Vitamin C, Vitamin E, - Lipoic acid, melatonin
Synthetic antioxidants: Butylated hydroxy Toluene, Butylated hydroxy Anisole.

c) Functional foods for chronic disease prevention

UNIT V **06 hours**

a) Effect of processing, storage and interactions of various environmental factors on the potential of nutraceuticals.

b) Regulatory Aspects; FSSAI, FDA, FPO, MPO, AGMARK. HACCP and GMPs on Food Safety. Adulteration of foods.

c) Pharmacopoeial Specifications for dietary supplements and nutraceuticals.

References:

1. Dietetics by Sri Lakshmi
2. Role of dietary fibres and neutraceuticals in preventing diseases by K.T Agusti and P.Faizal: BSPunblication.
3. Advanced Nutritional Therapies by Cooper. K.A., (1996).
4. The Food Pharmacy by Jean Carper, Simon & Schuster, UK Ltd., (1988).
5. Prescription for Nutritional Healing by James F.Balch and Phyllis A.Balch 2nd Edn., Avery Publishing Group, NY (1997).
6. G. Gibson and C.williams Editors *2000 Functional foods* Woodhead Publ.Co.London.
7. Goldberg, I. *Functional Foods*. 1994. Chapman and Hall, New York.
8. Labuza, T.P. 2000 Functional Foods and Dietary Supplements: Safety, Good Manufacturing Practice (GMPs) and Shelf Life Testing in *Essentials of Functional Foods* M.K. Sachmidl and T.P. Labuza eds. Aspen Press.
9. Handbook of Nutraceuticals and Functional Foods, Third Edition (Modern Nutrition)
10. Shils, ME, Olson, JA, Shike, M. 1994 *Modern Nutrition in Health and Disease*. Eighth edition. Lea and Febiger

Semester VIII – Elective course on Pharmaceutical Product Development

No of Hours: 3 Tutorial:1 Credit points:4

Unit-I **10 Hours**

Introduction to pharmaceutical product development, objectives, regulations related to preformulation, formulation development, stability assessment, manufacturing and quality control testing of different types of dosage forms

Unit-II **10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

i. Solvents and solubilizers
ii. Cyclodextrins and their applications
iii. Non - ionic surfactants and their applications
iv. Polyethylene glycols and sorbitols
v. Suspending and emulsifying agents
vi. Semi solid excipients

Unit-III **10 Hours**

An advanced study of Pharmaceutical Excipients in pharmaceutical product development with a special reference to the following categories

i. Tablet and capsule excipients
ii. Directly compressible vehicles
iii. Coat materials
iv. Excipients in parenteral and aerosols products
v. Excipients for formulation of NDDS

Selection and application of excipients in pharmaceutical formulations with specific industrial applications

Unit-IV **08 Hours**

Optimization techniques in pharmaceutical product development.A study of various optimization techniques for pharmaceutical product development with specific examples.Optimization by factorial designs and their applications.A study of QbD and its application in pharmaceutical product development.

Unit-V **07 Hours**

Selection and quality control testing of packaging materials for pharmaceutical product development- regulatory considerations.

Recommended Books (Latest editions)

1. Pharmaceutical Statistics Practical and Clinical Applications by Stanford Bolton, CharlesBon; Marcel Dekker Inc.
2. Encyclopedia of Pharmaceutical Technology, edited by James swarbrick, Third Edition,Informa Healthcare publishers.
3. Pharmaceutical Dosage Forms, Tablets, Volume II, edited by Herbert A. Lieberman andLeon Lachman; Marcel Dekker, Inc.
4. The Theory and Practice of Industrial Pharmacy, Fourth Edition, edited by Roop kKhar, S P Vyas, Farhan J Ahmad, Gaurav K Jain; CBS Publishers and Distributors Pvt.Ltd. 2013.
5. Martin's Physical Pharmacy and Pharmaceutical Sciences, Fifth Edition, edited by Patrick J. Sinko, BI Publications Pvt. Ltd.
6. Targeted and Controlled Drug Delivery, Novel Carrier Systems by S. P. Vyas and R. K.Khar, CBS Publishers and Distributors Pvt. Ltd, First Edition 2012.
7. Pharmaceutical Dosage Forms and Drug Delivery Systems, Loyd V. Allen Jr., Nicholas B.Popovich, Howard C. Ansel, 9th Ed. 40
8. Aulton's Pharmaceutics – The Design and Manufacture of Medicines, Michael E. Aulton,3rd Ed.
9. Remington – The Science and Practice of Pharmacy, 20th Ed.
10. Pharmaceutical Dosage Forms – Tablets Vol 1 to 3, A. Liberman, Leon Lachman andJoseph B. Schwartz
11. Pharmaceutical Dosage Forms – Disperse Systems Vol 1 to 3, H.A. Liberman, Martin, M.R and Gilbert S. Banker.
12. Pharmaceutical Dosage Forms – Parenteral Medication Vol 1 & 2, Kenneth E. Avis andH.A. Libermann.
13. Advanced Review Articles related to the topics.

2016

THE MASTER OF PHARMACY (M. PHARM.)

COURSE REGULATION 2014

(BASED ON NOTIFICATION IN THE GAZETTE OF INDIA NO. 362, DATED DECEMBER 11, 2014)

SCHEME AND SYLLABUS

PHARMACY COUNCIL OF INDIA
Combined Council's Building, Kotla Road,
Aiwan-E-Ghalib Marg, New Delhi-110 002.
Website : www.pci.nic.

Table of Contents

S.No.	Content	Page.No.
	Regulations	01
1.	Short Title and Commencement	01
2.	Minimum qualification for admission	01
3.	Duration of the program	01
4.	Medium of instruction and examinations	01
5.	Working days in each semester	01
6.	Attendance and progress	02
7.	Program/Course credit structure	02
8.	Academic work	03
9.	Course of study	03
10.	Program Committee	15
11.	Examinations/Assessments	16
12.	Promotion and award of grades	32
13.	Carry forward of marks	32
14.	Improvement of internal assessment	33
15.	Reexamination of end semester examinations	33
16.	Allowed to keep terms (ATKT)	33
17.	Grading of performances	33
18.	The Semester grade point average (SGPA)	34
19.	Cumulative Grade Point Average (CGPA)	34
20.	Declaration of class	35
21.	Project work	35
22.	Award of Ranks	36
23.	Award of degree	36
24.	Duration for completion of the program of study	36
25.	Revaluation I Retotaling of answer papers	36
26.	Re-admission after break of study	36
27.	Pharmaceutics (MPH)	37
28.	Industrial Pharmacy (MIP)	55
29.	Pharmaceutical Chemistry (MPC)	73
30.	Pharmaceutical Analysis (MPA)	98
31.	Pharmaceutical Quality Assurance (MQA)	119
32.	Pharmaceutical Regulatory Affairs (MRA)	142
33.	Pharmaceutical Biotechnology (MPB)	165
34.	Pharmacy Practice (MPP)	188
35.	Pharmacology (MPL)	209
36.	Pharmacognosy (MPG)	232
37.	Research Methodology & Biostatistics (MRM)	252

रजिस्ट्री सं० डी० एल०-33004/99 REGD. NO. D. L.-33004/99

भारत का राजपत्र
The Gazette of India

असाधारण
EXTRAORDINARY
भाग III—खण्ड 4
PART III—Section 4
प्राधिकार से प्रकाशित
PUBLISHED BY AUTHORITY

सं. 362] नई दिल्ली, बृहस्पतिवार, दिसम्बर 11, 2014/अग्रहायण 20, 1936
No. 362] NEW DELHI, THURSDAY, DECEMBER 11, 2014/AGRAHAYANA 20, 1936

PHARMACY COUNCIL OF INDIA

NOTIFICATION

New Delhi, the 10th December, 2014

The Master of Pharmacy (M.Pharm) Course Regulations, 2014

No. 14-136/ 2014-PCI.—In exercise of the powers conferred by Sections 10 and 18 of the Pharmacy Act, 1948 (8 of 1948), the Pharmacy Council of India, with the approval of the Central Government hereby makes the following regulations; namely–

CHAPTER –I:REGULATIONS

1. Short Title and Commencement

These regulations shall be called as "The Revised Regulations for the Master of Pharmacy (M. Pharm.)Degree Program - Credit Based Semester System (CBSS) of the Pharmacy Council of India, New Delhi". They shall come into effect from the Academic Year 2016-17. The regulations framed are subject to modifications from time to time by the authorities of the university.

2. Minimum qualification for admission

A Pass in the following examinations

a) B. Pharm Degree examination of an Indian university established by law in India from an institution approved by Pharmacy Council of India and has scored not less than 55 % of the maximum marks (aggregate of 4 years of B.Pharm.)

b) Every student, selected for admission to post graduate pharmacy program in any PCI approved institution should have obtained registration with the State Pharmacy Council or should obtain the same within one month from the date of his/her admission, failing which the admission of the candidate shall be cancelled.

Note: It is mandatory to submit a migration certificate obtained from the respective university where the candidate had passed his/her qualifying degree (B.Pharm.)

3. Duration of the program

The program of study for M.Pharm. shall extend over a period of four semesters (two academic years). The curricula and syllabi for the program shall be prescribed from time to time by Phamacy Council of India, New Delhi.

4. Medium of instruction and examinations

Medium of instruction and examination shall be in English.

5. Working days in each semester

Each semestershall consist of not less than 100 working days. The odd semesters shall be conducted from the month of June/July to November/December and the even semesters shall be conducted from the month of December/January to May/June in every calendar year.

6. Attendance and progress

A candidate is required to put in at least 80% attendance in individual courses considering theory and practical separately. The candidate shall complete the prescribed course satisfactorily to be eligible to appear for the respective examinations.

7. Program/Course credit structure

As per the philosophy of Credit Based Semester System, certain quantum of academic work viz. theory classes, practical classes, seminars, assignments, etc. are measured in terms of credits. On satisfactory completion of the courses, a candidate earns credits. The amount of credit associated with a course is dependent upon the number of hours of instruction per week in that course. Similarly the credit associated with any of the other academic, co/extra-curricular activities is dependent upon the quantum of work expected to be put in for each of these activities per week/per activity.

7.1. Credit assignment

7.1.1. Theory and Laboratory courses

Courses are broadly classified as Theory and Practical. Theory courses consist of lecture (L) and Practical (P) courses consist of hours spent in the laboratory. Credits (C) for a course is dependent on the number of hours of instruction per week in that course, and is obtained by using a multiplier of one (1) for lecture and a multiplier of half (1/2) for practical (laboratory) hours.Thus, for example, a theory course having four lectures per week throughout the semester carries a credit of 4. Similarly, a practical having four laboratory hours per week throughout semester carries a credit of 2.

The contact hours of seminars, assignments and research work shall be treated as that of practical courses for the purpose of calculating credits. i.e., the contact hours shall be multiplied by 1/2. Similarly, the contact hours of journal club, research work presentations and discussions with the supervisor shall be considered as theory course and multiplied by 1.

7.2. Minimum credit requirements

The minimum credit points required for the award of M. Pharm. degree is 95. However based on the credit points earned by the students under the head of co-curricular activities, a student shall earn a maximum of 100 credit points. These credits are divided into Theory courses, Practical, Seminars, Assignments,Research work, Discussions with the supervisor, Journal club and Co-Curricular activities over the duration of four semesters. The credits

are distributed semester-wise as shown in Table 14. Courses generally progress in sequence, building competencies and their positioning indicates certain academic maturity on the part of the learners. Learners are expected to follow the semester-wise schedule of courses given in the syllabus.

8. Academic work

A regular record of attendance both in Theory, Practical, Seminar, Assignment, Journal club, Discussion with the supervisor, Research work presentation and Dissertation shall be maintained by the department / teaching staff of respective courses.

9. Course of study

The specializations in M.Pharm program is given in Table 1.

Table – 1: List of M.Pharm. Specializations and their Code

S. No.	Specialization	Code
1.	Pharmaceutics	MPH
2.	Industrial Pharmacy	MIP
3.	Pharmaceutical Chemistry	MPC
4.	Pharmaceutical Analysis	MPA
5.	Pharmaceutical Quality Assurance	MQA
6.	Pharmaceutical Regulatory Affairs	MRA
7.	Pharmaceutical Biotechnology	MPB
8.	Pharmacy Practice	MPP
9.	Pharmacology	MPL
10.	Pharmacognosy	MPG

The course of study for M.Pharm specializations shall include Semester wise Theory & Practical as given in Table – 2 to 11. The number of hours to be devoted to each theory and practical course in any semester shall not be less than that shown in Table – 2 to 11.

Table – 2: Course of study for M. Pharm. (Pharmaceutics)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPH101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPH102T	Drug Delivery System	4	4	4	100
MPH103T	Modern Pharmaceutics	4	4	4	100
MPH104T	Regulatory Affair	4	4	4	100
MPH105P	Pharmaceutics Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPH201T	Molecular Pharmaceutics (Nano Tech and Targeted DDS)	4	4	4	100
MPH202T	Advanced Biopharmaceutics & Pharmacokinetics	4	4	4	100
MPH203T	Computer Aided Drug Delivery System	4	4	4	100
MPH204T	Cosmetic and Cosmeceuticals	4	4	4	100
MPH205P	Pharmaceutics Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 3: Course of study for M. Pharm. (Industrial Pharmacy)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MIP101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MIP102T	Pharmaceutical Formulation Development	4	4	4	100
MIP103T	Novel drug delivery systems	4	4	4	100
MIP104T	Intellectual Property Rights	4	4	4	100
MIP105P	Industrial Pharmacy Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MIP201T	Advanced Biopharmaceutics and Pharmacokinetics	4	4	4	100
MIP202T	Scale up and Technology Transfer	4	4	4	100
MIP203T	Pharmaceutical Production Technology	4	4	4	100
MIP204T	Entrepreneurship Management	4	4	4	100
MIP205P	Industrial Pharmacy Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 4: Course of study for M. Pharm. (Pharmaceutical Chemistry)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPC101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPC1012T	Advanced Organic Chemistry -I	4	4	4	100
MPC103T	Advanced Medicinal chemistry	4	4	4	100
MPC104T	Chemistry of Natural Products	4	4	4	100
MPC105P	Pharmaceutical Chemistry Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650
Semester II					
MPC201T	Advanced Spectral Analysis	4	4	4	100
MPC202T	Advanced Organic Chemistry -II	4	4	4	100
MPC203T	Computer Aided Drug Design	4	4	4	100
MPC204T	Pharmaceutical Process Chemistry	4	4	4	100
MPC205P	Pharmaceutical Chemistry Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 5: Course of study for M. Pharm. (Pharmaceutical Analysis)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPA102T	Advanced Pharmaceutical Analysis	4	4	4	100
MPA103T	Pharmaceutical Validation	4	4	4	100
MPA104T	Food Analysis	4	4	4	100
MPA105P	Pharmaceutical Analysis Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPA201T	Advanced Instrumental Analysis	4	4	4	100
MPA202T	Modern Bio-Analytical Techniques	4	4	4	100
MPA203T	Quality Control and Quality Assurance	4	4	4	100
MPA204T	Herbal and Cosmetic Analysis	4	4	4	100
MPA205P	Pharmaceutical Analysis Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 6: Course of study for M. Pharm. (Pharmaceutical Quality Assurance)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MQA101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MQA102T	Quality Management System	4	4	4	100
MQA103T	Quality Control and Quality Assurance	4	4	4	100
MQA104T	Product Development and Technology Transfer	4	4	4	100
MQA105P	Pharmaceutical Quality Assurance Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MQA201T	Hazards and Safety Management	4	4	4	100
MQA202T	Pharmaceutical Validation	4	4	4	100
MQA203T	Audits and Regulatory Compliance	4	4	4	100
MQA204T	Pharmaceutical Manufacturing Technology	4	4	4	100
MQA205P	Pharmaceutical Quality Assurance Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 7: Course of study for M. Pharm. (Regulatory Affairs)

Course Code	Course	Credit Hours	Credit Points	Hrs./ wk	Marks
Semester I					
MRA 101T	Good Regulatory Practices	4	4	4	100
MRA 102T	Documentation and Regulatory Writing	4	4	4	100
MRA 103T	Clinical Research Regulations	4	4	4	100
MRA 104T	Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	4	4	4	100
MRA 105P	Regulatory Affairs Practical I	12	6	12	150
	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650
Semester II					
MRA 201T	Regulatory Aspects of Drugs & Cosmetics	4	4	4	100
MRA 202T	Regulatory Aspects of Herbal & Biologicals	4	4	4	100
MRA 203T	Regulatory Aspects of Medical Devices	4	4	4	100
MRA 204T	Regulatory Aspects of Food & Nutraceuticals	4	4	4	100
MRA 205P	Regulatory Affairs Practical II	12	6	12	150
	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 8: Course of study for M. Pharm. (Pharmaceutical Biotechnology)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPB 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPB 102T	Microbial And Cellular Biology	4	4	4	100
MPB 103T	Bioprocess Engineering and Technology	4	4	4	100
MPB 104T	Advanced Pharmaceutical Biotechnology	4	4	4	100
MPB 105P	Pharmaceutical Biotechnology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPB 201T	Proteins and protein Formulation	4	4	4	100
MPB 202T	Immunotechnology	4	4	4	100
MPB 203T	Bioinformatics and Computer Technology	4	4	4	100
MPB 204T	Biological Evaluation of Drug Therapy	4	4	4	100
MPB 205P	Pharmaceutical Biotechnology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 9: Course of study for M. Pharm. (Pharmacy Practice)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPP 101T	Clinical Pharmacy Practice	4	4	4	100
MPP 102T	Pharmacotherapeutics-I	4	4	4	100
MPP 103T	Hospital & Community Pharmacy	4	4	4	100
MPP 104T	Clinical Research	4	4	4	100
MPP 105P	Pharmacy Practice Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPP 201T	Principles of Quality Use of Medicines	4	4	4	100
MPP 102T	Pharmacotherapeutics II	4	4	4	100
MPP 203T	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	4	4	4	100
MPP 204T	Pharmacoepidemiology & Pharmacoeconomics	4	4	4	100
MPP 205P	Pharmacy Practice Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 10: Course of study for (Pharmacology)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPL 101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPL 102T	Advanced Pharmacology-I	4	4	4	100
MPL 103T	Pharmacological and Toxicological Screening Methods-I	4	4	4	100
MPL 104T	Cellular and Molecular Pharmacology	4	4	4	100
MPL 105P	Pharmacology Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPL 201T	Advanced Pharmacology II	4	4	4	100
MPL 202T	Pharmacological and Toxicological Screening Methods-II	4	4	4	100
MPL 203T	Principles of Drug Discovery	4	4	4	100
MPL 204T	Experimental Pharmacology practical- II	4	4	4	100
MPL 205P	Pharmacology Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 11: Course of study for M. Pharm. (Pharmacognosy)

Course Code	Course	Credit Hours	Credit Points	Hrs./wk	Marks
Semester I					
MPG101T	Modern Pharmaceutical Analytical Techniques	4	4	4	100
MPG102T	Advanced Pharmacognosy-1	4	4	4	100
MPG103T	Phytochemistry	4	4	4	100
MPG104T	Industrial Pharmacognostical Technology	4	4	4	100
MPG105P	Pharmacognosy Practical I	12	6	12	150
-	Seminar/Assignment	7	4	7	100
Total		35	26	35	650
Semester II					
MPG201T	Medicinal Plant biotechnology	4	4	4	100
MPG102T	Advanced Pharmacognosy-II	4	4	4	100
MPG203T	Indian system of medicine	4	4	4	100
MPG204T	Herbal cosmetics	4	4	4	100
MPG205P	Pharmacognosy Practical II	12	6	12	150
-	Seminar/Assignment	7	4	7	100
	Total	35	26	35	650

Table – 12: Course of study for M. Pharm. III Semester
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
MRM 301T	Research Methodology and Biostatistics*	4	4
-	Journal club	1	1
-	Discussion / Presentation (Proposal Presentation)	2	2
-	Research Work	28	14
Total		35	21

* Non University Exam

Table – 13: Course of study for M. Pharm. IV Semester
(Common for All Specializations)

Course Code	Course	Credit Hours	Credit Points
-	Journal Club	1	1
-	Research Work	31	16
-	Discussion/Final Presentation	3	3
Total		35	20

Table – 14: Semester wise credits distribution

Semester	Credit Points
I	26
II	26
III	21
IV	20
Co-curricular Activities (Attending Conference, Scientific Presentations and Other Scholarly Activities)	Minimum=02 Maximum=07*
Total Credit Points	Minimum=95 Maximum=100*

*Credit Points for Co-curricular Activities

Table – 15: Guidelines for Awarding Credit Points for Co-curricular Activities

Name of the Activity	Maximum Credit Points Eligible / Activity
Participation in National Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	01
Participation in international Level Seminar/Conference/Workshop/Symposium/ Training Programs (related to the specialization of the student)	02
Academic Award/Research Award from State Level/National Agencies	01
Academic Award/Research Award from International Agencies	02
Research / Review Publication in National Journals (Indexed in Scopus / Web of Science)	01
Research / Review Publication in International Journals (Indexed in Scopus / Web of Science)	02

Note: International Conference: Held Outside India

International Journal: The Editorial Board Outside India

*The credit points assigned for extracurricular and or co-curricular activities shall be given by the Principals of the colleges and the same shall be submitted to the University. The criteria to acquire this credit point shall be defined by the colleges from time to time.

10. Program Committee

1. The M. Pharm. programme shall have a Programme Committee constituted by the Head of the institution in consultation with all the Heads of the departments.

2. The composition of the Programme Committee shall be as follows:
A teacher at the cadre of Professor shall be the Chairperson; One Teacher from eachM.Pharm specialization and four student representatives (two from each academic year), nominated by the Head of the institution.

3. Duties of the Programme Committee:
   i. Periodically reviewing the progress of the classes.
   ii. Discussing the problems concerning curriculum, syllabus and the conduct of classes.
   iii. Discussing with the course teachers on the nature and scope of assessment for the course and the same shall be announced to the students at the beginning of respective semesters.

iv. Communicating its recommendation to the Head of the institution on academic matters.
v. The Programme Committee shall meet at least twice in a semester preferably at the end of each sessionalexam and before the end semester exam.

11. Examinations/Assessments

The schemes for internal assessment and end semester examinations are given in Table – 16.

11.1. End semester examinations

The End Semester Examinations for each theory and practical coursethrough semesters I to IVshall beconducted by the respective university except for the subject with asterix symbol (*) in table I and II for which examinations shall be conducted by the subject experts at college level and the marks/grades shall be submitted to the university.

Tables – 1616 : Schemes for internal assessments and end semester

(Pharmaceutics- MPH)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPH 101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPH 102T	Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH 103T	Modern Pharmaceutics	10	15	1 Hr	25	75	3 Hrs	100
MPH 104T	Regulatory Affair	10	15	1 Hr	25	75	3 Hrs	100
MPH 105P	Pharmaceutics Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPH 201T	Molecular Pharmaceutics(Nano Tech and Targeted DDS)	10	15	1 Hr	25	75	3 Hrs	100
MPH 202T	Advanced Biopharmaceutics & Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MPH 203T	Computer Aided Drug Delivery System	10	15	1 Hr	25	75	3 Hrs	100
MPH	Cosmetic	10	15	1 Hr	25	75	3 Hrs	100

204T	and Cosmeceutic als							
MPH 205P	Pharmaceuti cs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 1717 : Schemes for internal assessments and end semester
(Industrial Pharmacy- MIP)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total			
			Marks	Duration		Marks	Duration	
SEMESTER I								
MIP101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MIP102T	Pharmaceutical Formulation Development	10	15	1 Hr	25	75	3 Hrs	100
MIP103T	Novel drug delivery systems	10	15	1 Hr	25	75	3 Hrs	100
MIP104T	Intellectual Property Rights	10	15	1 Hr	25	75	3 Hrs	100
MIP105P	Industrial Pharmacy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MIP201T	Advanced Biopharmaceutics and Pharmacokinetics	10	15	1 Hr	25	75	3 Hrs	100
MIP202T	Scale up and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MIP203T	Pharmaceutical Production Technology	10	15	1 Hr	25	75	3 Hrs	100
MIP204T	Entrepreneurship Management	10	15	1 Hr	25	75	3 Hrs	100

MIP205P	Industrial Pharmacy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

(Pharmaceutical Chemistry-MPC)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPC101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPC102T	Advanced Organic Chemistry -I	10	15	1 Hr	25	75	3 Hrs	100
MPC103T	Advanced Medicinal chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC104T	Chemistry of Natural Products	10	15	1 Hr	25	75	3 Hrs	100
MPC105P	Pharmaceutical Chemistry Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPC201T	Advanced Spectral Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPC202T	Advanced Organic Chemistry -II	10	15	1 Hr	25	75	3 Hrs	100
MPC203T	Computer Aided Drug Design	10	15	1 Hr	25	75	3 Hrs	100
MPC204T	Pharmaceutical Process Chemistry	10	15	1 Hr	25	75	3 Hrs	100
MPC205P	Pharmaceutic	20	30	6 Hrs	50	100	6	150

	al Chemistry Practical II						Hrs	
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 19: Schemes for internal assessments and end semester examinations (Pharmaceutical Analysis-MPA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total			
			Marks	Duration		Marks	Duration	
SEMESTER I								
MPA101T	Modern Pharmaceutical Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA102T	Advanced Pharmaceutical Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA103T	Pharmaceutical Validation	10	15	1 Hr	25	75	3 Hrs	100
MPA104T	Food Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA105P	Pharmaceutical Analysis-I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPA201T	Advanced Instrumental Analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA202T	Modern Bio-Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPA203T	Quality Control and Quality	10	15	1 Hr	25	75	3 Hrs	100

	Assurance							
MPA204T	Herbal and Cosmetic analysis	10	15	1 Hr	25	75	3 Hrs	100
MPA205P	Pharmaceutical Analysis-II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 20: Schemes for internal assessments and end semester examinations (Pharmaceutical Quality Assurance-MQA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total			
			Marks	Duration		Marks	Duration	
SEMESTER I								
MQA101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MQA102T	Quality Management System	10	15	1 Hr	25	75	3 Hrs	100
MQA103T	Quality Control and Quality Assurance	10	15	1 Hr	25	75	3 Hrs	100
MQA104T	Product Development and Technology Transfer	10	15	1 Hr	25	75	3 Hrs	100
MQA105P	Pharmaceutical Quality Assurance Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MQA201T	Hazards and Safety Management	10	15	1 Hr	25	75	3 Hrs	100
MQA202T	Pharmaceutical Validation	10	15	1 Hr	25	75	3 Hrs	100
MQA203T	Audits and Regulatory Compliance	10	15	1 Hr	25	75	3 Hrs	100
MQA204T	Pharmaceutical Manufacturing Technology	10	15	1 Hr	25	75	3 Hrs	100
MQA205P	Pharmaceutical Quality Assurance Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 21: Schemes for internal assessments and end semester examinations (Pharmaceutical Regulatory Affairs-MRA)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total			
			Marks	Duration		Marks	Duration	
SEMESTER I								
MRA101T	Good Pharmaceutical Practices	10	15	1 Hr	25	75	3 Hrs	100
MRA102T	Documentation and Regulatory Writing	10	15	1 Hr	25	75	3 Hrs	100
MRA103T	Clinical Research Regulations	10	15	1 Hr	25	75	3 Hrs	100
MRA104T	Regulations and Legislation for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals In India and Intellectual Property Rights	10	15	1 Hr	25	75	3 Hrs	100
MRA105T	Pharmaceutical Regulatory Affairs Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MRA201T	Regulatory Aspects of Drugs & Cosmetics	10	15	1 Hr	25	75	3 Hrs	100

MRA202T	Regulatory Aspects of Herbal & Biologicals	10	15	1 Hr	25	75	3 Hrs	100
MRA203T	Regulatory Aspects of Medical Devices	10	15	1 Hr	25	75	3 Hrs	100
MRA204T	Regulatory Aspects of Food & Nutraceuticals	10	15	1 Hr	25	75	3 Hrs	100
MRA205P	Pharmaceutical Regulatory Affairs Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 22: Schemes for internal assessments and end semester examinations (Pharmaceutical Biotechnology-MPB)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPB101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPB102T	Microbial And Cellular Biology	10	15	1 Hr	25	75	3 Hrs	100
MPB103T	Bioprocess Engineering and Technology	10	15	1 Hr	25	75	3 Hrs	100
MPB104T	Advanced Pharmaceutical Biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPB105P	Pharmaceutical Biotechnology Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPB201T	Proteins and protein Formulation	10	15	1 Hr	25	75	3 Hrs	100
MPB202T	Immunotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPB203T	Bioinformatics and Computer Technology	10	15	1 Hr	25	75	3 Hrs	100
MPB204T	Biological Evaluation of Drug Therapy	10	15	1 Hr	25	75	3 Hrs	100
MPB205P	Pharmaceutical Biotechnology Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 23: Schemes for internal assessments and end semester examinations (Pharmacy Practice-MPP)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPP101T	Clinical Pharmacy Practice	10	15	1 Hr	25	75	3 Hrs	100
MPP102T	Pharmacotherapeutics-I	10	15	1 Hr	25	75	3 Hrs	100
MPP103T	Hospital & Community Pharmacy	10	15	1 Hr	25	75	3 Hrs	100
MPP104T	Clinical Research	10	15	1 Hr	25	75	3 Hrs	100
MPP105P	Pharmacy Practice Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPP201T	Principles of Quality Use of Medicines	10	15	1 Hr	25	75	3 Hrs	100
MPP102T	Pharmacotherapeutics II	10	15	1 Hr	25	75	3 Hrs	100
MPP203T	Clinical Pharmacokinetics and Therapeutic Drug Monitoring	10	15	1 Hr	25	75	3 Hrs	100
MPP204T	Pharmacoepidemiology & Pharmacoeconomics	10	15	1 Hr	25	75	3 Hrs	100
MPP205P	Pharmacy Practice Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 24: Schemes for internal assessments and end semester examinations (Pharmacology-MPL)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPL101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPL102T	Advanced Pharmacology-I	10	15	1 Hr	25	75	3 Hrs	100
MPL103T	Pharmacological and Toxicological Screening Methods-I	10	15	1 Hr	25	75	3 Hrs	100
MPL104T	Cellular and Molecular Pharmacology	10	15	1 Hr	25	75	3 Hrs	100
MPL105P	Experimental Pharmacology - I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPL201T	Advanced Pharmacology II	10	15	1 Hr	25	75	3 Hrs	100
MPL102T	Pharmacological and Toxicological Screening Methods-II	10	15	1 Hr	25	75	3 Hrs	100
MPL203T	Principles of Drug Discovery	10	15	1 Hr	25	75	3 Hrs	100
MPL204T	Clinical research and pharmacovigilance	10	15	1 Hr	25	75	3 Hrs	100
MPL205P	Experimental Pharmacology - II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 25: Schemes for internal assessments and end semester examinations (Pharmacognosy-MPG)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER I								
MPG101T	Modern Pharmaceutical Analytical Techniques	10	15	1 Hr	25	75	3 Hrs	100
MPG102T	Advanced Pharmacognosy-I	10	15	1 Hr	25	75	3 Hrs	100
MPG103T	Phytochemistry	10	15	1 Hr	25	75	3 Hrs	100
MPG104T	Industrial Pharmacognostical Technology	10	15	1 Hr	25	75	3 Hrs	100
MPG105P	Pharmacognosy Practical I	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650
SEMESTER II								
MPG201T	Medicinal Plant biotechnology	10	15	1 Hr	25	75	3 Hrs	100
MPG102T	Advanced Pharmacognosy-II	10	15	1 Hr	25	75	3 Hrs	100
MPG203T	Indian system of medicine	10	15	1 Hr	25	75	3 Hrs	100
MPG204T	Herbal cosmetics	10	15	1 Hr	25	75	3 Hrs	100
MPG205P	Pharmacognosy Practical II	20	30	6 Hrs	50	100	6 Hrs	150
-	Seminar /Assignment	-	-	-	-	-	-	100
Total								650

Tables – 26: Schemes for internal assessments and end semester examinations (Semester III& IV)

Course Code	Course	Internal Assessment				End Semester Exams		Total Marks
		Continuous Mode	Sessional Exams		Total	Marks	Duration	
			Marks	Duration				
SEMESTER III								
MRM301T	Research Methodology and Biostatistics*	10	15	1 Hr	25	75	3 Hrs	100
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	50	-	-	50
-	Research work*	-	-	-	-	350	1 Hr	350
Total								525
SEMESTER IV								
-	Journal club	-	-	-	25	-	-	25
-	Discussion / Presentation (Proposal Presentation)	-	-	-	75	-	-	75
-	Research work and Colloquium	-	-	-	-	400	1 Hr	400
Total								500

*Non University Examination

11.2. Internal assessment: Continuous mode

The marks allocated for Continuous mode of Internal Assessment shall be awarded as per the scheme given below.

Table – 27: Scheme for awarding internal assessment: Continuous mode

Theory	
Criteria	Maximum Marks
Attendance (Refer Table – 28)	8
Student – Teacher interaction	2
Total	10
Practical	
Attendance (Refer Table – 28	10
Based on Practical Records, Regular viva voce, etc.	10
Total	20

Table – 28: Guidelines for the allotment of marks for attendance

Percentage of Attendance	Theory	Practical
95 – 100	8	10
90 – 94	6	7.5
85 – 89	4	5
80 – 84	2	2.5
Less than 80	0	0

11.2.1. Sessional Exams

Two sessional exams shall be conducted for each theory / practical course as per the schedule fixed by the college(s). The scheme of question paper for theory and practical sessional examinations is given in the table. The average marks of two sessional exams shall be computed for internal assessment as per the requirements given in tables.

12. Promotion and award of grades

A student shall be declared PASS and eligible for getting grade in a course of M.Pharm.programme if he/she secures at least 50% marks in that particular courseincluding internal assessment.

13. Carry forward of marks

In case a student fails to secure the minimum 50% in any Theory or Practical course as specified in 12, then he/she shall reappear for the end semester examination of that course. However his/her marks of the Internal Assessment shall be carried over and he/she shall be entitled for grade obtained by him/her on passing.

14. Improvement of internal assessment

A student shall have the opportunity to improve his/her performance only once in the sessional exam component of the internal assessment. The re-conduct of the sessional exam shall be completed before the commencement of next end semester theory examinations.

15. Reexamination of end semester examinations

Reexamination of end semester examination shall be conducted as per the schedule given in table 29. The exact dates of examinations shall be notified from time to time.

Table – 29: Tentative schedule of end semester examinations

Semester	For Regular Candidates	For Failed Candidates
I and III	November / December	May / June
II and IV	May / June	November / December

16. Allowed to keep terms (ATKT):

No student shall be admitted to any examination unless he/she fulfills the norms given in 6. ATKT rules are applicable as follows:

A student shall be eligible to carry forward all the courses of I and IIsemesters till the III semester examinations. However, he/she shall not be eligible to attend the courses of IV semester until all the courses of I, II and III semesters are successfully completed.

A student shall be eligible to get his/her CGPA upon successful completion of the courses of I to IV semesters within the stipulated time period as per the norms.

Note: Grade AB should be considered as failed and treated as one head for deciding ATKT. Such rules are also applicable for those students who fail to register for examination(s) of any course in any semester.

17. Grading of performances

17.1. Letter grades and grade points allocations:

Based on the performances, each student shall be awarded a final letter grade at the end of the semester for each course.The letter grades and their corresponding grade points are given in Table – 30.

Table – 30: Letter grades and grade points equivalent to Percentage of marks and performances

Percentage of Marks Obtained	Letter Grade	Grade Point	Performance
90.00 – 100	O	10	Outstanding
80.00 – 89.99	A	9	Excellent
70.00 – 79.99	B	8	Good
60.00 – 69.99	C	7	Fair
50.00 – 59.99	D	6	Average
Less than 50	F	0	Fail
Absent	AB	0	Fail

A learner who remains absent for any end semester examination shall be assigned a letter grade of AB and a corresponding grade point of zero. He/she should reappear for the said evaluation/examination in due course.

18. The Semester grade point average (SGPA)

The performance of a student in a semester is indicated by a number called 'Semester Grade Point Average' (SGPA). The SGPA is the weighted average of the grade points obtainedin all the courses by the student during the semester. For example, if a student takes five courses (Theory/Practical) in a semester with credits C1, C2, C3 and C4 and the student's grade points in these courses are G1, G2, G3 and G4, respectively, and then students' SGPA is equal to:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4G_4}{C_1 + C_2 + C_3 + C_4}$$

The SGPA is calculated to two decimal points. It should be noted that, the SGPA for any semester shall take into consideration the F and ABS grade awarded in that semester. For example if a learner has a F or ABS grade in course 4, theSGPA shall then be computed as:

$$SGPA = \frac{C_1G_1 + C_2G_2 + C_3G_3 + C_4 * ZERO}{C_1 + C_2 + C_3 + C_4}$$

19. Cumulative Grade Point Average (CGPA)

The CGPA is calculated with the SGPA of all the IV semesters to two decimal points and is indicated in final grade report card/final transcript showing the grades of all IV semesters and their courses. The CGPA shall reflect the failed statusin case of F grade(s), till the course(s) is/are passed. When the course(s) is/are passedby obtaining a pass grade on subsequent examination(s) theCGPA

shall only reflect the new grade and not the fail grades earned earlier.The CGPA is calculated as:

$$CGPA = \frac{C_1S_1 + C_2S_2 + C_3S_3 + C_4S_4}{C_1 + C_2 + C_3 + C_4}$$

where C_1, C_2, C_3,.... is the total number of credits for semester I,II,III,.... and S_1,S_2, S_3,....is the SGPA of semester I,II,III,.... .

20. Declaration of class

The class shall be awarded on the basis of CGPA as follows:

First Class with Distinction	= CGPA of. 7.50 and above
First Class	= CGPA of 6.00 to 7.49
Second Class	= CGPA of 5.00 to 5.99

21. Project work

All the students shall undertake a project under the supervision of a teacher in Semester III to IV and submit a report. 4 copies of the project report shall be submitted (typed & bound copy not less than 75 pages).

The internal and external examiner appointed by the University shall evaluate the project at the time of the Practical examinations of other semester(s). The projects shall be evaluated as per the criteria given below.

Evaluation of Dissertation Book:

Objective(s) of the work done	50 Marks
Methodology adopted	150 Marks
Results and Discussions	250 Marks
Conclusions and Outcomes	50 Marks
Total	500 Marks

Evaluation of Presentation:

Presentation of work	100 Marks
Communication skills	50 Marks
Question and answer skills	100 Marks
Total	250 Marks

22. Award of Ranks

Ranks and Medals shall be awarded on the basis of final CGPA. However, candidates who fail in one or more courses during the M.Pharm program shall not be eligible for award of ranks. Moreover, the candidates should have completed the M. Pharm program in minimum prescribed number of years, (two years) for the award of Ranks.

23. Award of degree

Candidates who fulfill the requirements mentioned above shall be eligible for award of degree during the ensuing convocation.

24. Duration for completion of the program of study

The duration for the completion of the program shall be fixed as double the actual duration of the program and the students have to pass within the said period, otherwise they have to get fresh Registration.

25. Revaluation I Retotaling of answer papers

There is no provision for revaluation of the answer papers in any examination. However, the candidates can apply for retotaling by paying prescribed fee.

26. Re-admission after break of study

Candidate who seeks re-admission to the program after break of study has to get the approval from the university by paying a condonation fee.

PHARMACEUTICS(MPH)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES
(MPH 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 HOURS

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. — 11 Hrs

   b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

   c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy. — 11 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	11 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography	11 Hrs
5	a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray diffraction methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	11 Hrs
6	Immunological assays : RIA (Radio immuno assay), ELISA, Bioluminescence assays.	5 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

DRUG DELIVERY SYSTEMS
(MPH 102T)

SCOPE

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

OBJECTIVES

Upon completion of the course, student shall be able to understand

The various approaches for development of novel drug delivery systems.

The criteria for selection of drugs and polymers for the development of delivering system

The formulation and evaluation of Novel drug delivery systems..

THEORY 60 Hrs

1.	Sustained Release(SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/ disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: introduction, definition, classification, properties and application Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy.	10 Hrs
2	Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems;Mechanically activated, pH activated, Enzyme activated, and Osmotic activated Drug Delivery Systems Feedback regulated Drug Delivery Systems; Principles & Fundamentals.	10 Hrs
3	Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. Buccal Drug Delivery Systems: Principle of muco adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.	10 Hrs
4	Occular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.	06 Hrs

5	Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.	10 Hrs
6	Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules.	08 Hrs
7	Vaccine delivery systems: Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	06 Hrs

REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded,
Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., New York, 1992.
3. Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by WileyInterscience Publication, John Wiley and Sons, Inc, New York! Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002

JOURNALS

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian drugs (IDMA)
3. Journal of controlled release (Elsevier Sciences) desirable
4. Drug Development and Industrial Pharmacy (Marcel & Decker) desirable

MODERN PHARMACEUTICS
(MPH 103T)

Scope

Course designed to impart advanced knowledge and skills required to learn various aspects and concepts at pharmaceutical industries

Objectives

Upon completion of the course, student shall be able to understand

- The elements of preformulation studies.
- The Active Pharmaceutical Ingredients and Generic drug Product development
- Industrial Management and GMP Considerations.
- Optimization Techniques & Pilot Plant Scale Up Techniques
- Stability Testing, sterilization process & packaging of dosage forms.

THEORY 60 HRS

1.	a. Preformation Concepts – Drug Excipient interactions - different methods, kinetics of stability, Stability testing. Theories of dispersion and pharmaceutical Dispersion (Emulsion and Suspension, SMEDDS) preparation and stability Large and small volume parental - physiological and formulation consideration, Manufacturing and evaluation.	10 Hrs
	b. Optimization techniques in Pharmaceutical Formulation: Concept and parameters of optimization, Optimization techniques in pharmaceutical formulation and processing. Statistical design, Response surface method, Contour designs, Factorial designs and application in formulation	10 Hrs
2	Validation : Introduction to Pharmaceutical Validation, Scope & merits of Validation, Validation and calibration of Master plan, ICH & WHO guidelines for calibration and validation of equipments, Validation of specific dosage form, Types of validation. Government regulation, Manufacturing Process Model, URS, DQ, IQ, OQ & P.Q. of facilities.	10 Hrs
3	cGMP & Industrial Management: Objectives and policies of current good manufacturing practices, layout of buildings, services, equipments and their maintenance Production management: Production organization, , materials management, handling and transportation, inventory management and control, production and planning control, Sales forecasting, budget and cost control, industrial and personal relationship. Concept of Total Quality Management.	10 Hrs

4	Compression and compaction: Physics of tablet compression, compression, consolidation, effect of friction, distribution of forces, compaction profiles. Solubility.	10 Hrs
5	Study of consolidation parameters; Diffusion parameters, Dissolution parameters and Pharmacokinetic parameters, Heckel plots, Similarity factors – f2 and f1, Higuchi and Peppas plot, Linearity Concept of significance, Standard deviation , Chi square test, students T-test , ANOVA test.	10 Hrs

REFERENCES

1. Theory and Practice of Industrial Pharmacy By Lachmann and Libermann
2. Pharmaceutical dosage forms: Tablets Vol. 1-3 by Leon Lachmann.
3. Pharmaceutical Dosage forms: Disperse systems, Vol, 1-2; By Leon Lachmann.
4. Pharmaceutical Dosage forms: Parenteral medications Vol. 1-2; By Leon Lachmann.
5. Modern Pharmaceutics; By Gillbert and S. Banker.
6. Remington's Pharmaceutical Sciences.
7. Advances in Pharmaceutical Sciences Vol. 1-5; By H.S. Bean & A.H. Beckett.
8. Physical Pharmacy; By Alfred martin
9. Bentley's Textbook of Pharmaceutics – by Rawlins.
10. Good manufacturing practices for Pharmaceuticals: A plan for total quality control, Second edition; By Sidney H. Willig.
11. Quality Assurance Guide; By Organization of Pharmaceutical producers of India.
12. Drug formulation manual; By D.P.S. Kohli and D.H.Shah. Eastern publishers, New Delhi.
13. How to practice GMPs; By P.P.Sharma. Vandhana Publications, Agra.
14. Pharmaceutical Process Validation; By Fra. R. Berry and Robert A. Nash.
15. Pharmaceutical Preformulations; By J.J. Wells.
16. Applied production and operations management; By Evans, Anderson, Sweeney and Williams.
17. Encyclopaedia of Pharmaceutical technology, Vol I – III.

REGULATORY AFFAIRS
(MPH 104T)

Scope

Course designed to impart advanced knowledge and skills required to learn the concept of generic drug and their development, various regulatory filings in different countries, different phases of clinical trials and submitting regulatory documents : filing process of IND, NDA and ANDA

- To know the approval process of
- To know the chemistry, manufacturing controls and their regulatory importance
- To learn the documentation requirements for
- To learn the importance and

Objectives:

Upon completion of the course, it is expected that the students will be able to understand

- The Concepts of innovator and generic drugs, drug development process
- The Regulatory guidance's and guidelines for filing and approval process
- Preparation of Dossiers and their submission to regulatory agencies in different countries
- Post approval regulatory requirements for actives and drug products
- Submission of global documents in CTD/ eCTD formats
- Clinical trials requirements for approvals for conducting clinical trials
- Pharmacovigilence and process of monitoring in clinical trials.

THEORY 60 Hrs

1. a. Documentation in Pharmaceutical industry: Master formula record, DMF (Drug Master File), distribution records. Generic drugs product development Introduction , Hatch-Waxman act and amendments, CFR (CODE OF FEDERAL REGULATION) ,drug product performance, in-vitro, ANDA regulatory approval process, NDA approval process, BE and drug product assessment, in –vivo, scale up process approval changes, post marketing surveillance, outsourcing BA and BE to CRO. 12 Hrs

   b. Regulatory requirement for product approval: API, biologics, novel, therapies obtaining NDA, ANDA for generic drugs ways and means of US registration for foreign drugs

2	CMC, post approval regulatory affairs. Regulation for combination products and medical devices.CTD and ECTD format, industry and FDA liaison. ICH - Guidelines of ICH-Q, S E, M. Regulatory requirements of EU, MHRA, TGA and ROW countries.	12 Hrs
3	Non clinical drug development: Global submission of IND, NDA, ANDA. Investigation of medicinal products dossier, dossier (IMPD) and investigator brochure (IB).	12 Hrs
4	Clinical trials: Developing clinical trial protocols. Institutional review board/ independent ethics committee Formulation and working procedures informed Consent process and procedures. HIPAA- new, requirement to clinical study process, pharmacovigilance safety monitoring in clinical trials.	12 Hrs

REFERENCES

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and IsaderKaufer,Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P.Martin, Drugs and the Pharmaceutical Sciences,Vol.185, Informa Health care Publishers.
3. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD,5th edition, Drugs and the Pharmaceutical Sciences,Vol.190.
4. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons.Inc.
5. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics/edited By Douglas J. Pisano, David Mantus.
6. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A.Rozovsky and Rodney K. Adams
7. www.ich.org/
8. www.fda.gov/
9. europa.eu/index_en.htm
10. https://www.tga.gov.au/tga-basics

PHARMACEUTICS PRACTICALS - I
(MPH 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. To perform In-vitro dissolution profile of CR/ SR marketed formulation
8. Formulation and evaluation of sustained release matrix tablets
9. Formulation and evaluation osmotically controlled DDS
10. Preparation and evaluation of Floating DDS- hydro dynamically balanced DDS
11. Formulation and evaluation of Muco adhesive tablets.
12. Formulation and evaluation of trans dermal patches.
13. To carry out preformulation studies of tablets.
14. To study the effect of compressional force on tablets disintegration time.
15. To study Micromeritic properties of powders and granulation.
16. To study the effect of particle size on dissolution of a tablet.
17. To study the effect of binders on dissolution of a tablet.
18. To plot Heckal plot, Higuchi and peppas plot and determine similarity factors.

MOLECULAR PHARMACEUTICS (NANO TECHNOLOGY & TARGETED DDS) (NTDS)
(MPH 201T)

Scope

This course is designed to impart knowledge on the area of advances in novel drug delivery systems.

Objectives

Upon completion of the course student shall be able to understand

- The various approaches for development of novel drug delivery systems.
- The criteria for selection of drugs and polymers for the development of NTDS
- The formulation and evaluation of novel drug delivery systems.

THEORY 60 Hrs

1.	Targeted Drug Delivery Systems: Concepts, Events and biological process involved in drug targeting. Tumor targeting and Brain specific delivery.	12 Hrs
2	Targeting Methods: introduction preparation and evaluation. Nano Particles & Liposomes: Types, preparation and evaluation.	12 Hrs
3	Micro Capsules / Micro Spheres: Types, preparation and evaluation , Monoclonal Antibodies ; preparation and application, preparation and application of Niosomes, Aquasomes, Phytosomes, Electrosomes.	12 Hrs
4	Pulmonary Drug Delivery Systems : Aerosols, propellents, ContainersTypes, preparation and evaluation, Intra Nasal Route Delivery systems; Types, preparation and evaluation.	12 Hrs
5	Nucleic acid based therapeutic delivery system : Gene therapy, introduction (ex-vivo & in-vivo gene therapy). Potential target diseases for gene therapy (inherited disorder and cancer). Gene expression systems (viral and nonviral gene transfer). Liposomal gene delivery systems. Biodistribution and Pharmacokinetics. knowledge of therapeutic antisense molecules and aptamers as drugs of future.	12 Hrs

REFERENCES

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded,Marcel Dekker, Inc., New York, 1992.
2. S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances, VallabhPrakashan, New Delhi, First edition 2002.
3. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, NewDelhi, First edition 1997 (reprint in 2001).

ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS
(MPH 202T)

Scope

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply biopharmaceutics theories in practical problem solving. Basic theoretical discussions of the principles of biopharmaceutics and pharmacokinetics are provided to help the students' to clarify the concepts.

Objectives

Upon completion of this course it is expected that students will be able understand,

- The basic concepts in biopharmaceutics and pharmacokinetics.
- The use raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- The critical evaluation of biopharmaceutic studies involving drug product equivalency.
- The design and evaluation of dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.
- The potential clinical pharmacokinetic problems and application of basics of pharmacokinetic

THEORY 60 Hrs

1. Drug Absorption from the Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting drug absorption, pH–partition theory of drug absorption. Formuulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes–Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form ,Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form ,Dissolution methods ,Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data.Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex. 12 Hrs

2	Biopharmaceutic considerations in drug product design and In Vitro Drug Product Performance: Introduction, biopharmaceutic factors affecting drug bioavailability, rate-limiting steps in drug absorption, physicochemical nature of the drug formulation factors affecting drug product performance, in vitro: dissolution and drug release testing, compendial methods of dissolution, alternative methods of dissolution testing,meeting dissolution requirements,problems of variable control in dissolution testingperformance of drug products. In vitro–in vivo correlation, dissolution profile comparisons, drug product stability,considerations in the design of a drug product.	12 Hrs
3	Pharmacokinetics: Basic considerations, pharmacokinetic models, compartment modeling: one compartment model- IV bolus, IV infusion, extra-vascular. Multi compartment model:two compartment - model in brief, non-linear pharmacokinetics: cause of non-linearity, Michaelis – Menten equation, estimation of k_{max} and v_{max}. Drug interactions: introduction, the effect of protein-binding interactions,the effect of tissue-binding interactions,cytochrome p450-based drug interactions,drug interactions linked to transporters.	12 Hrs
4	Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: drug product performance, purpose of bioavailability studies, relative and absolute availability. methods for assessing bioavailability, bioequivalence studies, design and evaluation of bioequivalence studies, study designs, crossover study designs, evaluation of the data, bioequivalence example, study submission and drug review process. biopharmaceutics classification system, methods. Permeability: In-vitro, in-situ and In-vivo methods.generic biologics (biosimilar drug products),clinical significance of bioequivalence studies, special concerns in bioavailability and bioequivalence studies, generic substitution.	12 Hrs
5	Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Introduction to Pharmacokinetics and pharmacodynamic, drug interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs. Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy), Gene therapies.	12 Hrs

REFERENCES

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition,Philadelphia, Lea and Febiger, 1991
2. Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmankar and Sunil B. Jaiswal., VallabPrakashan, Pitampura, Delhi
3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2nd edition, Connecticut Appleton Century Crofts, 1985
4. Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath,Prism Book
5. Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc.,New York, 1982
6. Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Leaand Febiger, Philadelphia, 1970
7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by MalcolmRowland and Thom~ N. Tozer, Lea and Febiger, Philadelphia, 1995
8. Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack PublishingCompany, Pennsylvania 1989
9. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition,revised and expande by Robert. E. Notari, Marcel Dekker Inc, New York and Basel,1987.
10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M.Pemarowski, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
11. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.
12. Basic Pharmacokinetics,1 st edition,Sunil S JambhekarandPhilip J Breen,pharmaceutical press, RPS Publishing,2009.
13. Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef, John Wiley & Sons, Inc,2003.

COMPUTER AIDED DRUG DEVELOPMENT
(MPH 203T)

Scope

This course is designed to impart knowledge and skills necessary for computer Applications in pharmaceutical research and development who want to understand the application of computers across the entire drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of computerized information (informatics) in the drug development process are provided to help the students to clarify the concepts.

Objectives

Upon completion of this course it is expected that students will be able to understand,

- History of Computers in Pharmaceutical Research and Development
- Computational Modeling of Drug Disposition
- Computers in Preclinical Development
- Optimization Techniques in Pharmaceutical Formulation
- Computers in Market Analysis
- Computers in Clinical Development
- Artificial Intelligence (AI) and Robotics
- Computational fluid dynamics(CFD)

THEORY		60 Hrs
1.	a. Computers in Pharmaceutical Research and Development: A General Overview: History of Computers in Pharmaceutical Research and Development. Statistical modeling in Pharmaceutical research and development: Descriptive versus Mechanistic Modeling, Statistical Parameters, Estimation, Confidence Regions, Nonlinearity at the Optimum, Sensitivity Analysis, Optimal Design, Population Modeling b. Quality-by-Design In Pharmaceutical Development: Introduction, ICH Q8 guideline, Regulatory and industry views on QbD, Scientifically based QbD - examples of application.	12 Hrs
2	Computational Modeling Of Drug Disposition: Introduction ,Modeling Techniques: Drug Absorption, Solubility, Intestinal Permeation, Drug Distribution ,Drug Excretion, Active Transport; P-gp, BCRP, Nucleoside Transporters, hPEPT1, ASBT, OCT, OATP, BBB-Choline Transporter.	12 Hrs

3	Computer-aided formulation development:: Concept of optimization, Optimization parameters, Factorial design, Optimization technology & Screening design. Computers in Pharmaceutical Formulation: Development of pharmaceutical emulsions, microemulsion drug carriers Legal Protection of Innovative Uses of Computers in R&D, The Ethics of Computing in Pharmaceutical Research, Computers in Market analysis	12 Hrs
4	a. Computer-aided biopharmaceutical characterization: Gastrointestinal absorption simulation. Introduction, Theoretical background, Model construction, Parameter sensitivity analysis, Virtual trial, Fed vs. fasted state, In vitro dissolution and in vitro-in vivo correlation, Biowaiver considerations b. Computer Simulations in Pharmacokinetics and Pharmacodynamics: Introduction, Computer Simulation: Whole Organism, Isolated Tissues, Organs, Cell, Proteins and Genes. c. Computers in Clinical Development: Clinical Data Collection and Management, Regulation of Computer Systems	12 Hrs
5	Artificial Intelligence (AI), Robotics and Computational fluid dynamics: General overview, Pharmaceutical Automation, Pharmaceutical applications, Advantages and Disadvantages. Current Challenges and Future Directions.	12 Hrs

REFERENCES

1. Computer Applications in Pharmaceutical Research and Development, Sean Ekins, 2006, John Wiley & Sons.
2. Computer-Aided Applications in Pharmaceutical Technology, 1st Edition, Jelena Djuris, Woodhead Publishing
3. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.

COSMETICS AND COSMECEUTICALS
(MPH 204T)

Scope

This course is designed to impart knowledge and skills necessary forthefundamental need for cosmetic and cosmeceutical products.

Objectives

Upon completion of the course, the students shall be able to understand

- Key ingredients used in cosmetics and cosmeceuticals.
- Key building blocks for various formulations.
- Current technologies in the market
- Various key ingredients and basic science to develop cosmetics and cosmeceuticals
- Scientific knowledge to develop cosmetics and cosmeceuticals with desired Safety, stability, and efficacy.

THEORY 60 Hrs

1. Cosmetics – Regulatory : Definition of cosmetic products as per Indian regulation. Indian regulatory requirements for labeling of cosmetics Regulatory provisions relating to import of cosmetics., Misbranded and spurious cosmetics. Regulatory provisions relating to manufacture of cosmetics - Conditions for obtaining license, prohibition of manufacture and sale of certain cosmetics, loan license, offences and penalties. 12 Hrs

2 Cosmetics - Biological aspects : Structure of skin relating to problems like dry skin, acne, pigmentation, prickly heat, wrinkles and body odor. Structure of hair and hair growth cycle. Common problems associated with oral cavity. Cleansing and care needs for face, eye lids, lips, hands, feet, nail, scalp, neck, body and under-arm. 12 Hrs

3 Formulation Building blocks: Building blocks for different product formulations of cosmetics/cosmeceuticals. Surfactants – Classification and application. Emollients, rheological additives: classification and application. Antimicrobial used as preservatives, their merits and demerits. Factors affecting microbial preservative efficacy. Building blocks for formulation of a moisturizing cream, vanishing cream, cold cream, shampoo and toothpaste. Soaps and syndetbars. 12 Hrs

Perfumes; Classification of perfumes. Perfume ingredients listed as allergens in EU regulation.

	Controversial ingredients: Parabens, formaldehyde liberators, dioxane.	
4	Design of cosmeceutical products: Sun protection, sunscreens classification and regulatory aspects. Addressing dry skin, acne, sun-protection, pigmentation, prickly heat, wrinkles, body odor., dandruff, dental cavities, bleeding gums, mouth odor and sensitive teeth through cosmeceutical formulations.	12 Hrs
5	Herbal Cosmetics : Herbal ingredients used in Hair care, skin care and oral care. Review of guidelines for herbal cosmetics by private bodies like cosmos with respect to preservatives, emollients, foaming agents, emulsifiers and rheology modifiers. Challenges in formulating herbal cosmetics.	12 Hrs

REFERENCES

1. Harry's Cosmeticology. 8th edition.
2. Poucher'sperfumecosmeticsandSoaps,10th edition.
3. Cosmetics - Formulation, Manufacture and quality control, PP.Sharma,4th edition
4. Handbook of cosmetic science and Technology A.O.Barel, M.Paye and H.I. Maibach. 3rd edition
5. Cosmetic and Toiletries recent suppliers catalogue.
6. CTFA directory.

PHARMACEUTICS PRACTICALS - II
(MPH 205P)

1. To study the effect of temperature change , non solvent addition, incompatible polymer addition in microcapsules preparation
2. Preparation and evaluation of Alginate beads
3. Formulation and evaluation of gelatin /albumin microspheres
4. Formulation and evaluation of liposomes/niosomes
5. Formulation and evaluation of spherules
6. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
7. Comparison of dissolution of two different marketed products /brands
8. Protein binding studies of a highly protein bound drug & poorly protein bound drug
9. Bioavailability studies of Paracetamol in animals.
10. Pharmacokinetic and IVIVC data analysis by Winnoline^{R} software
11. In vitro cell studies for permeability and metabolism
12. DoE Using Design Expert® Software
13. Formulation data analysis Using Design Expert® Software
14. Quality-by-Design in Pharmaceutical Development
15. Computer Simulations in Pharmacokinetics and Pharmacodynamics
16. Computational Modeling Of Drug Disposition
17. To develop Clinical Data Collection manual
18. To carry out Sensitivity Analysis, and Population Modeling.
19. Development and evaluation of Creams
20. Development and evaluation of Shampoo and Toothpaste base
21. To incorporate herbal and chemical actives to develop products
22. To address Dry skin, acne, blemish, Wrinkles, bleeding gums and dandruff

INDUSTRIALPHARMACY(MIP)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES

(MIP 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 HOURS

1. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. 11 Hrs

   IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

   Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy. 11 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	11 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography	11 Hrs
5	Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	11 Hrs
6.	Immunological Assays: Radioimmunology assay (RIA), ELISA (Theory & practical) and knowledge on Bioluminescence assays.	5 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, 6th edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

PHARMACEUTICAL FORMULATION DEVELOPMENT
(MIP 102T)

Scope

This course is designed to impart knowledge and skills necessary to train the students on par with the routine of Industrial activities in R&D and F&D.

Objectives

On completion of this course it is expected that students will be able to understand-

- The scheduled activities in a Pharmaceutical firm.
- The pre formulation studies of pilot batches of pharmaceutical industry.
- The significance of dissolution and product stability

THEORY 60 Hrs

1. Preformulation Studies: Molecular optimization of APIs (drug substances), crystal morphology and variations, powder flow, structure modification, drug-excipient compatibility studies, methods of determination. 12 Hrs

2 Formulation Additives: Study of different formulation additives, factors influencing their incorporation, role of formulation development and processing, new developments in excipient science. Design of experiments – factorial design for product and process development. 12 Hrs

3 Solubility: Importance, experimental determination, phase-solubility analysis, pH-solubility profile, solubility techniques to improve solubility and utilization of analytical methods – cosolvency, salt formation, complexation, solid dispersion, micellar solubilization and hydrotropy. 12 Hrs

4 Dissolution: Theories, mechanisms of dissolution, in-vitro dissolution testing models – sink and non-sink. Factors influencing dissolution and intrinsic dissolution studies. Dissolution test apparatus – designs, dissolution testing for conventional and controlled release products. Data handling and correction factor. Biorelevent media, in-vitro and in-vivo correlations, levels of correlations. 12 Hrs

5 Product Stability: Degradation kinetics, mechanisms, stability testing of drugs and pharmaceuticals, factors influencing-media effects and pH effects, accelerated stability studies, interpretation of kinetic data (API & tablets). Solid state stability and shelf life assignment. Stability protocols, reports and ICH guidelines. 12 Hrs

REFERENCES

1. Lachman L, Lieberman HA, Kanig JL. The Theory and Practice Of Industrial Pharmacy, 3rd ed., Varghese Publishers, Mumbai 1991.
2. Sinko PJ. Martin's physical pharmacy and pharmaceutical sciences, 5th ed., B.I. Publications Pvt. Ltd, Noida, 2006.
3. Lieberman HA, Lachman L, Schwartz JB. Pharmaceutical dosage forms: tablets Vol. I-III, 2nd ed., CBS Publishers & distributors, New Delhi, 2005.
4. Conners KA. A Text book of pharmaceutical analysi Wells JI. Pharmaceutical preformulation: The physicochemical properties of drug substances. Ellis Horwood Ltd., England, 1998.
5. Yalkowsky SH. Techniques of solubilization of drugs. Vol-12. Marcel Dekker Inc., New York, 1981
6. Dressman J, Kramer J. Pharmaceutical dissolution testing. Saurah printer pvt. Ltd., New Delhi,2005.
7. Sethi PD. Quantitative analysis of drugs in pharmaceutical formulations, 3rd ed., CBS publications, New Delhi, 2008.
8. Carstensen JT, Rhodes CT. Drug stability principles and practices, 3rd ed., CBS Publishers & distributors, New Delhi, 2005.
9. Yoshioka S, Stella VJ. Stability of drugs and dosage forms, Springer (India) Pvt. Ltd., New Delhi, 2006.
10. Banker GS, Rhodes CT. Modern Pharmaceutics, 4th ed., Marcel Dekker Inc, New York, 2005.
11. W. Grimm - Stability testing of drug products.
12. Mazzo DJ. International stability testing. Eastern Press Pvt. Ltd., Bangalore, 1999. 13. Beckett AH, Stenlake JB. Practical pharmaceutical chemistry, Part I & II., 4th ed., CBS Publishers & distributors, New Delhi, 2004.
14. Indian Pharmacopoeia. Controller of Publication. Delhi, 1996.
15. British Pharmacopoeia. British Pharmacopoeia Commission Office, London, 2008.
16. United States Pharmacopoeia. United States Pharmacopeial Convention, Inc, USA, 2003.
17. Encyclopaedia of Pharm. Technology, Vol I – III.
18. Wells J. I. Pharmaceutical Preformulation : The physicochemical properties of drug substances, Ellis Horwood Ltd. England, 1988.

NOVEL DRUG DELIVERY SYSTEMS
(MIP 103T)

Scope

This course is designed to impart knowledge and skills necessary to train the students in the area of novel drug delivery systems.

Objective

On completion of this course it is expected that students will be able to understand,

- The need, concept, design and evaluation of various customized, sustained and controlled release dosage forms.
- To formulate and evaluate various novel drug delivery systems

THEORY 60 Hrs

1. Concept & Models for NDDS: Classification of rate controlled drug delivery systems (DDS), rate programmed release, activation modulated & feedback regulated DDS, effect of system parameters in controlled drug delivery, computation of desired release rate and dose for controlled release DDS, pharmacokinetic design for DDS – intermittent, zero order & first order release. 12 Hrs

   Carriers for Drug Delivery: Polymers / co-polymers-introduction, classification, characterization, polymerization techniques, application in CDDS / NDDS, biodegradable & natural polymers.

2 Study of Various DDS: Concepts, design, formulation & evaluation of controlled release oral DDS, Mucoadhesive DDS (buccal, nasal, pulmonary) Pulsatile, colon specific, liquid sustained release systems, Ocular delivery systems 12 Hrs

3 Transdermal Drug Delivery Systems: Theory, design, formulation & evaluation including iontophoresis and other latest developments in skin delivery systems. 08 Hrs

4 Sub Micron Cosmeceuticals: Biology, formulation science and evaluation of various cosmetics for skin, hair, nail, eye etc and it's regulatory aspects. 04 Hrs

5	Targeted Drug Delivery Systems: Importance, concept, biological process and events involved in drug targeting, design, formulation & evaluation, methods in drug targeting – nanoparticles, liposomes, niosomes, pharmacosomes, resealed erythrocytes, microspheres, magnetic microspheres. Specialized pharmaceutical emulsions – multiple emulsions, micro-emulsions.	12 Hrs
6	Protein / Peptide Drug Delivery Systems: Concepts, delivery techniques, formulation, stability testing, causes of protein destabilization, stabilization methods.	
7	Biotechnology in Drug Delivery Systems: Brief review of major areas-recombinant DNA technology, monoclonal antibodies, gene therapy.	06 Hrs
8	New trends for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Telepharmacy.	06 Hrs

REFERENCES

1. Novel Drug Delivery System, Y.W. Chein, Vol 50, Marcel Dekker, NY.
2. Controlled Drug Delivery Systems, Robinson, Vol 29, Marcel Dekker, NY.
3. Transdermal Controlled Systemic Medications, YW Chein, Vol 31, Marcel Dekker, NY.
4. Bioadhesive DDS, E. Mathiowitz, Vol 98, Marcel Dekker, NY.
5. Nasal System Drug Delivery, K.S.E. Su, Vol 39, Marcel Dekker, NY.
6. Drug Delivery Devices, Vol 32, P Tyle Marcel Dekker, NY.
7. Polymers for Controlled Drug Delivery, P.J. Tarcha, CRC Press.
8. Pharmaceutical Biotechnology, Vyas, CBS, Delhi.
9. Biotechnology of Industrial Antibiotics, E.J. Vandamme, Marcel Dekker, NY.
10. Protein Formulation & Delivery, E.J. McNally, Vol 99, Marcel Dekker, NY.
11. Drug Targeting, M.H. Rubinstein, John Wiley, NY.

INTELLECTUAL PROPERTY RIGHTS
(MIP 104T)

Scope

This course is designed to impart knowledge and skills necessary to train the students to be on par with the routine of Industrial activities in drug regulatory affairs

Objectives

On completion of this course it is expected that students will be able to understand,

- Assist in Regulatory Audit process.
- Establish regulatory guidelines for drug and drug products
- The Regulatory requirements for contract research organization

THEORY		60 Hrs
1.	Definition, Need for patenting, Types of Patents, Conditions to be satisfied by an invention to be patentable, Introduction to patent search. Parts of patents. Filling of patents. The essential elements of patent; Guidelines for preparation of laboratory note book, Non-obviousness in Patent.	12 Hrs
2	Role of GATT, TRIPS, and WIPO	12 Hrs
3	Brief introduction to Trademark protection and WHO Patents. IPR's and its types, Major bodies regulating Indian Pharmaceutical sector.	12 Hrs
4	Brief introduction to CDSCO. WHO, USFDA, EMEA, TGA, MHRA, MCC, ANVISA	12 Hrs
5	Regulatory requirements for contract research organization. Regulations for Biosimilars.	12 Hrs

REFERENCES :

1. Pharmaceutical Process Validation: By Fra R. Berry and Robert A. Nash, Vol 57, 2nd Edition
2. Applied Production and Operation Management By Evans, Anderson and Williams
3. GMP for pharmaceuticals Material Management by K.K. Ahuja Published by CBS publishers
4. ISO 9000-Norms and explanations
5. GMP for pharmaceuticals- Willing S.H. Marcel and Dekker

INDUSTRIAL PHARMACY PRACTICAL - I
(MIP 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC / GC
4. Estimation of riboflavin/quinine sulphate by fluorimetry
5. Estimation of sodium/potassium by flame photometry
6. Effect of surfactants on the solubility of drugs.
7. Effect of pH on the solubility of drugs.
8. Stability testing of solution and solid dosage forms for photo degradation..
9. Stability studies of drugs in dosage forms at 25 ^{o}C, 60% RH and 40 ^{o}C, 75% RH.
10. Compatibility evaluation of drugs and excipients (DSC & FTIR).
11. Preparation and evaluation of different polymeric membranes.
12. Formulation and evaluation of sustained release oral matrix tablet/ oral reservoir system.
13. Formulation and evaluation of microspheres / microcapsules.
14. Formulation and evaluation of transdermal drug delivery systems.
15. Design and evaluation of face wash, body- wash, creams, lotions, shampoo, toothpaste, lipstick.
16. Electrophoresis of protein solution.
17. Preparation and evaluation of Liposome delivery system.

ADVANCED BIOPHARMACEUTICS & PHARMACOKINETICS
(MIP 201T)

Scope

This course is designed to impart knowledge and skills necessary for dose calculations, dose adjustments and to apply Biopharmaceutics theories in practical problem solving.

Objectives

On completion of this course it is expected that students will be able to understand,

- The basic concepts in Biopharmaceutics and pharmacokinetics.
- The use of raw data and derive the pharmacokinetic models and parameters the best describe the process of drug absorption, distribution, metabolism and elimination.
- To critically evaluate Biopharmaceutics studies involving drug product equivalency.
- To design and evaluate dosage regimens of the drugs using pharmacokinetic and biopharmaceutic parameters.

THEORY 60 Hrs

1. Drug Absorption From The Gastrointestinal Tract: Gastrointestinal tract, Mechanism of drug absorption, Factors affecting, pH–partition theory, Formulation and physicochemical factors: Dissolution rate, Dissolution process, Noyes–Whitney equation and drug dissolution, Factors affecting the dissolution rate. Gastrointestinal absorption: role of the dosage form: Solution (elixir, syrup and solution) as a dosage form ,Suspension as a dosage form, Capsule as a dosage form, Tablet as a dosage form ,Dissolution methods ,Formulation and processing factors, Correlation of in vivo data with in vitro dissolution data. Transport model: Permeability-Solubility-Charge State and the pH Partition Hypothesis, Properties of the Gastrointestinal Tract (GIT), pH Microclimate Intracellular pH Environment, Tight-Junction Complex. Solubility: Experimental methods. Permeability: In-vitro, in-situ and In-vivo methods. 12 Hrs

2 Biopharmaceutic Considerations in Drug Product Design and In Vitro Drug Product Performance: Introduction, Biopharmaceutic Factors Affecting Drug Bioavailability, Rate-Limiting Steps in Drug Absorption, Physicochemical Nature of the 12 Hrs

	Drug Formulation Factors Affecting Drug Product Performance, In Vitro: Dissolution and Drug Release Testing, Compendial Methods of Dissolution, Alternative Methods of Dissolution Testing, Meeting Dissolution Requirements, Problems of Variable Control in Dissolution Testing Performance of Drug Products: In Vitro–In Vivo Correlation, Dissolution Profile Comparisons, Drug Product Stability, Considerations in the Design of a Drug Product.	
3	Pharmacokinetics: Basic considerations, Pharmacokinetic models, Compartment modeling: One compartment model- IV bolus, IV infusion, Extra-vascular; Multi Compartment model: Two compartment - model in brief, Non-Linear Pharmacokinetics: Cause of non-linearity, Michaelis – Menten equation, Estimation Kmax and Vmax. Drug interactions: Introduction, The effect of protein-binding interactions, The effect of tissue-binding interactions, Cytochrome P450-based drug interactions, Drug interactions linked to transporters.	12 Hrs
4	Drug Product Performance, In Vivo: Bioavailability and Bioequivalence: Drug Product Performance, Purpose of Bioavailability Studies, Relative and Absolute Availability, , Methods for Assessing Bioavailability, Bioequivalence Studies, Design and Evaluation of Bioequivalence Studies, Study Designs, Crossover Study Designs, Evaluation of the Data, Bioequivalence Example, Study Submission and Drug Review Process, The Biopharmaceutics Classification System, Generic Biologics (Biosimilar Drug Products),Clinical Significance of Bioequivalence Studies, Special Concerns in Bioavailability and Bioequivalence Studies, Generic Substitution.	12 Hrs
5	Application of Pharmacokinetics: Modified-Release Drug Products, Targeted Drug Delivery Systems and Biotechnological Products. Relationship between Pharmacokinetics including Pharmacodynamics: Generation of a pharmacokinetic–pharmacodynamic (PKPD) equation, Pharmacokinetic and pharmacodynamic, interactions. Pharmacokinetics and pharmacodynamics of biotechnology drugs: Introduction, Proteins and peptides, Monoclonal antibodies, Oligonucleotides, Vaccines (immunotherapy),Gene therapies.	12 Hrs

REFERENCES

1. Biopharmaceutics and Clinical Pharmacokinetics by Milo Gibaldi, 4th edition,Philadelphia, Lea and Febiger, 1991
2. Biopharmaceutics and Pharmacokinetics, A. Treatise, D .M. Brahmankar and Sunil B.J aiswal., Vallab Prakashan, Pitampura, Delhi
3. Applied Biopharmaceutics and Pharmacokinetics by Shargel. Land YuABC, 2nd edition, Connecticut Appleton Century Crofts, 1985
4. Textbook of Biopharmaceutics and Pharmacokinetics, Dr. Shobha Rani R. Hiremath,Prism Book
5. Pharmacokinetics by Milo Gibaldi and D. Perrier, 2nd edition, Marcel Dekker Inc.,New York, 1982
6. Current Concepts in Pharmaceutical Sciences: Biopharmaceutics, Swarbrick. J, Lea and Febiger, Philadelphia, 1970
7. Clinical Pharmacokinetics, Concepts and Applications 3rd edition by Malcolm Rowland and Thom~ N. Tozer, Lea and Febiger, Philadelphia, 1995
8. Dissolution, Bioavailability and Bioequivalence, Abdou. H.M, Mack Publishing Company, Pennsylvania 1989
9. Biopharmaceutics and Clinical Pharmacokinetics, An Introduction, 4th edition, revised and expande by Robert. E. Notari, Marcel Dekker Inc, New York and Basel,1987.
10. Biopharmaceutics and Relevant Pharmacokinetics by John. G Wagner and M.Pemarowski, 1st edition, Drug Intelligence Publications, Hamilton, Illinois, 1971.
11. Encyclopedia of Pharmaceutical Technology, Vol 13, James Swarbrick, James. G.Boylan, Marcel Dekker Inc, New York, 1996.
12. Basic Pharmacokinetics,1 st edition, Sunil S Jambhekar and Philip J Breen,pharmaceutical press, RPS Publishing,2009.
13. Absorption and Drug Development- Solubility, Permeability, and Charge State, Alex Avdeef, John Wiley & Sons, Inc,2003.

SCALE UP AND TECHNOLOGY TRANSFER
(MIP 202T)

Scope

This course is designed to impart knowledge and skills necessary to train the students to be on scale up, technology transfer process and industrial safety issues.

Objectives:

On completion of this course it is expected that students will be able to understand,

- Manage the scale up process in pharmaceutical industry.
- Assist in technology transfer.
- To establish safety guidelines, which prevent industrial hazards.

THEORY 60 Hrs

1.	Pilot plant design: Basic requirements for design, facility, equipment selection, for tablets, capsules, liquid orals, parentral and semisolid preparations. Scale up: Importance, Technology transfer from R & D to pilot plant to plant scale, process scale up for tablets, capsules, liquid orals, semisolids, parentral, NDDS products – stress on formula, equipments, product uniformity, stability, raw materials, physical layout, input, in-process and finished product specifications, problems encountered during transfer of technology	12 Hrs
2	Validation: General concepts, types, procedures & protocols, documentation, VMF. Analytical method validation, cleaning validation and vender qualification.	12 Hrs
3	Equipment Qualification: Importance, IQ, OQ, PQ for equipments – autoclave, DHS, membrane filter, rapid mixer granulator, cone blender, FBD, tablet compression machine, liquid filling and sealing machine. Aseptic room validation.	12 Hrs
4	Process validation: Importance, validation of mixing, granulation, drying, compression, tablet coating, liquid filling and sealing, sterilization, water process systems, environmental control.	12 Hrs

5	Industrial safety: Hazards – fire, mechanical, electrical, chemical and pharmaceutical, Monitoring & prevention systems, industrial effluent testing & treatment. Control of environmental pollution.	12 Hrs

REFERENCES

1. Pharmaceutical process validation, JR Berry, Nash, Vol 57, Marcel Dekker, NY.
2. Pharmaceutical Production facilities, design and applications, by GC Cole, Taylor and Francis.
3. Pharmaceutical project management, T.Kennedy, Vol 86, Marcel Dekker, NY.
4. The theory & Practice of Industrial Pharmacy, L.Lachman, H.A.Lieberman, Varghese Publ. Bombay.
5. Tablet machine instruments in pharmaceuticals, PR Watt, John Wiloy.
6. Pharmaceutical dosage forms, Tablets, Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
7. Pharmaceutical dosage forms, Parentral medications, Vol 1, 2 by K.E. Avis, Marcel Dekker, NY.
8. Dispersed system Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
9. Subrahmanyam, CVS, Pharmaceutical production and Management, 2007, Vallabh Prakashan,Dehli.

PHARMACEUTICAL PRODUCTION TECHNOLOGY
(MIP 203T)

Scope

This course is designed to impart knowledge and skills necessary to train the students to be on par with the routine of Industrial activities in Production

Objectives

On completion of this course it is expected that students will be able to understand,

Handle the scheduled activities in a Pharmaceutical firm.
Manage the production of large batches of pharmaceutical formulations.

THEORY 60 Hrs

1.	Improved Tablet Production: Tablet production process, unit operation improvements, granulation and pelletization equipments, continuous and batch mixing, rapid mixing granulators, rota granulators, spheronizers and marumerisers, and other specialized granulation and drying equipments. Problems encountered. Coating Technology: Process, equipments, particle coating, fluidized bed coating, application techniques. Problems encountered.	12 Hrs
2	Parenteral Production: Area planning & environmental control, wall and floor treatment, fixtures and machineries, change rooms, personnel flow, utilities & utilities equipment location, engineering and maintenance.	12 Hrs
3	Lyophilization & Spray drying Technology: Principles, process, freeze-drying and spray drying equipments.	12 Hrs
4	Capsule Production: Production process, improved capsule manufacturing and filling machines for hard and soft gelatin capsules. Layout and problems encountered. Disperse Systems Production: Production processes, applications of mixers, mills, disperse equipments including fine solids dispersion, problems encountered.	12 Hrs

Packaging Technology: Types of packaging materials, machinery, labeling, package printing for different dosage forms.

5 Air Handling Systems: Study of AHUs, humidity & temperature control, air filtration systems, dust collectors. Water Treatment Process: Techniques and maintenance – RO, DM, ultra – filtration, WFI. 12 Hrs

REFERENCES

1. The Theory & Practice of Industrial Pharmacy, L. Lachman, Varghese Publ, Bombay.
2. Modern Pharmaceutics by Banker, Vol 72, Marcel Dekker, NY.
3. Pharmaceutical Dosage Forms, Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
4. Pharmaceutical Dosage Forms, Parentral medications, Vol 1, 2 by K.E. Avis, Marcel Dekker, NY.
5. Pharmaceutical Production Facilities, design and applications, by G.C. Cole, Taylor and Francis.
6. Dispersed System Vol 1, 2, 3 by Lachman, Lieberman, Marcel Dekker, NY.
7. Product design and testing of polymeric materials by N.P. Chezerisionoff.
8. Pharmaceutical Project Management, T.Kennedy, Vol 86, Marcel Dekker, NY.
9. Packaging Pharmaceutical and Health Care, H.Lockhard.
10. Quality Control of Packaging Materials in Pharmaceutical Industy, .Kharburn, Marcel Dekker, NY.
11. Freeze drying / Lyophilization of Pharmaceuticals & Biological Products, L. Ray, Vol 96, Marcel Dekker, NY.
12. Tablet Machine Instrumentation In Pharmaceuticals, PR Watt, Ellis Horwoods, UK.

ENTREPRENEURSHIP MANAGEMENT
(MIP 204T)

Scope

This course is designed to impart knowledge and skills necessary to train the students on entrepreneurship management.

Objectives:

On completion of this course it is expected that students will be able to understand,

- The Role of enterprise in national and global economy
- Dynamics of motivation and concepts of entrepreneurship
- Demands and challenges of Growth Strategies And Networking

THEORY 60 Hrs

1.	Conceptual Frame Work: Concept need and process in entrepreneurship development. Role of enterprise in national and global economy. Types of enterprise – Merits and Demerits. Government policies and schemes for enterprise development. Institutional support in enterprise development and management.	12 Hrs
2	Entrepreneur: Entrepreneurial motivation – dynamics of motivation. Entrepreneurial competency –Concepts. Developing Entrepreneurial competencies - requirements and understanding the process of entrepreneurship development, self-awareness, interpersonal skills, creativity, assertiveness, achievement, factors affecting entrepreneur role.	12 Hrs
3	Launching And Organising An Enterprise: Environment scanning – Information, sources, schemes of assistance, problems. Enterprise selection, market assessment, enterprise feasibility study, SWOT Analysis. Resource mobilisation - finance, technology, raw material, site and manpower. Costing and marketing management and quality control. Feedback, monitoring and evaluation.	12 Hrs
4	Growth Strategies And Networking: Performance appraisal and assessment. Profitability and control measures, demands and challenges. Need for diversification. Future Growth – Techniques of expansion and diversification, vision strategies. Concept and dynamics. Methods, Joint venture, co-ordination and feasibility study.	12 Hrs

5	Preparing Project Proposal To Start On New Enterprise Project work – Feasibility report; Planning, resource mobilisation and implementation.	12 Hrs

REFERENCES

1. Akhauri, M.M.P.(1990): Entrepreneurship for Women in India, NIESBUD, New Delhi.
2. Hisrich, R.D & Brush, C.G.(1996) The Women Entrepreneurs, D.C. Health & Co., Toranto.
3. Hisrich, R.D. and Peters, M.P. (1995): Entrepreneurship – Starting, Developing and Managing a New Enterprise, Richard D., Inwin, INC, USA.
4. Meredith, G.G. etal (1982): Practice of Entrepreneurship, ILO, Geneva.
5. Patel, V.C. (1987): Women Entrepreneurship – Developing New Entrepreneurs, Ahmedabad EDII.

INDUSTRIAL PHARMACY PRACTICAL - II
(MIP 205P)

1. Improvement of dissolution characteristics of slightly soluble drug by Solid dispersion technique.
2. Comparison of dissolution of two different marketed products /brands
3. Protein binding studies of a highly protein bound drug & poorly protein bound drug
4. Bioavailability studies of Paracetamol (Animal).
5. Pharmacokinetic and IVIVC data analysis by WinnolineR software
6. In vitro cell studies for permeability and metabolism
7. Formulation and evaluation of tablets
8. Formulation and evaluation of capsules
9. Formulation and evaluation of injections
10. Formulation and evaluation of emulsion
11. Formulation and evaluation of suspension.
12. Formulation and evaluation of enteric coating tablets.
13. Preparation and evaluation of a freeze dried formulation.
14. Preparation and evaluation of a spray dried formulation.

PHARMACEUTICALCHEMISTRY(MPC)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES
(MPC 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. — 10 Hrs

   b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.

   c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence (Characterestics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy. — 10 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	10 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: a) Thin Layer chromatography b) High Performance Thin Layer Chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Ultra High Performance Liquid chromatography h) Affinity chromatography i) Gel Chromatography	10 Hrs
5	a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	10 Hrs
6	a. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. b. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation	10 Hrs

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED ORGANIC CHEMISTRY - I
(MPC 102T)

Scope

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

Objectives

Upon completion of course, the student shall be to understand

- The principles and applications of reterosynthesis
- The mechanism & applications of various named reactions
- The concept of disconnection to develop synthetic routes for small target molecule.
- The various catalysts used in organic reactions
- The chemistry of heterocyclic compounds

THEORY 60 Hrs

1. Basic Aspects of Organic Chemistry: 12 Hrs
   1. Organic intermediates: Carbocations, carbanions, free radicals, carbenes and nitrenes. Their method of formation, stability and synthetic applications.
   2. Types of reaction mechanisms and methods of determining them,
   3. Detailed knowledge regarding the reactions, mechanisms and their relative reactivity and orientations.

   Addition reactions

   a) Nucleophilic uni- and bimolecular reactions (SN1 and SN2)
   b) Elimination reactions (E1 & E2; Hoffman & Saytzeff's rule)
   c) Rearrangement reaction

2 Study of mechanism and synthetic applications of following named Reactions: 12 Hrs

Ugi reaction, Brook rearrangement, Ullmann coupling reactions, Dieckmann Reaction, Doebner-Miller Reaction, Sandmeyer Reaction, Mitsunobu reaction, Mannich reaction, Vilsmeyer-Haack Reaction, Sharpless asymmetric epoxidation, Baeyer-Villiger oxidation, Shapiro & Suzuki reaction, Ozonolysis and Michael addition reaction

3 Synthetic Reagents & Applications: 12 Hrs

Aluminiumisopropoxide, N-bromosuccinamide, diazomethane, dicyclohexylcarbodimide, Wilkinson reagent, Witting reagent. Osmium tetroxide, titanium chloride, diazopropane, diethyl azodicarboxylate, Triphenylphosphine, Benzotriazol-1-yloxy) tris (dimethylamino) phosphonium hexafluoro-phosphate (BOP).

Protecting groups

a. Role of protection in organic synthesis
b. Protection for the hydroxyl group, including 1,2-and1,3-diols: ethers, esters, carbonates, cyclic acetals & ketals
c. Protection for the Carbonyl Group: Acetals and Ketals
d. Protection for the Carboxyl Group: amides and hydrazides, esters
e. Protection for the Amino Group and Amino acids: carbamates and amides

4 Heterocyclic Chemistry: 12 Hrs

Organic Name reactions with their respective mechanism and application involved in synthesis of drugs containing five, six membered and fused hetrocyclics such as Debus-Radziszewski imidazole synthesis, Knorr Pyrazole Synthesis Pinner Pyrimidine Synthesis, Combes Quinoline Synthesis, Bernthsen Acridine Synthesis, Smiles rearrangement and Traube purine synthesis.

Synthesis of few representative drugs containing these hetrocyclic nucleus such as Ketoconazole, Metronidazole, Miconazole, celecoxib, antipyrin, Metamizole sodium, Terconazole, Alprazolam, Triamterene, Sulfamerazine, Trimethoprim, Hydroxychloroquine, Quinine, Chloroquine, Quinacrine, Amsacrine, Prochlorpherazine, Promazine, Chlorpromazine,Theophylline , Mercaptopurine and Thioguanine.

5 Synthon approach and retrosynthesis applications 12 Hrs

i. Basic principles, terminologies and advantages of retrosynthesis; guidelines for dissection of molecules. Functional group interconvertion and addition (FGI and FGA)
ii. C-X disconnections; C-C disconnections – alcohols and carbonyl compounds; 1,2-, 1,3-,1,4-, 1,5-, 1,6-difunctionalized compounds
iii. Strategies for synthesis of three, four, five and six-membered ring.

REFERENCES

1. "Advanced Organic chemistry, Reaction, Mechanisms and Structure", J March, John Wiley and Sons, New York.
2. "Mechanism and Structure in Organic Chemistry", ES Gould, Hold Rinchart and Winston, New York.
3. "Organic Chemistry" Clayden, Greeves, Warren and Woihers., Oxford University Press 2001.
4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Pearson Education Lts, Dorling Kindersley 9India) Pvt. Ltd.,.
5. A guide to mechanisms in Organic Chemistry, Peter Skyes (Orient Longman, New Delhi).
6. Reactive Intermediates in Organic Chemistry, Tandom and Gowel, Oxford & IBH Publishers.
7. Combinational Chemistry – Synthesis and applications – Stephen R Wilson & Anthony W Czarnik, Wiley – Blackwell.
8. Carey, Organic Chemistry, 5th Edition (Viva Books Pvt. Ltd.)
9. Organic Synthesis - The Disconnection Approach, S. Warren, Wily India
10. Principles of Organic Synthesis, ROC Norman and JM Coxan, Nelson Thorns.
11. Organic Synthesis – Special Techniques. VK Ahluwalia and R Agarwal, Narosa Publishers.
12. Organic Reaction Mechanisms IVth Edtn, VK Ahluwalia and RK Parashar, Narosa Publishers.

ADVANCED MEDICINAL CHEMISTRY
(MPC 103T)

Scope

The subject is designed to impart knowledge about recent advances in the field of medicinal chemistry at the molecular level including different techniques for the rational drug design.

Objectives

At completion of this course it is expected that students will be able to understand

- Different stages of drug discovery
- Role of medicinal chemistry in drug research
- Different techniques for drug discovery
- Various strategies to design and develop new drug like molecules for biological targets
- Peptidomimetics

THEORY 60 Hrs

1. Drug discovery: Stages of drug discovery, lead discovery; identification, validation and diversity of drug targets. 12 Hrs

   Biological drug targets: Receptors, types, binding and activation, theories of drug receptor interaction, drug receptor interactions, agonists vs antagonists, artificial enzymes.

2 Prodrug Design and Analog design: 12 Hrs

   a) Prodrug design: Basic concept, Carrier linked prodrugs/ Bioprecursors, Prodrugs of functional group, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design.

   b) Combating drug resistance: Causes for drug resistance, strategies to combat drug resistance in antibiotics and anticancer therapy, Genetic principles of drug resistance.

   c) Analog Design: Introduction, Classical & Non classical, Bioisosteric replacement strategies, rigid analogs,

alteration of chain branching, changes in ring size, ring position isomers, design of stereo isomers and geometric isomers, fragments of a lead molecule, variation in inter atomic distance.

3 a) Medicinal chemistry aspects of the following class of drugs 12 Hrs

Systematic study, SAR, Mechanism of action and synthesis of new generation molecules of following class of drugs:

a) Anti-hypertensive drugs, Psychoactive drugs, Anticonvulsant drugs, H1 & H2 receptor antagonist, COX1 & COX2 inhibitors, Adrenergic & Cholinergic agents, Antineoplastic and Antiviral agents.

b) Stereochemistry and Drug action: Realization that stereo selectivity is a pre-requisite for evolution. Role of chirality in selective and specific therapeutic agents. Case studies, Enantio selectivity in drug adsorption, metabolism, distribution and elimination.

4 Rational Design of Enzyme Inhibitors 12 Hrs

Enzyme kinetics & Principles of Enzyme inhibitors, Enzyme inhibitors in medicine, Enzyme inhibitors in basic research, rational design of non-covalently and covalently binding enzyme inhibitors.

5 Peptidomimetics 12 Hrs

Therapeutic values of Peptidomimetics, design of peptidomimetics by manipulation of the amino acids, modification of the peptide backbone, incorporating conformational constraints locally or globally. Chemistry of prostaglandins, leukotrienes and thromboxones.

REFERENCES

1. Medicinal Chemistry by Burger, Vol I –VI.
2. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, 12th Edition, Lppincott Williams & Wilkins, Woltess Kluwer (India) Pvt.Ltd, New Delhi.
3. Comprehensive Medicinal Chemistry – Corwin and Hansch.
4. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

5. Introduction to Quantitative Drug Design by Y.C. Martin.
6. Principles of Medicinal Chemistry by William Foye, 7th Edition, Ippincott Williams & Wilkins, Woltess Kluwer (India) Pvt.Ltd, New Delhi.
7. Drug Design Volumes by Arienes, Academic Press, Elsevier Publishers, Noida, Uttar Pradesh..
8. Principles of Drug Design by Smith.
9. The Organic Chemistry of the Drug Design and Drug action by Richard B.Silverman, II Edition, Elsevier Publishers, New Delhi.
10. An Introduction to Medicinal Chemistry, Graham L.Patrick, III Edition, Oxford University Press, USA.
11. Biopharmaceutics and pharmacokinetics, DM.Brahmankar, Sunil B. Jaiswal II Edition, 2014, Vallabh Prakashan, New Delhi.
12. Peptidomimetics in Organic and Medicinal Chemistry by Antonio Guarna and Andrea Trabocchi, First edition, Wiley publishers.

CHEMISTRY OF NATURAL PRODUCTS
(MPC 104T)

Scope

The subject is designed to provide detail knowledge about chemistry of medicinal compounds from natural origin and general methods of structural elucidation of such compounds. It also emphasizes on isolation, purification and characterization of medicinal compounds from natural origin.

Objectives

At completion of this course it is expected that students will be able to understand-

- Different types of natural compounds and their chemistry and medicinal importance
- The importance of natural compounds as lead molecules for new drug discovery
- The concept of rDNA technology tool for new drug discovery
- General methods of structural elucidation of compounds of natural origin
- Isolation, purification and characterization of simple chemical constituents from natural source

THEORY 60 Hrs

1. Study of Natural products as leads for new pharmaceuticals for the following class of drugs — 12 Hrs
   a) Drugs Affecting the Central Nervous System: Morphine Alkaloids
   b) Anticancer Drugs: Paclitaxel and Docetaxel, Etoposide, and Teniposide
   c) Cardiovascular Drugs: Lovastatin, Teprotide and Dicoumarol
   d) Neuromuscular Blocking Drugs: Curare alkaloids
   e) Anti-malarial drugs and Analogues
   f) Chemistry of macrolid antibiotics (Erythromycin, Azithromycin, Roxithromycin, and Clarithromycin) and β - Lactam antibiotics (Cephalosporins and Carbapenem)
2. a) Alkaloids — 12 Hrs
   General introduction, classification, isolation, purification, molecular modification and biological activity of alkaloids, general methods of structural determination of alkaloids, structural elucidation and stereochemistry of ephedrine, morphine, ergot, emetine and reserpine.

b) Flavonoids

Introduction, isolation and purification of flavonoids, General methods of structural determination of flavonoids; Structural elucidation of quercetin.

c) Steroids

General introduction, chemistry of sterols, sapogenin and cardiac glycosides. Stereochemistry and nomenclature of steroids, chemistry of contraceptive agents male & female sex hormones (Testosterone, Estradiol, Progesterone), adrenocorticoids (Cortisone), contraceptive agents and steroids (Vit – D).

3 a) Terpenoids — 12 Hrs

Classification, isolation, isoprene rule and general methods of structural elucidation of Terpenoids; Structural elucidation of drugs belonging to mono (citral, menthol, camphor), di(retinol, Phytol, taxol) and tri terpenoids (Squalene,Ginsenoside) carotinoids (β carotene).

b) Vitamins

Chemistry and Physiological significance of Vitamin A, B1, B2, B12, C, E, Folic acid and Niacin.

4 a). Recombinant DNA technology and drug discovery — 12 Hrs

rDNA technology, hybridoma technology, New pharmaceuticals derived from biotechnology; Oligonucleotide therapy. Gene therapy: Introduction, Clinical application and recent advances in gene therapy, principles of RNA & DNA estimation

b). Active constituent of certain crude drugs used in Indigenous system Diabetic therapy – Gymnema sylvestre, Salacia reticulate, Pterocarpus marsupiam, Swertia chirata, Trigonella foenum graccum; Liver dysfunction – Phyllanthus niruri; Antitumor – Curcuma longa Linn.

5 Structural Characterization of natural compounds — 12 Hrs

Structural characterization of natural compounds using IR, 1HNMR, 13CNMR and MS Spectroscopy of specific drugs e.g., Penicillin, Morphine, Camphor, Vit-D, Quercetin and Digitalis glycosides.

REFERENCES

1. Modern Methods of Plant Analysis, Peech and M.V.Tracey, Springer – Verlag, Berlin, Heidelberg.
2. Phytochemistry Vol. I and II by Miller, Jan Nostrant Rein Hld.
3. Recent advances in Phytochemistry Vol. I to IV – Scikel Runeckles, Springer Science & Business Media.
4. Chemistry of natural products Vol I onwards IWPAC.
5. Natural Product Chemistry Nakanishi Gggolo, University Science Books, California.
6. Natural Product Chemistry "A laboratory guide" – Rapheal Khan.
7. The Alkaloid Chemistry and Physiology by RHF Manske, Academic Press.
8. Introduction to molecular Phytochemistry – CHJ Wells, Chapmannstall.
9. Organic Chemistry of Natural Products Vol I and II by Gurdeep and Chatwall, Himalaya Publishing House.
10. Organic Chemistry of Natural Products Vol I and II by O.P. Agarwal, Krishan Prakashan.
11. Organic Chemistry Vol I and II by I.L. Finar, Pearson education.
12. Elements of Biotechnology by P.K. Gupta, Rastogi Publishers.
13. Pharmaceutical Biotechnology by S.P.Vyas and V.K.Dixit, CBS Publishers.
14. Biotechnology by Purohit and Mathur, Agro-Bios, 13th edition.
15. Phytochemical methods of Harborne, Springer, Netherlands.
16. Burger's Medicinal Chemistry.

PHARMACEUTICAL CHEMISTRY PRACTICAL - I
(MPC 105P)

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer, RNA & DNA estimation
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on Column chromatography
4. Experiments based on HPLC
5. Experiments based on Gas Chromatography
6. Estimation of riboflavin/quinine sulphate by fluorimetry
7. Estimation of sodium/potassium by flame photometry

To perform the following reactions of synthetic importance

1. Purification of organic solvents, column chromatography
2. Claisen-schimidt reaction.
3. Benzyllic acid rearrangement.
4. Beckmann rearrangement.
5. Hoffmann rearrangement
6. Mannich reaction
7. Synthesis of medicinally important compounds involving more than one step along with purification and Characterization using TLC, melting point and IR spectroscopy (4 experiments)
8. Estimation of elements and functional groups in organic natural compounds
9. Isolation, characterization like melting point, mixed melting point, molecular weight determination, functional group analysis, co-chromatographic technique for identification of isolated compounds and interpretation of UV and IR data.
10. Some typical degradation reactions to be carried on selected plant constituents

ADVANCED SPECTRAL ANALYSIS
(MPC 201T)

Scope

This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, ATR-IR, DSC etc.

Objectives

At completion of this course it is expected that students will be able to understand-

- Interpretation of the NMR, Mass and IR spectra of various organic compounds
- Theoretical and practical skills of the hyphenated instruments
- Identification of organic compounds

THEORY 60Hrs

1. UV and IR spectroscopy: 12 Hrs
   Wood ward – Fieser rule for 1,3- butadienes, cyclic dienes and α, β-carbonyl compounds and interpretation compounds of enones. ATR-IR, IR Interpretation of organic compounds.

2 NMR spectroscopy: 12 Hrs
   1-D and 2-D NMR, NOESY and COSY, HECTOR, INADEQUATE techniques, Interpretation of organic compounds.

3 Mass Spectroscopy 12 Hrs
   Mass fragmentation and its rules, Fragmentation of important functional groups like alcohols, amines, carbonyl groups and alkanes, Meta stable ions, Mc Lafferty rearrangement, Ring rule, Isotopic peaks, Interpretation of organic compounds.

4 Chromatography: 12 Hrs
   Principle, Instrumentation and Applications of the following :
   a) GC-MS b) GC-AAS c) LC-MS d) LC-FTIR e) LC-NMR f) CE-MS g) High Performance Thin Layer chromatography h) Super critical fluid chromatography i) Ion Chromatography j) I-EC (Ion-Exclusion Chromatography) k) Flash chromatography

5 a). Thermal methods of analysis 12 Hrs

Introduction, principle, instrumentation and application of DSC, DTA and TGA.

b). Raman Spectroscopy

Introduction, Principle, Instrumentation and Applications.

c). Radio immuno assay

Biological standardization , bioassay, ELISA, Radioimmuno assay of digitalis and insulin.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
5. Quantitative analysis of Pharmaceutical formulations by HPTLC - P D Sethi, CBS Publishers, New Delhi.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

ADVANCED ORGANIC CHEMISTRY - II
(MPC 202T)

Scope

The subject is designed to provide in-depth knowledge about advances in organic chemistry, different techniques of organic synthesis and their applications to process chemistry as well as drug discovery.

Objectives

Upon completion of course, the student shall able to understand

- The principles and applications of Green chemistry
- The concept of peptide chemistry.
- The various catalysts used in organic reactions
- The concept of stereochemistry and asymmetric synthesis.

THEORY 60 Hrs

1. Green Chemistry: 12 Hrs
   a. Introduction, principles of green chemistry
   b. Microwave assisted reactions: Merit and demerits of its use, increased reaction rates, mechanism, superheating effects of microwave, effects of solvents in microwave assisted synthesis, microwave technology in process optimization, its applications in various organic reactions and heterocycles synthesis
   c. Ultrasound assisted reactions: Types of sonochemical reactions, homogenous, heterogeneous liquid-liquid and liquid-solid reactions, synthetic applications
   d. Continuous flow reactors: Working principle, advantages and synthetic applications.
2. Chemistry of peptides 12 Hrs
   a. Coupling reactions in peptide synthesis
   b. Principles of solid phase peptide synthesis, t-BOC and FMOC protocols, various solid supports and linkers: Activation procedures, peptide bond formation, deprotection and cleavage from resin, low and high HF cleavage protocols, formation of free peptides and peptide amides, purification and case studies, site-specific chemical modifications of peptides
   c. Segment and sequential strategies for solution phase peptide synthesis with any two case studies
   d. Side reactions in peptide synthesis: Deletion peptides, side

reactions initiated by proton abstraction, protonation, over-activation and side reactions of individual amino acids.

3 Photochemical Reactions 12 Hrs

Basic principles of photochemical reactions. Photo-oxidation, photo-addition and photo-fragmentation.

Pericyclic reactions

Mechanism, Types of pericyclic reactions such as cyclo addition, electrocyclic reaction and sigmatrophic rearrangement reactions with examples

4 Catalysis: 12 Hrs

a. Types of catalysis, heterogeneous and homogenous catalysis, advantages and disadvantages
b. Heterogeneous catalysis – preparation, characterization, kinetics, supported catalysts, catalyst deactivation and regeneration, some examples of heterogeneous catalysis used in synthesis of drugs.
c. Homogenous catalysis, hydrogenation, hydroformylation, hydrocyanation, Wilkinson catalysts, chiral ligands and chiral induction, Ziegler-Natta catalysts, some examples of homogenous catalysis used in synthesis of drugs
d. Transition-metal and Organo-catalysis in organic synthesis: Metal-catalyzed reactions
e. Biocatalysis: Use of enzymes in organic synthesis, immobilized enzymes/cells in organic reaction.
f. Phase transfer catalysis - theory and applications

5 Stereochemistry & Asymmetric Synthesis 12 Hrs

a. Basic concepts in stereochemistry – optical activity, specific rotation, racemates and resolution of racemates, the Cahn, Ingold, Prelog (CIP) sequence rule, meso compounds, pseudo asymmetric centres, axes of symmetry, Fischers D and L notation, cis-trans isomerism, E and Z notation.
b. Methods of asymmetric synthesis using chiral pool, chiral auxiliaries and catalytic asymmetric synthesis, enantiopure separation and Stereo selective synthesis with examples.

REFERENCES

1. "Advanced Organic chemistry, Reaction, mechanisms and structure", J March, John Wiley and sons, New York.
2. "Mechanism and structure in organic chemistry", ES Gould, Hold Rinchart and Winston,NewYork.
3. "Organic Chemistry" Clayden, Greeves, Warren and Woihers., Oxford University Press 2001.
4. "Organic Chemistry" Vol I and II. I.L. Finar. ELBS, Sixth ed., 1995.
5. Carey, Organic chemistry, 5th edition (Viva Books Pvt. Ltd.)
6. Organic synthesis-the disconnection approach, S. Warren, Wily India
7. Principles of organic synthesis, ROCNorman and JMCoxan, Nelson thorns
8. Organic synthesis- Special techniques VK Ahluwalia and R Aggarwal, Narosa Publishers.
9. Organic reaction mechanisms IV edtn, VK Ahluwalia and RK Parashar, Narosa Publishers.

COMPUTER AIDED DRUG DESIGN
(MPC 203T)

Scope

The subject is designed to impart knowledge on the current state of the art techniques involved in computer assisted drug design.

Objectives

At completion of this course it is expected that students will be able to understand

- Role of CADD in drug discovery
- Different CADD techniques and their applications
- Various strategies to design and develop new drug like molecules.
- Working with molecular modeling softwares to design new drug molecules
- The in silico virtual screening protocols

Theory — 60 Hrs

1. Introduction to Computer Aided Drug Design (CADD) — 12 Hrs

   History, different techniques and applications.

   Quantitative Structure Activity Relationships: Basics

   History and development of QSAR: Physicochemical parameters and methods to calculate physicochemical parameters: Hammett equation and electronic parameters (sigma), lipophilicity effects and parameters (log P, pi-substituent constant), steric effects (Taft steric and MR parameters) Experimental and theoretical approaches for the determination of these physicochemical parameters.

2 Quantitative Structure Activity Relationships: Applications — 12 Hrs

   Hansch analysis, Free Wilson analysis and relationship between them, Advantages and disadvantages; Deriving 2D-QSAR equations.

   3D-QSAR approaches and contour map analysis.

   Statistical methods used in QSAR analysis and importance of statistical parameters.

3 Molecular Modeling and Docking — 12 Hrs

   a) Molecular and Quantum Mechanics in drug design.

   b) Energy Minimization Methods: comparison between global

minimum conformation and bioactive conformation

c) Molecular docking and drug receptor interactions: Rigid docking, flexible docking and extra-precision docking. Agents acting on enzymes such as DHFR, HMG-CoA reductase and HIV protease, choline esterase (AchE & BchE)

4 Molecular Properties and Drug Design 12 Hrs

a) Prediction and analysis of ADMET properties of new molecules and its importance in drug design.

b) De novo drug design: Receptor/enzyme-interaction and its analysis, Receptor/enzyme cavity size prediction, predicting the functional components of cavities, Fragment based drug design.

c) Homology modeling and generation of 3D-structure of protein.

5 Pharmacophore Mapping and Virtual Screening 12 Hrs

Concept of pharmacophore, pharmacophore mapping, identification of Pharmacophore features and Pharmacophore modeling; Conformational search used in pharmacophore mapping.

In Silico Drug Design and Virtual Screening Techniques

Similarity based methods and Pharmacophore based screening, structure based In-silico virtual screening protocols.

REFERENCES

1. Computational and structural approaches to drug discovery, Robert M Stroud and Janet. F Moore, RCS Publishers.
2. Introduction to Quantitative Drug Design by Y.C. Martin, CRC Press, Taylor & Francis group..
3. Drug Design by Ariens Volume 1 to 10, Academic Press, 1975, Elsevier Publishers.
4. Principles of Drug Design by Smith and Williams, CRC Press, Taylor & Francis.
5. The Organic Chemistry of the Drug Design and Drug action by Richard B. Silverman, Elsevier Publishers.
6. Medicinal Chemistry by Burger, Wiley Publishing Co.

7. An Introduction to Medicinal Chemistry –Graham L. Patrick, Oxford University Press.
8. Wilson and Gisvold's Text book of Organic Medicinal and Pharmaceutical Chemistry, Ippincott Williams & Wilkins.
9. Comprehensive Medicinal Chemistry – Corwin and Hansch, Pergamon Publishers.
10. Computational and structural approaches to drug design edited by Robert M Stroud and Janet. F Moore

PHARMACEUTICAL PROCESS CHEMISTRY
(MPC 204T)

Scope

Process chemistry is often described as scale up reactions, taking them from small quantities created in the research lab to the larger quantities that are needed for further testing and then to even larger quantities required for commercial production. The goal of a process chemist is to develop synthetic routes that are safe, cost-effective, environmentally friendly, and efficient. The subject is designed to impart knowledge on the development and optimization of a synthetic route/s and the pilot plant procedure for the manufacture of Active Pharmaceutical Ingredients (APIs) and new chemical entities (NCEs) for the drug development phase.

Objectives

At completion of this course it is expected that students will be able to understand

- The strategies of scale up process of apis and intermediates
- The various unit operations and various reactions in process chemistry

THEORY — 60 Hrs

1. Process chemistry — 12 Hrs

Introduction, Synthetic strategy

Stages of scale up process: Bench, pilot and large scale process.

In-process control and validation of large scale process.

Case studies of some scale up process of APIs.

Impurities in API, types and their sources including genotoxic impurities

2 Unit operations — 12 Hrs

a) Extraction: Liquid equilibria, extraction with reflux, extraction with agitation, counter current extraction.
b) Filtration: Theory of filtration, pressure and vacuum filtration, centrifugal filtration,
c) Distillation: azeotropic and steam distillation
d) Evaporation: Types of evaporators, factors affecting evaporation.
e) Crystallization: Crystallization from aqueous, non-aqueous solutions factors affecting crystallization, nucleation. Principle and general methods of Preparation of polymorphs, hydrates, solvates and amorphous APIs.

3 Unit Processes - I 12 Hrs

a) Nitration: Nitrating agents, Aromatic nitration, kinetics and mechanism of aromatic nitration, process equipment for technical nitration, mixed acid for nitration,

b) Halogenation: Kinetics of halogenations, types of halogenations, catalytic halogenations. Case study on industrial halogenation process.

c) Oxidation: Introduction, types of oxidative reactions, Liquid phase oxidation with oxidizing agents. Nonmetallic Oxidizing agents such as H_2O_2, sodium hypochlorite, Oxygen gas, ozonolysis.

4 Unit Processes - II 12 Hrs

a) Reduction: Catalytic hydrogenation, Heterogeneous and homogeneous catalyst; Hydrogen transfer reactions, Metal hydrides. Case study on industrial reduction process.

b) Fermentation: Aerobic and anaerobic fermentation. Production of

i. Antibiotics; Penicillin and Streptomycin,
ii. Vitamins: B2 and B12
iii. Statins: Lovastatin, Simvastatin

c) Reaction progress kinetic analysis

i. Streamlining reaction steps, route selection,
ii. Characteristics of expedient routes, characteristics of cost-effective routes, reagent selection, families of reagents useful for scale-up.

5 Industrial Safety 12 Hrs

a) MSDS (Material Safety Data Sheet), hazard labels of chemicals and Personal Protection Equipment (PPE)

b) Fire hazards, types of fire & fire extinguishers

c) Occupational Health & Safety Assessment Series 1800 (OHSAS-1800) and ISO-14001(Environmental Management System), Effluents and its management

REFERENCES

1. Process Chemistry in the Pharmaceutical Industry: Challenges in an Ever-Changing Climate-An Overview; K. Gadamasetti, CRC Press.
2. Pharmaceutical Manufacturing Encyclopedia, 3rd edition, Volume 2.
3. Medicinal Chemistry by Burger, 6th edition, Volume 1-8.
4. W.L. McCabe, J.C Smith, Peter Harriott. Unit operations of chemical engineering, 7th edition, McGraw Hill
5. Polymorphism in Pharmaceutical Solids .Dekker Series Volume 95 Ed: H G Brittain (1999)
6. Regina M. Murphy: Introduction to Chemical Processes: Principles, Analysis, Synthesis
7. Peter J. Harrington: Pharmaceutical Process Chemistry for Synthesis: Rethinking the Routes to Scale-Up
8. P.H.Groggins: Unit processes in organic synthesis (MGH)
9. F.A.Henglein: Chemical Technology (Pergamon)
10. M.Gopal: Dryden's Outlines of Chemical Technology, WEP East-West Press
11. Clausen,Mattson: Principle of Industrial Chemistry, Wiley Publishing Co.,
12. Lowenheim & M.K. Moran: Industrial Chemicals
13. S.D. Shukla & G.N. Pandey: A text book of Chemical Technology Vol. II, Vikas Publishing House
14. J.K. Stille: Industrial Organic Chemistry (PH)
15. Shreve: Chemical Process, Mc Grawhill.
16. B.K.Sharma: Industrial Chemistry, Goel Publishing House
17. ICH Guidelines
18. United States Food and Drug Administration official website www.fda.gov

PHARMACEUTICAL CHEMISTRY PRACTICALS – II
(MPC 205P)

1. Synthesis of organic compounds by adapting different approaches involving (3 experiments)
   a) Oxidation
   b) Reduction/hydrogenation
   c) Nitration
2. Comparative study of synthesis of APIs/intermediates by different synthetic routes (2 experiments)
3. Assignments on regulatory requirements in API (2 experiments)
4. Comparison of absorption spectra by UV and Wood ward – Fieser rule
5. Interpretation of organic compounds by FT-IR
6. Interpretation of organic compounds by NMR
7. Interpretation of organic compounds by MS
8. Determination of purity by DSC in pharmaceuticals
9. Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra
10. To carry out the preparation of following organic compounds
11. Preparation of 4-chlorobenzhydrylpiperazine. (an intermediate for cetirizine HCl).
12. Preparation of 4-iodotolene from p-toluidine.
13. $NaBH_4$ reduction of vanillin to vanillyl alcohol
14. Preparation of umbelliferone by Pechhman reaction
15. Preparation of triphenyl imidazole
16. To perform the Microwave irradiated reactions of synthetic importance (Any two)
17. Determination of log P, MR, hydrogen bond donors and acceptors of selected drugs using softwares
18. Calculation of ADMET properties of drug molecules and its analysis using softwares
    Pharmacophore modeling
19. 2D-QSAR based experiments
20. 3D-QSAR based experiments
21. Docking study based experiment
22. Virtual screening based experiment

PHARMACEUTICALANALYSIS(MPA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPA 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

	THEORY	60 Hrs
1.	a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation. c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence (Characterestics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer. d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.	10 Hrs
2	NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.	10 Hrs
3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass	10

	Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: a. Thin Layer chromatography b. High Performance Thin Layer Chromatography c. Ion exchange chromatography d. Column chromatography e. Gas chromatography f. High Performance Liquid chromatography g. Ultra High Performance Liquid chromatography h. Affinity chromatography i. Gel Chromatography	10 Hrs
5	a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction	10 Hrs
6	Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation	10 Hrs

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED PHARMACEUTICAL ANALYSIS
(MPA 102T)

Scope

This subject deals with the various aspects of Impurity, Impurities in new drug products, in residual solvents, Elemental impurities, Impurity profiling and characterization of degradents, Stability testing of phytopharmaceuticals and their protocol preparation. It also covers the biological testing of various vaccines and their principle and procedure.

Objective

After completion of the course students shall able to know,

- Appropriate analytical skills required for the analytical method development.
- Principles of various reagents used in functional group analysis that renders necessary support in research methodology and demonstrates its application in the practical related problems.
- Analysis of impurities in drugs, residual solvents and stability studies of drugs and biological products

THEORY 60 Hrs

1. Impurity and stability studies: 10 Hrs

Definition, classification of impurities in drug Substance or Active Pharmaceutical Ingredients and quantification of impurities as per ICH guidelines

Impurities in new drug products:

Rationale for the reporting and control of degradation products, reporting degradation products content of batches, listing of degradation products in specifications, qualification of degradation products

Impurities in residual solvents:

General principles, classification of residual solvents, Analytical procedures, limits of residual solvents, reporting levels of residual solvents

2 Elemental impurities: 10 Hrs

Element classification, control of elemental impurities, Potential Sources of elemental Impurities, Identification of Potential Elemental Impurities, analytical procedures, instrumentation & C, H, N and S analysis

Stability testing protocols:

Selection of batches, container orientation, test parameters, sampling frequency, specification, storage conditions, recording of results, concept of stability, commitment etc. Important mechanistic and stability related information provided by results of study of factors like temperature, pH, buffering species ionic strength and dielectric constant etc. on the reaction rates. With practical considerations.

3	Impurity profiling and degradent characterization: Method development, Stability studies and concepts of validation accelerated stability testing & shelf life calculation, WHO and ICH stability testing guidelines, Stability zones, steps in development, practical considerations. Basics of impurity profiling and degradent characterization with special emphasis. Photostability testing guidelines, ICH stability guidelines for biological products	10 Hrs
4	Stability testing of phytopharmaceuticals: Regulatory requirements, protocols, HPTLC/HPLC finger printing, interactions and complexity.	10 Hrs
5	Biological tests and assays of the following: a. Adsorbed Tetanus vaccine b. Adsorbed Diphtheria vaccine c. Human anti haemophilic vaccine d. Rabies vaccine e. Tetanus Anti toxin f. Tetanus Anti serum g. Oxytocin h. Heparin sodium IP i. Antivenom. PCR, PCR studies for gene regulation, instrumentation (Principle and Procedures)	10 Hrs
6	Immunoassays (IA) Basic principles, Production of antibodies, Separation of bound and unbound drug, Radioimmunoassay, Optical IA, Enzyme IA, Fluoro IA, Luminiscence IA, Quantification and applications of IA.	10 Hrs

REFERENCES

1. Vogel's textbook of quantitative chemical analysis - Jeffery J Bassett, J. Mendham, R. C. Denney, 5th edition, ELBS, 1991.
2. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th Edition, CBS publishers, New Delhi, 1997.
3. Textbook of Pharmaceutical Analysis - K A Connors, 3rd Edition, John Wiley & Sons, 1982.

4. Pharmaceutical Analysis - Higuchi, Brochmman and Hassen, 2nd Edition, Wiley – Inter science Publication, 1961.
5. Quantitative Analysis of Drugs in Pharmaceutical formulation – P D Sethi, 3rd Edition, CBS Publishers New Delhi, 1997.
6. Pharmaceutical Analysis- Modern methods - J W Munson – Part B, Volume 11, Marcel Dekker Series.
7. The Quantitative analysis of Drugs - D C Carratt, 3rd edition, CBS Publishers, NewDelhi, 1964.
8. Indian Pharmacopoeia Vol I , II & III 2007, 2010, 2014.
9. Methods of sampling and microbiological examination of water, first revision, BIS
10. Practical HPLC method development – Snyder, Kirkland, Glajch, 2nd edition, John Wiley & Sons.
11. Analytical Profiles of drug substances – Klaus Florey, Volume 1 – 20, Elsevier, 2005
12. Analytical Profiles of drug substances and Excipients – Harry G Brittan, Volume 21 – 30, Elsevier, 2005.
13. The analysis of drugs in biological fluids - Joseph Chamberlain, 2nd edition, CRC press, London.
14. ICH Guidelines for impurity profiles and stability studies.

PHARMACEUTICAL VALIDATION
(MPA 103T)

Scope

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus to improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Objectives

Upon completion of the subject student shall be able to

- Explain the aspect of validation
- Carryout validation of manufacturing processes
- Apply the knowledge of validation to instruments and equipments
- Validate the manufacturing facilities

THEORY 60 Hrs

1.	Introduction: Definition of Qualification and Validation, Advantage of Validation, Streamlining of Qualification & Validation process and Validation Master Plan. Qualification: User Requirement Specification, Design Qualification, Factory Acceptance Test (FAT)/ Site Acceptance Test (SAT), Installation Qualification, Operational Qualification, Performance Qualification, Re- Qualification (Maintaining status- Calibration Preventive Maintenance, Change management), Qualification of Manufacturing Equipments, Qualification of Analytical Instruments and Laboratory equipments.	12 Hrs
2	Qualification of analytical instruments: Electronic balance, pH meter, UV-Visible spectrophotometer, FTIR, GC, HPLC, HPTLC Qualification of Glassware: Volumetric flask, pipette, Measuring cylinder, beakers and burette.	12 Hrs
3	Validation of Utility systems: Pharmaceutical Water System & pure steam, HVAC system, Compressed air and nitrogen. Cleaning Validation: Cleaning Validation - Cleaning Method development, Validation and validation of analytical method used in cleaning. Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP).	12 Hrs
4	Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.	12 Hrs

Computerized system validation: Electronic records and digital significance-21 CFR part 11 and GAMP 5.

5	General Principles of Intellectual Property: Concepts of Intellectual Property (IP), Intellectual Property Protection (IPP), Intellectual Property Rights (IPR); Economic importance, mechanism for protection of Intellectual Property –patents, Copyright, Trademark; Factors affecting choice of IP protection; Penalties for violation; Role of IP in pharmaceutical industry; Global ramification and financial implications. Filing a patent applications; patent application forms and guidelines. Types patent applications-provisional and non-provisional, PCT and convention patent applications; International patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices.	12 Hrs

REFERENCES

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco, (Marcel Dekker).
5. Michael Levin, Pharmaceutical Process Scale-Up‖, Drugs and Pharm. Sci. Series, Vol. 157,2nd Ed., Marcel Dekker Inc., N.Y.
6. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
7. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
8. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker, 2nd Ed.
9. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Inter Science.

FOOD ANALYSIS
(MPA 104T)

Scope

This course is designed to impart knowledge on analysis of food constituents and finished food products. The course includes application of instrumental analysis in the determination of pesticides in variety of food products.

Objectives

At completion of this course student shall be able to understand various analytical techniques in the determination of

- Food constituents
- Food additives
- Finished food products
- Pesticides in food
- And also student shall have the knowledge on food regulations and legislations

THEORY 60 Hrs

1. Carbohydrates: classification and properties of food carbohydrates, General methods of analysis of food carbohydrates, Changes in food carbohydrates during processing, Digestion, absorption and metabolism of carbohydrates, Dietary fibre, Crude fibre and application of food carbohydrates 12 Hrs
   Proteins: Chemistry and classification of amino acids and proteins, Physico-Chemical properties of protein and their structure, general methods of analysis of proteins and amino acids, Digestion, absorption and metabolism of proteins.

2 Lipids: Classification, general methods of analysis, refining of fats and oils; hydrogenation of vegetable oils, Determination of adulteration in fats and oils, Various methods used for measurement of spoilage of fats and fatty foods. 12 Hrs
   Vitamins: classification of vitamins, methods of analysis of vitamins, Principles of microbial assay of vitamins of B-series.

3 Food additives: Introduction, analysis of Preservatives, antioxidants, artificial sweeteners, flavors, flavor enhancers, stabilizers, thickening and jelling agents. 12 Hrs
   Pigments and synthetic dyes: Natural pigments, their occurrence and characteristic properties, permitted synthetic

dyes, Non-permitted synthetic dyes used by industries, Method of detection of natural, permitted and non-permitted dyes.

4	General Analytical methods for milk, milk constituents and milk products like ice cream, milk powder, butter, margarine, cheese including adulterants and contaminants of milk. Analysis of fermentation products like wine, spirits, beer and vinegar.	12 Hrs
5	Pesticide analysis: Effects of pest and insects on various food, use of pesticides in agriculture, pesticide cycle, organophosphorus and organochlorine pesticides analysis, determination of pesticide residues in grain, fruits, vegetables, milk and milk products. Legislation regulations of food products with special emphasis on BIS, Agmark, FDA and US-FDA.	12 Hrs

REFERENCES

1. The chemical analysis of foods – David Pearson, Seventh edition, Churchill Livingstone, Edinburgh London, 1976
2. Introduction to the Chemical analysis of foods – S. Nielsen, Jones & Bartlett publishers, Boston London, 1994.
3. Official methods of analysis of AOAC International, sixth edition, Volume I & II, 1997.
4. Analysis of Food constituents – Multon, Wiley VCH.
5. Dr. William Horwitz, Official methods of analysis of AOAC International, 18th edition, 2005.

PHARMACEUTICAL ANALYSIS PRACTICALS - II
(MPA 105P)

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. Assay of official compounds by different titrations
8. Assay of official compounds by instrumental techniques.
9. Quantitative determination of hydroxyl group.
10. Quantitative determination of amino group
11. Colorimetric determination of drugs by using different reagents
12. Imupurity profiling of drugs
13. Calibration of glasswares
14. Calibration of pH meter
15. Calibration of UV-Visible spectrophotometer
16. Calibration of FTIR spectrophotometer
17. Calibration of GC instrument
18. Calibration of HPLC instrument
19. Cleaning validation of any one equipment
20. Determination of total reducing sugar
21. Determination of proteins
22. Determination of saponification value, Iodine value, Peroxide value, Acid value in food products
23. Determination of fat content and rancidity in food products
24. Analysis of natural and synthetic colors in food
25. Determination of preservatives in food
26. Determination of pesticide residue in food products
27. Analysis of vitamin content in food products
28. Determination of density and specific gravity of foods
29. Determination of food additives

ADVANCED INSTRUMENTAL ANALYSIS
(MPA 201T)

Scope

This subject deals with various hyphenated analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are LC-MS, GC-MS, and hyphenated techniques.

Objectives

After completion of course student is able to know,

- interpretation of the NMR, Mass and IR spectra of various organic compounds
- theoretical and practical skills of the hyphenated instruments
- identification of organic compounds

THEORY 60 Hrs

1.	HPLC: Principle, instrumentation, pharmaceutical applications, peak shapes, capacity factor, selectivity, plate number, plate height, resolution, band broadening, pumps, injector, detectors, columns, column problems, gradient HPLC, HPLC solvents, trouble shooting, sample preparation, method development, New developments in HPLC-role and principles of ultra, nano liquid chromatography in pharmaceutical analysis. Immobilized polysaccharide CSP's: Advancement in enantiomeric separations, revised phase Chiral method development and HILIC approaches. HPLC in Chiral analysis of pharmaceuticals. Preparative HPLC, practical aspects of preparative HPLC.	12 Hrs
2	Biochromatography: Size exclusion chromatography, ion exchange chromatography, ion pair chromatography, affinity chromatography general principles, stationary phases and mobile phases. Gas chromatography: Principles, instrumentation, derivatization, head space sampling, columns for GC, detectors, quantification. High performance Thin Layer chromatography: Principles, instrumentation, pharmaceutical applications.	12 Hrs
3	Super critical fluid chromatography: Principles, instrumentation, pharmaceutical applications. Capillary electrophoresis: Overview of CE in pharmaceutical analysis, basic configuration, CE characteristics, principles of CE, methods and modes of CE. General considerations and method	12 Hrs

development in CE, Crown ethers as buffer additives in capillary electrophoresis. CE-MS hyphenation.

4 Mass spectrometry: Principle, theory, instrumentation of mass spectrometry, different types of ionization like electron impact, chemical, field, FAB and MALD, APCI, ESI, APPI mass fragmentation and its rules, meta stable ions, isotopic peaks and applications of mass spectrometry. LC-MS hyphenation and DART MS analysis. Mass analysers (Quadrpole, Time of flight, FT-ICR, ion trap and Orbitrap) instruments. MS/MS systems (Tandem: QqQ, TOF-TOF;Q-IT, Q-TOF, LTQ-FT, LTQ-Orbitrap. 12 Hrs

5 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR with reference to 13CNMR: Spin spin and spin lattice relaxation phenomenon. 13C NMR, 1-D and 2-D NMR, NOESY and COSY techniques, Interpretation and Applications of NMR spectroscopy. LC-NMR hyphenations. 12 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
5. Quantitative analysis of Pharmaceutical formulations by HPTLC - P D Sethi, CBS Publishers, New Delhi.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series.
8. Organic Spectroscopy by Donald L. Paviya, 5th Edition.

MODERN BIO-ANALYTICAL TECHNIQUES
(MPA 202T)

Scope

This subject is designed to provide detailed knowledge about the importance of analysis of drugs in biological matrices.

Objectives

Upon completion of the course, the student shall be able to understand

- Extraction of drugs from biological samples
- Separation of drugs from biological samples using different techniques
- Guidelines for BA/BE studies.

THEORY 60 Hrs

1. Extraction of drugs and metabolites from biological matrices: General need, principle and procedure involved in the Bioanalytical methods such as Protein precipitation, Liquid - Liquid extraction and Solid phase extraction and other novel sample preparation approach. Bioanalytical method validation: USFDA and EMEA guidelines. 12 Hrs

2 Biopharmaceutical Consideration: Introduction, Biopharmaceutical Factors Affecting Drug Bioavailability, In Vitro: Dissolution and Drug Release Testing, Alternative Methods of Dissolution Testing Transport models, Biopharmaceutics Classification System. Solubility: Experimental methods. Permeability: In-vitro, in-situ and In-vivo methods. 12 Hrs

3 Pharmacokinetics and Toxicokinetics: Basic consideration, Drug interaction (PK-PD interactions), The effect of protein-binding interactions, The effect of tissue-binding interactions, Cytochrome P450-based drug interactions, Drug interactions linked to transporters. Microsomal assays Toxicokinetics-Toxicokinetic evaluation in preclinical studies, Importance and applications of toxicokinetic studies. LC-MS in bioactivity screening and proteomics. 12 Hrs

4 Cell culture techniques Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of 12 Hrs

cells and their applications. Principles and applications of cell viability assays (MTT assays), Principles and applications of flow cytometry.

5 Metabolite identification: 12 Hrs

In-vitro / in-vivo approaches, protocols and sample preparation. Microsomal approaches (Rat liver microsomes (RLM) and Human liver microsomes (HLM) in Met –ID. Regulatory perspectives. In-vitro assay of drug metabolites & drug metabolizing enzymes.

Drug Product Performance, In Vivo: Bioavailability and Bioequivalence:

Drug Product Performance, Purpose of Bioavailability Studies, Relative and Absolute Availability. Methods for Assessing Bioavailability, Bioequivalence Studies, Design and Evaluation of Bioequivalence Studies, Study Designs, Crossover Study Designs, Generic Biologics (Biosimilar Drug Products), Clinical Significance of Bioequivalence Studies.

REFERENCES

1. Analysis of drugs in Biological fluids - Joseph Chamberlain, 2nd Edition. CRC Press, Newyork. 1995.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Pharmaceutical Analysis - Higuchi, Brochmman and Hassen, 2nd Edition, Wiley – Interscience Publications, 1961.
4. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series
5. Practical HPLC method Development – Snyder, Kirkland, Glaich, 2nd Edition, John Wiley & Sons, New Jercy. USA.
6. Chromatographic Analysis of Pharmaceuticals – John A Adamovics, 2nd Edition, Marcel Dekker, Newyork, USA. 1997.
7. Chromatographic methods in clinical chemistry & Toxicology – Roger L Bertholf, Ruth E Winecker, John Wiley & Sons, New Jercy, USA. 2007.
8. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
9. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
10. ICH, USFDA & CDSCO Guidelines.
11. Palmer

QUALITY CONTROL AND QUALITY ASSURANCE
(MPA 203T)

Scope

This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Objectives

At the completion of this subject it is expected that the student shall be able to know

- the cGMP aspects in a pharmaceutical industry
- to appreciate the importance of documentation
- to understand the scope of quality certifications applicable to Pharmaceutical industries
- to understand the responsibilities of QA & QC departments

THEORY 60 hrs

1. Concept and Evolution of Quality Control and Quality Assurance 12 Hrs
   Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines.
   Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non clinical testing, control on animal house, report preparation and documentation.

2. cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention (PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice. CPCSEA guidelines. 12 Hrs

3. Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3) 12 Hrs

Purchase specifications and maintenance of stores for raw materials. In process quality control and finished products quality control for following formulation in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias), Quality control test for containers, closures and secondary packing materials.

4. Documentation in pharmaceutical industry: Three tier documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Formula Record, Batch Formula Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data. 12 Hrs

5. Manufacturing operations and controls: Sanitation of manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging. 12 Hrs

REFERENCES

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's – P P Sharma, Vandana Publications, Agra, 1991.
5. The International Pharmacopoeia – vol I, II, III, IV & V - General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excepients and Dosage forms, 3rd edition, WHO, Geneva, 2005.
6. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
7. ICH guidelines
8. ISO 9000 and total quality management

9. The drugs and cosmetics act 1940 – Deshpande, Nilesh Gandhi, 4th edition, Susmit Publishers, 2006.
10. QA Manual – D.H. Shah, 1st edition, Business Horizons, 2000.
11. Good Manufacturing Practices for Pharmaceuticals a plan for total quality control – Sidney H. Willig, Vol. 52, 3rd edition, Marcel Dekker Series.
12. Steinborn L. GMP/ISO Quality Audit Manual for Healthcare Manufacturers and Their Suppliers, Sixth Edition, (Volume 1 - With Checklists and Software Package). Taylor & Francis; 2003.
13. Sarker DK. Quality Systems and Controls for Pharmaceuticals. John Wiley & Sons; 2008.

HERBAL AND COSMETIC ANALYSIS
(MPA 204T)

Scope

This course is designed to impart knowledge on analysis of herbal products. Regulatory requirements, herbal drug interaction with monographs. Performance evaluation of cosmetic products is included for the better understanding of the equipments used in cosmetic industries for the purpose.

Objectives

At completion of this course student shall be able to understand

- Determination of herbal remedies and regulations
- Analysis of natural products and monographs
- Determination of Herbal drug-drug interaction
- Principles of performance evaluation of cosmetic products.

THEORY 60 Hrs

1. Herbal remedies- Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of herbal medicine products, Validation of Herbal Therapies, Pharmacodynamic and Pharmacokinetic issues. Herbal drug standardization: WHO and AYUSH guidelines. 12 Hrs

2 Adulteration and Deterioration: Introduction, types of adulteration/substitution of herbal drugs, Causes and Measure of adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, heavy metals, pesticide residues, phototoxin and microbial contamination in herbal formulations. 12 Hrs

Regulatory requirements for setting herbal drug industry: Global marketing management, Indian and international patent law as applicable herbal drugs and natural products and its protocol.

3 Testing of natural products and drugs: Effect of herbal medicine on clinical laboratory testing, Adulterant Screening using modern analytical instruments, Regulation and dispensing of herbal drugs, Stability testing of natural products, protocol. 12 Hrs

Monographs of Herbal drugs: Study of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic

Pharmacopoeia, American herbal Pharmacopoeia, British herbal Pharmacopoeia, Siddha and Unani Pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

4 Herbal drug-drug interaction: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for bio drug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples. Challenges in monitoring the safety of herbal medicines. 12 Hrs

5 Evaluation of cosmetic products: Determination of acid value, ester value, saponification value, iodine value, peroxide value, rancidity, moisture, ash, volatile matter, heavy metals, fineness of powder, density, viscosity of cosmetic raw materials and finished products. Study of quality of raw materials and general methods of analysis of raw material used in cosmetic manufacture as per BIS.

Indian Standard specification laid down for sampling and testing of various cosmetics in finished forms such as baby care products, skin care products, dental products, personal hygiene preparations, lips sticks. Hair products and skin creams by the Bureau Indian Standards. 12 Hrs

REFERENCES

1. Pharmacognosy by Trease and Evans
2. Pharmacognosy by Kokate, Purohit and Gokhale
3. Quality Control Methods for Medicinal Plant, WHO, Geneva
4. Pharmacognosy & Pharmacobiotechnology by Ashutosh Kar
5. Essential of Pharmacognosy by Dr.S.H.Ansari
6. Cosmetics – Formulation, Manufacturing and Quality Control, P.P. Sharma, 4th edition, Vandana Publications Pvt. Ltd., Delhi
7. Indian Standard specification, for raw materials, BIS, New Delhi.
8. Indian Standard specification for 28 finished cosmetics BIS, New Delhi
9. Harry's Cosmeticology 8th edition
10. Suppliers catalogue on specialized cosmetic excipients
11. Wilkinson, Moore, seventh edition, George Godwin. Poucher's Perfumes, Cosmetics and Soaps
12. Hilda Butler, 10th Edition, Kluwer Academic Publishers. Handbook of Cosmetic Science and Technology, 3rd Edition,

PHARMACEUTICAL ANALYSIS PRACTICALS - I
(MPA 205P)

1. Comparison of absorption spectra by UV and Wood ward – Fiesure rule
2. Interpretation of organic compounds by FT-IR
3. Interpretation of organic compounds by NMR
4. Interpretation of organic compounds by MS
5. Determination of purity by DSC in pharmaceuticals
6. Identification of organic compounds using FT-IR, NMR, CNMR and Mass spectra
7. Bio molecules separation utilizing various sample preparation techniques and Quantitative analysis of components by gel electrophoresis.
8. Bio molecules separation utilizing various sample preparation techniques and Quantitative analysis of components by HPLC techniques.
9. Isolation of analgesics from biological fluids (Blood serum and urine).
10. Protocol preparation and performance of analytical/Bioanalytical method validation.
11. Protocol preparation for the conduct of BA/BE studies according to guidelines.
12. In process and finished product quality control tests for tablets, capsules, parenterals and creams
13. Quality control tests for Primary and secondary packing materials
14. Assay of raw materials as per official monographs
15. Testing of related and foreign substances in drugs and raw materials
16. Preparation of Master Formula Record.
17. Preparation of Batch Manufacturing Record.
18. Quantitative analysis of rancidity in lipsticks and hair oil
19. Determination of aryl amine content and Developer in hair dye
20. Determination of foam height and SLS content of Shampoo.
21. Determination of total fatty matter in creams (Soap, skin and hair creams)
22. Determination of acid value and saponification value.
23. Determination of calcium thioglycolate in depilatories

PHARMACEUTICALQUALITYASSURANCE(MQA)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MQA 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about chemicals and excipients

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 12 Hrs

   b. IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.

   c. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence (Characterestics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   d. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy. 12 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	12 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: • Thin Layer chromatography • High Performance Thin Layer Chromatography • Ion exchange chromatography • Column chromatography • Gas chromatography • High Performance Liquid chromatography • Ultra High Performance Liquid chromatography • Affinity chromatography • Gel Chromatography	12 Hrs
5	a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	12 Hrs
6	a. Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. b. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation	12 Hrs

and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis - Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry - Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods - Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.
10. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

QUALITY MANAGEMENT SYSTEMS
(MQA 102T)

Scope

This course is designed to impart fundamental knowledge and concepts about various quality management principles and systems utilized in the manufacturing industry. It also aids in understanding the quality evaluation in the pharmaceutical industries.

Objectives

At completion of this course it is expected that students will be able to understand-

- The importance of quality
- ISO management systems
- Tools for quality improvement
- Analysis of issues in quality
- Quality evaluation of pharmaceuticals
- Stability testing of drug and drug substances
- Statistical approaches for quality

THEORY 60 Hrs

1. Introduction to Quality: Evolution of Quality, Definition of Quality, Dimensions of Quality 12 Hrs

   Quality as a Strategic Decision: Meaning of strategy and strategic quality management, mission and vision statements, quality policy, Quality objectives, strategic planning and implementation, McKinsey 7s model, Competitive analysis, Management commitment to quality

   Customer Focus: Meaning of customer and customer focus, Classification of customers, Customer focus, Customer perception of quality, Factors affecting customer perception, Customer requirements, Meeting customer needs and expectations, Customer satisfaction and Customer delight, Handling customer complaints, Understanding customer behavior, concept of internal and external customers. Case studies.

   Cost of Quality: Cost of quality, Categories of cost of Quality, Models of cost of quality, Optimising costs, Preventing cost of quality.

2	Pharmaceutical quality Management: Basics of Quality Management, Total Quality Management (TQM), Principles of Six sigma, ISO 9001:2008, 9001:2015, ISO 14001:2004, Pharmaceutical Quality Management – ICH Q10, Knowledge management, Quality Metrics, Operational Excellence and Quality Management Review. OSHAS guidelines, NABL certification and accreditation, CFR-21 part 11, WHO-GMP requirements.	12 Hrs
3	Six System Inspection model: Quality Management system, Production system, Facility and Equipment system, Laboratory control system, Materials system, Packaging and labeling system. Concept of self inspection. Quality systems: Change Management/ Change control. Deviations, Out of Specifications (OOS), Out of Trend (OOT), Complaints - evaluation and handling, Investigation and determination of root cause, Corrective & Preventive Actions (CAPA), Returns and Recalls, Vendor Qualification, Annual Product Reviews, Batch Review and Batch Release. Concept of IPQC, area clearance/ Line clearance.	12 Hrs
4	Drug Stability: ICH guidelines for stability testing of drug substances and drug products. Study of ICH Q8, Quality by Design and Process development report Quality risk management: Introduction, risk assessment, risk control, risk review, risk management tools, HACCP, risk ranking and filtering according to ICH Q9 guidelines.	12 Hrs
5	Statistical Process control (SPC): Definition and Importance of SPC, Quality measurement in manufacturing, Statistical control charts - concepts and general aspects, Advantages of statistical control, Process capability, Estimating Inherent or potential capability from a control chart analysis, Measuring process control and quality improvement, Pursuit of decreased process variability.	8 Hrs
6	Regulatory Compliance through Quality Management and development of Quality Culture Benchmarking: Definition of benchmarking, Reasons for benchmarking, Types of Benchmarking, Benchmarking process, Advantages of benchmarking, Limitations of benchmarking.	4 Hrs

REFERENCES

1. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, By Al Endres, Wiley, 2000
2. Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, By Jiju Antony; David Preece, Routledge, 2002
3. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler; Susan Albers Mohrman; George Benson, Jossey-Bass, 2001
4. Corporate Culture and the Quality Organization By James W. Fairfield-Sonn, Quorum Books, 2001
5. The Quality Management Sourcebook: An International Guide to Materials and Resources By Christine Avery; Diane Zabel, Routledge, 1997
6. The Quality Toolbox, Second Edition, Nancy R. Tague, ASQ Publications
7. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications
8. Root Cause Analysis, The Core of Problem Solving and Corrective Action, Duke Okes, 2009, ASQ Publications.

QUALITY CONTROL AND QUALITY ASSURANCE
(MQA 103T)

Scope

This course deals with the various aspects of quality control and quality assurance aspects of pharmaceutical industries. It covers the important aspects like cGMP, QC tests, documentation, quality certifications, GLP and regulatory affairs.

Objectives

Upon completion of this course the student should be able to

- Understand the cGMP aspects in a pharmaceutical industry
- To appreciate the importance of documentation
- To understand the scope of quality certifications applicable to Pharmaceutical industries
- To understand the responsibilities of QA & QC departments.

THEORY 60 Hrs

1. Introduction: Concept and evolution and scopes of Quality Control and Quality Assurance, Good Laboratory Practice, GMP, Overview of ICH Guidelines - QSEM, with special emphasis on Q-series guidelines. 12 Hrs

   Good Laboratory Practices: Scope of GLP, Definitions, Quality assurance unit, protocol for conduct of non clinical testing, control on animal house, report preparation and documentation. CPCSEA guidelines.

2 cGMP guidelines according to schedule M, USFDA (inclusive of CDER and CBER) Pharmaceutical Inspection Convention(PIC), WHO and EMEA covering: Organization and personnel responsibilities, training, hygiene and personal records, drug industry location, design, construction and plant lay out, maintenance, sanitation, environmental control, utilities and maintenance of sterile areas, control of contamination and Good Warehousing Practice. 12 Hrs

3 Analysis of raw materials, finished products, packaging materials, in process quality control (IPQC), Developing specification (ICH Q6 and Q3), purchase specifications and maintenance of stores for raw materials. 12 Hrs

In process quality control and finished products quality control for following dosage forms in Pharma industry according to Indian, US and British pharmacopoeias: tablets, capsules, ointments, suppositories, creams, parenterals, ophthalmic and surgical products (How to refer pharmacopoeias).

4 Documentation in pharmaceutical industry: Three tier documentation, Policy, Procedures and Work instructions, and records (Formats), Basic principles- How to maintain, retention and retrieval etc. Standard operating procedures (How to write), Master Batch Record, Batch Manufacturing Record, Quality audit plan and reports. Specification and test procedures, Protocols and reports. Distribution records. Electronic data handling. Concepts of controlled and uncontrolled documents. 12 Hrs

Submission documents for regulators DMFs, as Common Technical Document and Electronic Common Technical Documentation (CTD, eCTD). Concept of regulated and non regulated markets.

5 Manufacturing operations and controls: Sanitation of manufacturing premises, mix-ups and cross contamination, processing of intermediates and bulk products, packaging operations, IPQC, release of finished product, process deviations, charge-in of components, time limitations on production, drug product inspection, expiry date calculation, calculation of yields, production record review, change control, sterile products, aseptic process control, packaging, reprocessing, salvaging, handling of waste and scrap disposal. 12 Hrs

Introduction, scope and importance of intellectual property rights. Concept of trade mark, copyright and patents.

REFERENCES

1. Quality Assurance Guide by organization of Pharmaceutical Procedures of India, 3rd revised edition, Volume I & II, Mumbai, 1996.
2. Good Laboratory Practice Regulations, 2nd Edition, Sandy Weinberg Vol. 69, Marcel Dekker Series, 1995.
3. Quality Assurance of Pharmaceuticals- A compedium of Guide lines and Related materials Vol I & II, 2nd edition, WHO Publications, 1999.
4. How to Practice GMP's – P P Sharma, Vandana Publications, Agra, 1991.

5. The International Pharmacopoeia – vol I, II, III, IV & V - General Methods of Analysis and Quality specification for Pharmaceutical Substances, Excepients and Dosage forms, 3rd edition, WHO, Geneva, 2005.
6. Good laboratory Practice Regulations – Allen F. Hirsch, Volume 38, Marcel Dekker Series, 1989.
7. ICH guidelines
8. ISO 9000 and total quality management
9. The drugs and cosmetics act 1940 – Deshpande, Nilesh Gandhi, 4th edition, Susmit Publishers, 2006.
10. QA Manual – D.H. Shah, 1st edition, Business Horizons, 2000.
11. Good Manufacturing Practices for Pharmaceuticals a plan for total quality control – Sidney H. Willig, Vol. 52, 3rd edition, Marcel Dekker Series.
12. Steinborn L. GMP/ISO Quality Audit Manual for Healthcare Manufacturers and Their Suppliers, Sixth Edition, (Volume 1 - With Checklists and Software Package). Taylor & Francis; 2003.
13. Sarker DK. Quality Systems and Controls for Pharmaceuticals. John Wiley & Sons; 2008.
14. Packaging of Pharmaceuticals.
15. Schedule M and Schedule N.

PRODUCT DEVELOPMENT AND TECHNOLOGY TRANSFER
(MQA 104T)

Scope

This deal with technology transfer covers the activities associated with Drug Substance, Drug Product and analytical tests and methods, required following candidate drug selection to completion of technology transfer from R&D to the first receiving site and technology transfer related to post-marketing changes in manufacturing places.

Objectives

Upon completion of this course the student should be able to

- To understand the new product development process
- To understand the necessary information to transfer technology from R&D to actual manufacturing by sorting out various information obtained during R&D
- To elucidate necessary information to transfer technology of existing products between various manufacturing places

THEORY		60 Hrs
1.	Principles of Drug discovery and development: Introduction, Clinical research process. Development and informational content for Investigational New Drugs Application (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA), Scale Up Post Approval Changes (SUPAC) and Bulk active chemical Post approval changes (BACPAC), Post marketing surveillance, Product registration guidelines - CDSCO, USFDA.	12 Hrs
2	Pre-formulation studies: Introduction/concept, organoleptic properties, purity, impurity profiles, particle size, shape and surface area. Solubility, Methods to improve solubility of Drugs: Surfactants & its importance, co-solvency. Techniques for the study of Crystal properties and polymorphism. Pre-formulation protocol, Stability testing during product development.	12 Hrs
3	Pilot plant scale up: Concept, Significance, design, layout of pilot plant scale up study, operations, large scale manufacturing techniques (formula, equipment, process, stability and quality control) of solids, liquids, semisolid and parenteral dosage forms. New era of drug products: opportunities and challenges.	12 Hrs

4	Pharmaceutical packaging: Pharmaceutical dosage form and their packaging requirments, Pharmaceutical packaging materials, Medical device packaging, Enteral Packaging, Aseptic packaging systems, Container closure systems, Issues facing modern drug packaging, Selection and evaluation of Pharmaceutical packaging materials. Quality control test: Containers, closures and secondary packing materials.	12 Hrs
5	Technology transfer: Development of technology by R & D, Technology transfer from R & D to production, Optimization and Production, Qualitative and quantitative technology models. Documentation in technology transfer: Development report, technology transfer plan and Exhibit.	12 Hrs

REFERENCES

1. The process of new drug discovery and development. I and II Edition (2006) by Charles G. Smith, James T and O. Donnell. CRC Press, Group of Taylor and Francis.
2. Leon Lac Lachman, Herbert A. Liberman, Theory and Practice of Industrial Pharmacy. Marcel Dekker Inc. New York.
3. Sidney H Willing, Murray M, Tuckerman. Williams Hitchings IV, Good manufacturing of pharmaceuticals (A Plan for total quality control) 3rd Edition. Bhalani publishing house Mumbai.
4. Tablets Vol. I, II, III by Leon Lachman, Herbert A. Liberman, Joseph B. Schwartz, 2nd Edn. (1989) Marcel Dekker Inc. New York.
5. Text book of Bio- Pharmaceutics and clinical Pharmacokinetics by Milo Gibaldi, 3rd Edn, Lea & Febriger, Philadelphia.
6. Pharmaceutical product development. Vandana V. Patrevale. John I. Disouza. Maharukh T.Rustomji. CRC Press, Group of Taylor and Francis.
7. Dissolution, Bioavailability and Bio-Equivalence by Abdou H.M, Mack Publishing company, Eastern Pennsylvania.
8. Remingtons Pharmaceutical Sciences, by Alfonso & Gennaro, 19th Edn.(1995)OO2C Lippincott; Williams and Wilkins A Wolters Kluwer Company, Philadelphia.
9. The Pharmaceutical Sciences; the Pharma Path way 'Pure and applied Pharmacy' by D. A Sawant, Pragathi Books Pvt. Ltd.
10. Pharmaceutical Packaging technology by D.A. Dean. E.R. Evans, I.H. Hall. 1st Edition(Reprint 2006). Taylor and Francis. London and New York.

QUALITY ASSURANCE PRACTICAL - I
(MQA 105P)

PRACTICALS

1. Analysis of Pharmacopoeial compounds in bulk and in their formulations (tablet/ capsules/ semisolids) by UV Vis spectrophotometer
2. Simultaneous estimation of multi-drug component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry or AAS
7. Case studies on
   - Total Quality Management
   - Six Sigma
   - Change Management/ Change control. Deviations,
   - Out of Specifications (OOS)
   - Out of Trend (OOT)
   - Corrective & Preventive Actions (CAPA)
   - Deviations
8. Development of Stability study protocol
9. Estimation of process capability
10. In process and finished product quality control tests for tablets, capsules, parenterals and semisolid dosage forms.
11. Assay of raw materials as per official monographs
12. Testing of related and foreign substances in drugs and raw materials
13. To carry out pre formulation study for tablets, parenterals (2 experiment).
14. To study the effect of pH on the solubility of drugs, (1 experiment)
15. Quality control tests for Primary and secondary packaging materials
16. Accelerated stability studies (1 experiment)
17. Improved solubility of drugs using surfactant systems (1 experiment)
18. Improved solubility of drugs using co-solvency method (1 experiment)
19. Determination of Pka and Log p of drugs.

HAZARDS AND SAFETY MANAGEMENT
(MQA 201T)

Scope

This course is designed to convey the knowledge necessary to understand issues related to different kinds of hazard and their management. Basic theoretical and practical discussions integrate the proficiency to handle the emergency situation in the pharmaceutical product development process and provides the principle based approach to solve the complex tribulations.

Objectives

At completion of this course it is expected that students will be able to

- Understand about environmental problems among learners.
- Impart basic knowledge about the environment and its allied problems.
- Develop an attitude of concern for the industry environment.
- Ensure safety standards in pharmaceutical industry
- Provide comprehensive knowledge on the safety management
- Empower an ideas to clear mechanism and management in different kinds of hazard management system
- Teach the method of Hazard assessment, procedure, methodology for provide safe industrial atmosphere.

THEORY 60Hrs

1. Multidisciplinary nature of environmental studies: Natural Resources, Renewable and non-renewable resources, Natural resources and associated problems, 12 Hrs

   a) Forest resources; b) Water resources; c) Mineral resources; d) Energy resources; e) Land resources

   Ecosystems: Concept of an ecosystem and Structure and function of an ecosystem. Environmental hazards: Hazards based on Air, Water, Soil and Radioisotopes.

2 Air based hazards: Sources, Types of Hazards, Air circulation maintenance industry for sterile area and non sterile area, Preliminary Hazard Analysis (PHA) Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system. 12 Hrs

3 Chemical based hazards: Sources of chemical hazards, Hazards of Organic synthesis, sulphonating hazard, Organic solvent hazard, Control measures for chemical hazards, 12 Hrs

Management of combustible gases, Toxic gases and Oxygen displacing gases management, Regulations for chemical hazard, Management of over-Exposure to chemicals and TLV concept.

4 Fire and Explosion: Introduction, Industrial processes and hazards potential, mechanical electrical, thermal and process hazards. Safety and hazards regulations, Fire protection system: Fire prevention, types of fire extinguishers and critical Hazard management system mechanical and chemical explosion, multiphase reactions, transport effects and global rates. Preventive and protective management from fires and explosion-electricity passivation, ventilation, and sprinkling, proofing, relief systems -relief valves, flares, scrubbers. 12 Hrs

5 Hazard and risk management: Self-protective measures against workplace hazards. Critical training for risk management, Process of hazard management, ICH guidelines on risk assessment and Risk management methods and Tools
Factory act and rules, fundamentals of accident prevention, elements of safety programme and safety management, Physicochemical measurements of effluents, BOD, COD, Determination of some contaminants, Effluent treatment procedure, Role of emergency services. 12 Hrs

REFERENCES

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
2. "Quantitative Risk Assessment in Chemical Process Industries" American Institute of Chemical Industries, Centre for Chemical Process safety.
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
4. Hazardous Chemicals: Safety Management and Global Regulations, T.S.S. Dikshith, CRC press

PHARMACEUTICAL VALIDATION
(MQA 202T)

Scope

The main purpose of the subject is to understand about validation and how it can be applied to industry and thus improve the quality of the products. The subject covers the complete information about validation, types, methodology and application.

Objectives

At completion of this course, it is expected that students will be able to understand

- The concepts of calibration, qualification and validation
- The qualification of various equipments and instruments
- Process validation of different dosage forms
- Validation of analytical method for estimation of drugs
- Cleaning validation of equipments employed in the manufacture of pharmaceuticals

THEORY 60 Hrs

1. Introduction to validation: Definition of Calibration, Qualification and Validation, Scope, frequency and importance. Difference between calibration and validation. Calibration of weights and measures. Advantages of Validation, scope of Validation, Organization for Validation, Validation Master plan, Types of Validation, Streamlining of qualification & Validation process and Validation Master Plan. 10 Hrs

   Qualification: User requirement specification, Design qualification, Factory Acceptance Test (FAT)/Site Acceptance Test (SAT), Installation qualification, Operational qualification, Performance qualification, Re-Qualification (Maintaining status-Calibration Preventive Maintenance, Change management).

2 Qualification of manufacturing equipment: Dry Powder Mixers, Fluid Bed and Tray dryers, Tablet Compression (Machine), Dry heat sterilization/Tunnels, Autoclaves, Membrane filtration, Capsule filling machine. 10 Hrs

   Qualification of analytical instruments: UV-Visible spectrophotometer, FTIR, DSC, GC, HPLC, HPTLC, LC-MS.

3	Qualification of laboratory equipments: Hardness tester, Friability test apparatus, tap density tester, Disintegration tester, Dissolution test apparatus Validation of Utility systems: Pharmaceutical water system & pure steam, HVAC system, Compressed air and nitrogen.	10 Hrs
4	Process Validation: Concept, Process and documentation of Process Validation. Prospective, Concurrent & Retrospective Validation, Re validation criteria, Process Validation of various formulations (Coated tablets, Capsules, Ointment/Creams, Liquid Orals and aerosols.), Aseptic filling: Media fill validation, USFDA guidelines on Process Validation- A life cycle approach. Analytical method validation: General principles, Validation of analytical method as per ICH guidelines and USP.	10 Hrs
5	Cleaning Validation: Cleaning Method development, Validation of analytical method used in cleaning, Cleaning of Equipment, Cleaning of Facilities. Cleaning in place (CIP). Validation of facilities in sterile and non-sterile plant. Computerized system validation: Electronic records and digital signature - 21 CFR Part 11 and GAMP	10 Hrs
6	General Principles of Intellectual Property: Concepts of Intellectual Property (IP), Intellectual Property Protection (IPP), Intellectual Property Rights (IPR); Economic importance, mechanism for protection of Intellectual Property –patents, Copyright, Trademark; Factors affecting choice of IP protection; Penalties for violation; Role of IP in pharmaceutical industry; Global ramification and financial implications. Filing a patent applications; patent application forms and guidelines. Types patent applications-provisional and non provisional, PCT and convention patent applications; International patenting requirement procedures and costs; Rights and responsibilities of a patentee; Practical aspects regarding maintaining of a Patent file; Patent infringement meaning and scope. Significance of transfer technology (TOT), IP and ethics-positive and negative aspects of IPP; Societal responsibility, avoiding unethical practices.	10 Hrs

REFERENCES

1. B. T. Loftus & R. A. Nash, "Pharmaceutical Process Validation", Drugs and Pharm Sci. Series, Vol. 129, 3rd Ed., Marcel Dekker Inc., N.Y.
2. The Theory & Practice of Industrial Pharmacy, 3rd edition, Leon Lachman, Herbert A. Lieberman, Joseph. L. Karig, Varghese Publishing House, Bombay.
3. Validation Master plan by Terveeks or Deeks, Davis Harwood International publishing.
4. Validation of Aseptic Pharmaceutical Processes, 2nd Edition, by Carleton & Agalloco,
5. (Marcel Dekker).
6. Michael Levin, Pharmaceutical Process Scale-Up", Drugs and Pharm. Sci. Series, Vol. 157,2nd Ed., Marcel Dekker Inc., N.Y.
7. Validation Standard Operating Procedures: A Step by Step Guide for Achieving Compliance in the Pharmaceutical, Medical Device, and Biotech Industries, Syed Imtiaz Haider
8. Pharmaceutical Equipment Validation: The Ultimate Qualification Handbook, Phillip A. Cloud, Interpharm Press
9. Validation of Pharmaceutical Processes: Sterile Products, Frederick J. Carlton (Ed.) and James Agalloco (Ed.), Marcel Dekker
10. Analytical Method validation and Instrument Performance Verification by Churg Chan, Heiman Lam, Y.C. Lee, Yue. Zhang, Wiley Interscience.
11. Huber L. Validation and Qualification in Analytical Laboratories. Informa Healthcare
12. Wingate G. Validating Corporate Computer Systems: Good IT Practice for Pharmaceutical Manufacturers. Interpharm Press
13. LeBlanc DA. Validated Cleaning Technologies for Pharmaceutical Manufacturing. Interpharm Press

AUDITS AND REGULATORY COMPLIANCE
(MPA 203T)

Scope

This course deals with the understanding and process for auditing in pharmaceutical industries. This subject covers the methodology involved in the auditing process of different in pharmaceutical industries.

Objectives

Upon completion of this course the student should be able to

- To understand the importance of auditing
- To understand the methodology of auditing
- To carry out the audit process
- To prepare the auditing report
- To prepare the check list for auditing

THEORY 60 Hrs

1.	Introduction: Objectives, Management of audit, Responsibilities, Planning process, information gathering, administration, Classifications of deficiencies	12 Hrs
2	Role of quality systems and audits in pharmaceutical manufacturing environment: cGMP Regulations, Quality assurance functions, Quality systems approach, Management responsibilities, Resource, Manufacturing operations, Evaluation activities, Transitioning to quality system approach, Audit checklist for drug industries.	12 Hrs
3	Auditing of vendors and production department: Bulk Pharmaceutical Chemicals and packaging material Vendor audit, Warehouse and weighing, Dry Production: Granulation, tableting, coating, capsules, sterile production and packaging.	12 Hrs
4	Auditing of Microbiological laboratory: Auditing the manufacturing process, Product and process information, General areas of interest in the building raw materials, Water, Packaging materials.	12 Hrs

5	Auditing of Quality Assurance and engineering department: Quality Assurance Maintenance, Critical systems: HVAC, Water, Water for Injection systems, ETP.	12 Hrs

REFERENCES

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley-Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyar. CRC Press. 2000.
4. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-loana Stefan, Jacobus F. Van Staden. Taylor and Francis (2005).

PHARMACEUTICAL MANUFACTURING TECHNOLOGY
(MQA 204T)

Scope

This course is designed to impart knowledge and skills necessary to train the students with the industrial activities during Pharmaceutical Manufacturing.

Objectives

At completion of this course it is expected that students will be able to understand,

- The common practice in the pharmaceutical industry developments, plant layout and production planning
- Will be familiar with the principles and practices of aseptic process technology, non sterile manufacturing technology and packaging technology.
- Have a better understanding of principles and implementation of Quality by design (QbD) and process analytical technology (PAT) in pharmaceutical manufacturing

THEORY 60 Hrs

1. Pharmaceutical industry developments: Legal requirements and Licenses for API and formulation industry, Plant location-Factors influencing. 12 Hrs

   Plant layout: Factors influencing, Special provisions, Storage space requirements, sterile and aseptic area layout.

   Production planning: General principles, production systems, calculation of standard cost, process planning, routing, loading, scheduling, dispatching of records, production control.

2 Aseptic process technology: Manufacturing, manufacturing flowcharts, in process-quality control tests for following sterile dosage forms: Ointment, Suspension and Emulsion, Dry powder, Solution (Small Volume & large Volume). 12 Hrs

   Advanced sterile product manufacturing technology : Area planning & environmental control, wall and floor treatment, fixtures and machineries, change rooms, personnel flow, utilities & utilities equipment location, engineering and maintenance.

   Process Automation in Pharmaceutical Industry: With specific reference to manufacturing of sterile semisolids, Small Volume Parenterals & Large Volume Parenterals (SVP & LVP), Monitoring of Parenteral manufacturing facility, Cleaning in Place (CIP),

Sterilization in Place (SIP), Prefilled Syringe, Powdered Jet, Needle Free Injections, and Form Fill Seal Technology (FFS). Lyophilization technology: Principles, process, equipment.

3	Non sterile manufacturing process technology: Manufacturing, manufacturing flowcharts, in process-quality control tests for following Non-Sterile solid dosage forms: Tablets (compressed & coated), Capsules (Hard & Soft). Advance non-sterile solid product manufacturing technology: Process Automation in Pharmaceutical Industry with specific reference to manufacturing of tablets and coated products, Improved Tablet Production: Tablet production process, granulation and pelletization equipments, continuous and batch mixing, rapid mixing granulators, rota granulators, spheronizers and marumerisers, and other specialized granulation and drying equipments. Problems encountered. Coating technology: Process, equipments, particle coating, fluidized bed coating, application techniques. Problems encountered.	12 Hrs
4	Containers and closures for pharmaceuticals: Types, performance, assuring quality of glass; types of plastics used, Drug plastic interactions, biological tests, modification of plastics by drugs; different types of closures and closure liners; film wrapper; blister packs; bubble packs; shrink packaging; foil / plastic pouches, bottle seals, tape seals, breakable seals and sealed tubes; quality control of packaging material and filling equipment, flexible packaging, product package compatibility, transit worthiness of package, Stability aspects of packaging. Evaluation of stability of packaging material.	12 Hrs
5	Quality by design (QbD) and process analytical technology (PAT): Current approach and its limitations. Why QbD is required, Advantages, Elements of QbD, Terminology: QTPP. CMA, CQA, CPP, RLD, Design space, Design of Experiments, Risk Assessment and mitigation/minimization. Quality by Design, Formulations by Design, QbD for drug products, QbD for Drug Substances, QbD for Excipients, Analytical QbD. FDA initiative on process analytical technology. PAT as a driver for improving quality and reducing costs: quality by design (QbD), QA, QC and GAMP. PAT guidance, standards and regulatory requirements.	12 Hrs

REFERENCES

1. Lachman L, Lieberman HA, Kanig JL. The theory and practice of industrial pharmacy, 3rd ed., Varghese Publishers, Mumbai 1991.
2. Sinko PJ. Martin's physical pharmacy and pharmaceutical sciences, 5th ed., B.I. Publications Pvt. Ltd, Noida, 2006.
3. Lieberman HA, Lachman L, Schwartz JB. Pharmaceutical dosage forms: tablets Vol. I-III, 2nd ed., CBS Publishers & distributors, New Delhi, 2005.
4. Banker GS, Rhodes CT. Modern Pharmaceutics, 4th ed., Marcel Dekker Inc, New York, 2005.
5. Sidney H Willing, Murray M, Tuckerman. Williams Hitchings IV, Good manufacturing of pharmaceuticals (A Plan for total quality control) 3rd Edition. Bhalani publishing house Mumbai.
6. Indian Pharmacopoeia. Controller of Publication. Delhi, 1996.
7. British Pharmacopoeia. British Pharmacopoeia Commission Office, London, 2008.
8. United States Pharmacopoeia. United States Pharmacopeial Convention, Inc, USA, 2003.
9. Dean D A, Evans E R and Hall I H. Pharmaceutical Packaging Technology. London, Taylor & Francis, 1st Edition. UK.
10. Edward J Bauer. Pharmaceutical Packaging Handbook. 2009. Informa Health care USA Inc. New york.
11. Shaybe Cox Gad. Pharmaceutical Manufacturing Handbook. John Willey and Sons, New Jersey, 2008.

QUALITY ASSURANCE PRACTICAL – II PRACTICALS
(MQA 205P)

1. Organic contaminants residue analysis by HPLC
2. Estimation of Metallic contaminants by Flame photometer
3. Identification of antibiotic residue by TLC
4. Estimation of Hydrogen Sulphide in Air.
5. Estimation of Chlorine in Work Environment.
6. Sampling and analysis of SO_2 using Colorimetric method
7. Qualification of following Pharma equipment
   a. Autoclave
   b. Hot air oven
   c. Powder Mixer (Dry)
   d. Tablet Compression Machine
8. Validation of an analytical method for a drug
9. Validation of a processing area
10. Qualification of at least two analytical instruments
11. Cleaning validation of one equipment
12. Qualification of Pharmaceutical Testing Equipment (Dissolution testing apparatus, Friability Apparatus, Disintegration Tester)
13. Check list for Bulk Pharmaceutical Chemicals vendors
14. Check list for tableting production.
15. Check list for sterile production area
16. Check list for Water for injection.
17. Design of plant layout: Sterile and non-sterile
18. Case study on application of QbD
19. Case study on application of PAT

PHARMACEUTICALREGULATORY AFFAIRS(MRA)

GOOD REGULATORY PRACTICES (MRA 101T)

Scope

This course is designed to impart fundamental knowledge on various Good Regulatory Practices viz., cGMP, GLP, GALP and GDP for Pharmaceuticals, Cosmetics, Food & Nutraceuticals, Medical devices, In-vitro Diagnostic Medical Devices (IVDs) and biological products and understand the rationale behind these requirements and will propose ways and means of complying with them.

Objectives

At completion of this course it is expected that students will be able to understand,

- The key regulatory and compliance elements with respect to Good Manufacturing Practices, Good Laboratory Practices, Good Automated Laboratory Practices and Good Documentation Practices.
- Prepare and implement the check lists and SOPs for various Good Regulatory Practices
- Implement Good Regulatory Practices in the Healthcare and related Industries
- Prepare for the readiness and conduct of audits and inspections.

THEORY 60 Hrs

1. Current Good Manufacturing Practices: Introduction, US cGMP Part 210 and Part 211.EC Principles of GMP (Directive 91/356/EEC) Article 6 to Article 14 and WHO cGMP guidelines GAMP-5; Medical device and IVDs Global Harmonization Task Force(GHTF) Guidance docs. — 12 Hrs

2 Good Laboratory Practices: Introduction, USFDA GLP Regulations (Subpart A to Subpart K), Controlling the GLP inspection process, Documentation, Audit, goals of Laboratory Quality Audit, Audit tools, Future of GLP regulations, relevant ISO and Quality Council of India(QCI) Standards — 12 Hrs

3 Good Automated Laboratory Practices: Introduction to GALP, Principles of GALP, GALP Requirements, SOPs of GALP, Training Documentation,21 CFR Part 11, General check list of 21CFR Part 11, Software Evaluation checklist, relevant ISO and QCI Standards. — 12 Hrs

4	Good Distribution Practices: Introduction to GDP, Legal GDP requirements put worldwide, Principles, Personnel, Documentation, Premises and Equipment, Deliveries to Customers, Returns, Self-Inspection, Provision of information, Stability testing principles, WHO GDP, USP GDP (Supply chain integrity), relevant CDSCO guidance and ISO standards	12 Hrs
5	Quality management systems: Concept of Quality, Total Quality Management, Quality by design, Six Sigma concept, Out of Specifications (OOS), Change control. Validation: Types of Validation, Types of Qualification, Validation master plan (VMP), Analytical Method Validation. Validation of utilities, [Compressed air, steam, water systems, Heat Ventilation and Air conditioning (HVAC)]and Cleaning Validation. The International Conference on Harmonization (ICH) process, ICH guidelines to establish quality, safety and efficacy of drug substances and products, ISO 13485, Sch MIII and other relevant CDSCO regulatory guidance documents.	12 Hrs

REFERENCES

1. Good Laboratory Practice Regulations, by Sandy Weinberg, Fourth Edition Drugs and the Pharmaceutical Sciences, Vol.168
2. Good Pharmaceutical Manufacturing practice, Rational and compliance by John Sharp, CRC Press
3. Establishing a cGMP Laboratory Audit System, A practical Guide by David M.Bleisner, Wiley Publication.
4. How to practice GLP by PP Sharma, Vandana Publications.
5. Laboratory Auditing for Quality and Regulatory compliance bu Donald C.Singer, Drugs and the Pharmaceutical Sciences, Vol.150.
6. Drugs & Cosmetics Act, Rules & Amendments

DOCUMENTATION AND REGULATORY WRITING
(MRA 102T)

Scope

This course is designed to impart fundamental knowledge on documentation and general principles involved in regulatory writing and submission to agencies.

Objectives

Upon completion of the course the student shall be able to,

- Know the various documents pertaining to drugs in pharmaceutical industry
- Understand the basics of regulatory compilation
- Create and assemble the regulation submission as per the requirements of agencies
- Follow up the submissions and post approval document requirements

THEORY 60 Hrs

1. Documentation in pharmaceutical industry: Exploratory Product Development Brief (EPDB) for Drug substance and Drug product, Product Development Plan (PDP), Product Development Report (PDR), Master Formula Record, Batch Manufacturing Record and its calculations, Batch Reconciliation, Batch Packaging Records, Print pack specifications, Distribution records, Certificate of Analysis (CoA), Site Master File and Drug Master Files (DMF). 12 Hrs

2 Dossier preparation and submission: Introduction and overview of dossiers, contents and organization of dossier, binders and sections, compilation and review of dossier. Paper submissions, overview and modules of CTD, electronic CTD submissions; Electronic submission: Planning electronic submission, requirements for submission, regulatory bindings and requirements, Tool and Technologies, electronic dossier submission process and validating the submission, Electronic Submission Gateway (ESG). Non eCTD electronic submissions (NeeS), Asian CTD formats (ACTD) submission. Organizing, process and validation of submission. Submission in Sugam system of CDSCO. 12 Hrs

3	Audits: Introduction, Definition, Summary, Types of audits, GMP compliance audit, Audit policy, Internal and External Audits, Second Party Audits, External third party audits, Auditing strategies, Preparation and conducting audit, Auditing strategies, audit analysis, audit report, audit follow up. Auditing/inspection of manufacturing facilities by regulatory agencies. Timelines for audits/inspection. GHTF study group 4 guidance document. ISO 13485.	12 Hrs
4	Inspections: Pre-approval inspections, Inspection of pharmaceutical manufacturers, Inspection of drug distribution channels, Quality systems requirements for national good manufacturing practice inspectorates, inspection report, model certificate of good manufacturing practices, Root cause analysis, Corrective and Preventive action (CAPA).	12 Hrs
5	Product life cycle management: Prior Approval Supplement (PAS), Post Approval Changes [SUPAC], Changes Being Effected in 30 Days (CBE-30), Annual Report, Post marketing Reporting Requirements, Post approval Labeling Changes, Lifecycle Management, FDA Inspection and Enforcement, Establishment Inspection Report (EIR), Warning Letters, Recalls, Seizure and Injunctions. ISO Risk Management Standard	12 Hrs

REFERENCES

1. Compliance auditing for Pharmaceutical Manufacturers. Karen Ginsbury and Gil Bismuth, Interpharm/CRC, Boca Raton, London New York, Washington D.C.
2. Pharmaceutical Manufacturing Handbook, Regulations and Quality by Shayne Cox Gad. Wiley-Interscience, A John Wiley and sons, Inc., Publications.
3. Handbook of microbiological Quality control. Rosamund M. Baird, Norman A. Hodges, Stephen P. Denyar. CRC Press. 2000.
4. Laboratory auditing for quality and regulatory compliance. Donald C. Singer, Raluca-loana Stefan, Jacobus F. Van Staden. Taylor and Francis (2005).
5. Implementing Juran's Road Map for Quality Leadership: Benchmarks and Results, By Al Endres, Wiley, 2000
6. Understanding, Managing and Implementing Quality: Frameworks, Techniques and Cases, By Jiju Antony; David Preece, Routledge, 2002

7. Organizing for High Performance: Employee Involvement, TQM, Reengineering, and Knowledge Management in the Fortune 1000: The CEO Report By Edward E. Lawler; Susan Albers Mohrman; George Benson, Jossey-Bass, 2001
8. Corporate Culture and the Quality Organization By James W. Fairfield-Sonn, Quorum Books, 2001
9. The Quality Management Sourcebook: An International Guide to Materials and Resources By Christine Avery; Diane Zabel, Routledge, 1997
10. The Quality Toolbox, Second Edition, Nancy R. Tague, ASQ Publications
11. Juran's Quality Handbook, Sixth Edition, Joseph M. Juran and Joseph A. De Feo, ASQ Publications
12. Root Cause Analysis, The Core of Problem Solving and Corrective Action, Duke Okes, 2009, ASQ Publications
13. International Medical Device Regulators Forum (IMDRF) Medical Device Single Audit Program (MDSAP)

CLINICAL RESEARCH REGULATIONS
(MRA 103T)

Scope

This course is designed to impart the fundamental knowledge on the clinical development process of drugs, pharmaceuticals and Medical Devices, phases and conduct of clinical trials and research, regulations and guidance governing the conduct of clinical research in India, USA and EU. It prepares the students to learn in detail on various laws, legislations and guidance related to safety, efficacy, ethical conduct and regulatory approval of clinical research.

Objectives

Upon completion of the course, the student shall be able to (know, do and appreciate)

- History, origin and ethics of clinical and biomedical research and evaluation
- Clinical drug, medical device development process and different types and phases of clinical trials
- Regulatory requirements and guidance for conduct of clinical trials and research

Theory — 60 Hrs

1. Clinical Drug Development Process — 12 Hrs
   - Different types of Clinical Studies
   - Phases of clinical trials, Clinical Trial protocol
   - Phase 0 studies
   - Phase I and subtype studies (single ascending, multiple ascending, dose escalation, methods, food effect studies, drug – drug interaction, PK end points
   - Phase II studies (proof of concept or principle studies to establish efficacy)
   - Phase III studies (Multi ethnicity, global clinical trial, registration studies)
   - Phase IV studies (Post Marketing Studies; PSUR)

   Clinical Investigation and Evaluation of Medical Devices & IVDs

   Different Types of Studies
   Key Concepts of Medical Device Clinical Evaluation
   Key concepts of Clinical Investigation

2 Ethics in Clinical Research: 12 Hrs

- Historical Perspectives: Nuremberg Code, Thalidomide study , Nazis Trials, Tuskegee Syphilis Study, The Belmont Report, The declaration of Helsinki
- Origin of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines.
- The ethics of randomized clinical trials
- The role of placebo in clinical trials
- Ethics of clinical research in special population
- Institutional Review Board/Independent Ethics Committee/Ethics Committee – composition, roles, responsibilities, review and approval process and ongoing monitoring of safety data
- Data safety monitoring boards.
- Responsibilities of sponsor, CRO, and investigator in ethical conduct of clinical research
    - Ethical principles governing informed consent process
    - Patient Information Sheet and Informed Consent Form
    - The informed consent process and documentation

3 Regulations governing Clinical Trials 12 Hrs

India: Clinical Research regulations in India – Schedule Y & Medical Device Guidance

USA: Regulations to conduct drug studies in USA (FDA)

- NDA 505(b)(1) of the FD&C Act (Application for approval of a new drug)
- NDA 505(b)(2) of the FD&C Act (Application for approval of a new drug that relies, at least in part, on data not developed by the applicant)
- ANDA 505(j) of the FD&C Act (Application for approval of a generic drug product)
- FDA Guidance for Industry - Acceptance of Foreign Clinical Studies
- FDA Clinical Trials Guidance Document: Good Clinical Practice

EU: Clinical Research regulations in European Union (EMA)

4 Clinical Research Related Guidelines 12 Hrs

- Good Clinical Practice Guidelines (ICH GCP E6)
- Indian GCP Guidelines
- ICMR Ethical Guidelines for Biomedical Research
- CDSCO guidelines

GHTF study group 5 guidance documents

Regulatory Guidance on Efficacy and Safety ICH Guidance's

- E4 – Dose Response Information to support Drug Registration
- E7 – Studies in support of General Population: Geriatrics
- E8 – General Considerations of Clinical Trials
- E10 – Choice of Control Groups and Related Issues in Clinical Trials,
- E 11 – Clinical Investigation of Medicinal Products in the Pediatric Population
- General biostatics principle applied in clinical research

5 USA & EU Guidance 12 Hrs

USA: FDA Guidance

- CFR 21Part 50: Protection of Human Subjects
- CFR 21Part 54: Financial Disclosure by Clinical Investigators
- CFR 21Part 312: IND Application
- CFR 21Part 314: Application for FDA Approval to Market a New Drug
- CFR 21Part 320: Bioavailability and bioequivalence requirements
- CFR 21Part 812: Investigational Device Exemptions
- CFR 21Part 822: Post-market surveillance
- FDA Safety Reporting Requirements for INDs and BA/BE Studies
- FDA Med Watch
- Guidance for Industry: Good Pharmacovigilance Practices and Pharmacoepidemiologic Assessment

European Union: EMA Guidance

- EU Directives 2001
- EudraLex (EMEA) Volume 3 – Scientific guidelines for medicinal products for human use
- EU Annual Safety Report (ASR)
- Volume 9A – Pharmacovigilance for Medicinal Products for Human Use
- EU MDD with respect to clinical research
- ISO 14155

REFERENCES

1. Clinical Trials and Human Research: A Practical Guide to Regulatory Compliance By Fay A. Rozovsky and Rodney K. Adams
2. HIPAA and Human Subjects Research: A Question and Answer Reference Guide By Mark Barnes, JD, LLM and Jennifer Kulynych, JD, PhD
3. Principles and Practices of Clinical Research, Second Edition Edited by John I. Gallin and Frederick P. Ognibene
4. Reviewing Clinical Trials: A Guide for the Ethics Committee; Johan PE Karlberg and Marjorie A Speers; Karlberg, Johan Petter Einar, Hong Kong.
5. International Pharmaceutical Product Registration: Aspects of Quality, Safety and Efficacy; Anthony C. Cartwright; Taylor & Francis Inc., USA.
6. New Drug Approval Process: The Global Challenge; Guarino, Richard A; Marcel Dekker Inc., NY.
7. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics; Douglas J. Pisano, David Mantus; CRC Press, USA
8. Country Specific Guidelines from official websites.
9. Drugs & Cosmetics Act & Rules and Amendments

RECOMMENDED WEBSITES:

1. EU Clinical Research Directive 2001: http://www.eortc.be/services/doc/clinical-eudirective-04-april-01.pdf
2. Code of Federal Regulations, FDA: http://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/cfrsearch.cfm
3. Guidelines of International Conference on Harmonization: http://www.ich.org/products/guidelines.html
4. Eudralex Guidelines: http://www.gmpcompliance.info/euguide.htm
5. FDA New Drug Application:
6. http://www.fda.gov/regulatoryinformation/legislation/FederalFoodDrugandCosmeticActFDCAct/FDCActChapterVDrugsandDevices/ucm108125.htm
7. Medicines and Healthcare products Regulatory Agency: http://www.mhra.gov.uk
8. Central Drugs Standard Control Organization Guidance for Industry: http://cdsco.nic.in/CDSCO-GuidanceForIndustry.pdf
9. ICMR Ethical Guidelines for Biomedical Research: http://icmr.nic.in/ethical_guidelines.pdf

REGULATIONS AND LEGISLATION FOR DRUGS & COSMETICS, MEDICAL DEVICES, BIOLOGICALS & HERBALS, AND FOOD & NUTRACEUTICALS IN INDIA AND INTELLECTUAL PROPERTY RIGHTS

(MRA 104T)

Scope

This course is designed to impart fundamental knowledge on regulations and legislation in India w.r.t. Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals. It prepares the students for basic regulatory requirements in India of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals. for manufacture, import & registration, export, sale, marketing authorization, clinical trials and intellectual property rights.

Objectives

Upon the completion of the course the student shall be able to:

- Know different Acts and guidelines that regulate Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals industry in India.
- Understand the approval process and regulatory requirements for Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals

THEORY 60 Hrs

1. Biologicals & Herbals, and Food & Nutraceuticals Acts and Rules (with latest amendments): 12 Hrs

    1. Drugs and Cosmetics Act 1940 and Rules 1945: DPCO and NPPA
    2. Other relevant provisions (rules schedules and guidelines for approval of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals in India

    Other relevant Acts: Narcotics Drugs and Psychotropic Substances Act; Medicinal and Toilet Preparations (Excise Duties) Act, 1955; Pharmacy Act, 1948; Drugs and Magic Remedies (Objectionable Advertisements) Act, 1955; Prevention of Cruelty to Animals Act.

2	Regulatory requirements and approval procedures for Drugs & Cosmetics Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals CDSCO (Central Drug Standard Control Organization) and State Licensing Authority: Organization, Responsibilities • Rules, regulations, guidelines and standards for regulatory filing of Drugs & Cosmetics, Medical Devices, Biologicals & Herbals, and Food & Nutraceuticals • Format and contents of Regulatory dossier filing Clinical trial/ investigations	12 Hrs
3	Indian Pharmacopoeial Standards, BIS standards and ISO and other relevant standards	12 Hrs
4	Bioavailability and Bioequivalence data (BA &BE), BCS Classification of Drugs, Regulatory Requirements for Bioequivalence study Stability requirements: ICH and WHO Guidelines for Drug testing in animals/Preclinical Studies Animal testing: Rationale for conducting studies, CPCSEA Guidelines Ethical guidelines for human participants ICMR-DBT Guidelines for Stem Cell Research	12 Hrs
5	Intellectual Property Rights: Patent, Trademark, Copyright, Industrial Designs and Geographical Indications, Indian Patent Scenario. IPR vs Regulatory Affairs	12 Hrs

REFERENCES

1. Manual of Patent Practice & Procedure, 3rd Edition, by The Patent Office of India
2. Patent Failure How Judges, Bureaucrats, and Lawyers put innovators at risk by James Bessen and Michael J. Meurer
3. Principles and Practice of Clinical Trial Medicine by Richard Chin and Bruce Y. Lee
4. Ethical Guidelines for Biomedical Research on Human Participants by Indian Council of Medical Research New delhi 2006.
5. CPCSEA Guidelines for Laboratory Animal Facility by Committee for the purpose of control and supervision on experiments on animals (CPCSEA)

6. ICH E6 Guideline — Good Clinical Practice‖ by ICH Harmonised Tripartite
7. Guidance for Industry on Submission of Clinical Trial Application for Evaluating Safety and Efficacy by CDSCO (Central Drug Standard Control Organisation)
8. Guidance for Industry on Requirement of Chemical & Pharmaceutical Information including Stability Study Data before approval of clinical trials / BE studies by CDSCO
9. Guidelines for Import and Manufacture of Medical Devices by CDSCO
10. Guidelines from official website of CDSCO

REGULATORY AFFAIRS PRACTICAL - I
(MRA 105P)

1. Case studies (4 Nos.) of each of Good Pharmaceutical Practices.
2. Documentation for in process and finished products Quality control tests for Solid, liquid, Semisolid and Sterile preparations.
3. Preparation of SOPs, Analytical reports (Stability and validation)
4. Protocol preparation for documentation of various types of records (BMR, MFR, DR)
5. Labeling comparison between brand & generics.
6. Preparation of clinical trial protocol for registering trial in India
7. Registration for conducting BA/ BE studies in India
8. Import of drugs for research and developmental activities
9. Preparation of regulatory dossier as per Indian CTD format and submission in SUGAM
10. Registering for different Intellectual Property Rights in India
11. GMP Audit Requirements as per CDSCO
12. Preparation and documentation for Indian Patent application.
13. Preparation of checklist for registration of IND as per ICH CTD format.
14. Preparation of checklist for registration of NDA as per ICH CTD format.
15. Preparation of checklist for registration of ANDA as per ICH CTD format.
16. Case studies on response with scientific rationale to USFDA Warning Letter
17. Preparation of submission checklist of IMPD for EU submission.
18. Comparison study of marketing authorization procedures in EU.
19. Comparative study of DMF system in US, EU and Japan
20. Preparation of regulatory submission using eCTD software
21. Preparation of Clinical Trial Application (CTA) for US submission
22. Preparation of Clinical Trial Application (CTA) for EU submission
23. Comparison of Clinical Trial Application requirements of US, EU and Japan of a dosage form.
24. Regulatory requirements checklist for conducting clinical trials in India.
25. Regulatory requirements checklist for conducting clinical trials in Europe.
26. Regulatory requirements checklist for conducting clinical trials in USA

SEMESTER II

REGULATORY ASPECTS OF DRUGS & COSMETICS

(MRA 201T)

Scope

This course is designed to impart the fundamental knowledge on the drug development process, regulatory requirements for approval of new drugs, drug products and cosmetics in regulated and semi-regulated countriesIt prepares the students to learn in detail on the regulatory requirements, documentation requirements, and registration procedures for marketing the drug products and cosmetics in regulated and semi-regulated countries.

Objectives

Upon completion of the course, the student shall be able to know

- process of drug discovery and development and generic product development
- regulatory approval process and registration procedures for API and drug products in US, EU
- Cosmetics regulations in regulated and semi-regulated countries
- A comparative study of India with other global regulated markets

Theory 60 Hrs

1. USA & CANADA: Organization structure and functions of FDA. Federal register and Code of Federal Regulations (CFR), History and evolution of United States Federal, Food, Drug and Cosmetic Act (FFDCA), Hatch Waxman act and Orange book, Purple book, Drug Master Files (DMF) system in US, Regulatory Approval Process for Investigational New Drug (IND), New Drug Application (NDA), Abbreviated New Drug Application (ANDA), Supplemental New Drug Application (SNDA); Regulatory requirements for Orphan drugs and Combination Products, Changes to an approved NDA / ANDA. Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in USA. Legislation and regulations for import, manufacture, distribution and sale of cosmetics in USA and Canada. 12 Hrs

2 European Union & Australia: Organization and structure of EMA & EDQM, General guidelines, Active Substance Master Files (ASMF) system in EU, Content and approval process of IMPD, Marketing Authorization procedures in EU (Centralized procedure, 12 Hrs

	Decentralized procedure, Mutual recognition procedure and National Procedure). Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in EU, Eudralex directives for human medicines, Variations & extensions, Compliance of European Pharmacopoeia (CEP)/ Certificate of Suitability (CoS), Marketing Authorization (MA) transfers, Qualified Person (QP) in EU. Legislation and regulations for import, manufacture, distribution and sale of cosmetics in European Union & Australia.	
3	Japan: Organization of the PMDA, Pharmaceutical Laws and regulations, types of registration applications, DMF system in Japan, drug regulatory approval process, Regulatory considerations for manufacturing, packaging and labeling of pharmaceuticals in Japan, Post marketing surveillance in Japan. Legislation and regulations for import, manufacture, distribution and sale of cosmetics in Japan	12 Hrs
4	Emerging Market: Introduction, Countries covered, Study of the world map,study of various committees across the globe (ASEAN, APEC, EAC, GCC, PANDRH, SADC) WHO: WHO, GMP, Regulatory Requirements for registration of drugs and post approval requirements in WHO through prequalification programme, Certificate of Pharmaceutical Product (CoPP) - General and Country Specific (South Africa, Egypt, Algeria and Morocco, Nigeria, Kenya and Botswana)	12 Hrs
5	Brazil, ASEAN, CIS and GCC Countries: ASIAN Countries: Introduction to ACTD, Regulatory Requirements for registration of drugs and post approval requirements in China and South Korea & Association of Southeast Asian Nations (ASEAN) Region i.e. Vietnam, Malaysia, Philippines, Singapore and Thailand. CIS (Commonwealth Independent States): Regulatory pre-requisites related to Marketing authorization requirements for drugs and post approval requirements in CIS countries i.e. Russia, Kazakhstan and Ukraine GCC (Gulf Cooperation Council) for Arab states: Regulatory pre-requisites related to Marketing authorization requirements for drugs and post approval requirements in Saudi Arabia and UAE Legislation and regulations for import, manufacture, distribution and sale of cosmetics in Brazil, ASEAN, CIS and GCC Countries.	12 Hrs

REFERENCES :

1. Generic Drug Product Development, Solid Oral Dosage forms, Leon Shargel and Isader Kaufer, Marcel Dekker series, Vol.143
2. The Pharmaceutical Regulatory Process, Edited by Ira R. Berry Marcel Dekker Series, Vol.144
3. The Pharmaceutical Regulatory Process, Second Edition Edited by Ira R. Berry and Robert P. Martin, Drugs and the Pharmaceutical Sciences, Vol.185 Informa Health care Publishers.
4. New Drug Approval Process: Accelerating Global Registrations By Richard A Guarino, MD, 5th edition, Drugs and the Pharmaceutical Sciences, Vol.190.
5. Guidebook for drug regulatory submissions / Sandy Weinberg. By John Wiley & Sons. Inc.
6. Drugs: From Discovery to Approval, Second Edition By Rick Ng
7. New Drug Development: A Regulatory Overview, Eighth Edition By Mark Mathieu
8. Pharmaceutical Risk Management By Jeffrey E. Fetterman, Wayne L. Pines and Gary H. Slatko
9. Preparation and Maintenance of the IND Application in eCTD Format By William K. Sietsema
10. Country Specific Guidelines from official websites.
11. http://www.who.int/medicines/areas/quality_safety/regulation_legislation/ListMRAWebsites.pdf
12. Roadmap to an ASEAN economic community Edited by Denis Hew. ISEAS Publications, Singapore 2005, ISBN981-230-347-2
13. ASEAN, Rodolfo C. Severino, ISEAS Publications, Singapore 2005, ISBN 978-981-230-750-7
14. Building a Future with Brics: The Next Decade for Offshoring, Mark Kobayashi-Hillary, Springer
15. Outsourcing to India: The Offshore Advantage, Mark Kobayashi-Hillary, Springer Trade performance and Regional Integration of the CIS Countries, Lev Freinkman,
16. The world Bank, Washington, DC, ISBN: 0-8212-5896-0
17. Global Pharmaceutical Policy: Ensuring Medicines for Tomorrow's World ByFrederick M. Abbott, Graham Dukes, Maurice Nelson Graham Dukes 139
18. The Gulf Cooperation Council: A Rising Power and Lessons for ASEAN by Linda Low and Lorraine Carlos Salazar (Nov 22, 2010)
19. Doing Business in the Asean Countries, Balbir Bhasin, Business Expert Press ISBN:13:978-1-60649-108-9
20. Realizing the ASEAN Economic Community: A Comprehensive Assessment, Michael G Plummer (Editor), Chia Siow Yue (Editor), Instute of South east asian studies, Singapore

REGULATORY ASPECTS OF HERBAL AND BIOLOGICALS
(MRA 202T)

Scope

This course is designed to impart fundamental knowledge on Regulatory Requirements, Licensing and Registration, Regulation on Labelling of Biologics in India, USA and Europe

It prepares the students to learn in detail on Regulatory Requirements for biologics, Vaccines and Blood Products

Objectives

Upon the completion of the course the student shall be able to :

- Know the regulatory Requirements for Biologics and Vaccines
- Understand the regulation for newly developed biologics and biosimilars
- Know the pre-clinical and clinical development considerations of biologics
- Understand the Regulatory Requirements of Blood and/or Its Components Including Blood Products and label requirements

Theory — 60 Hrs

1. India : Introduction, Applicable Regulations and Guidelines , Principles for Development of Similar Biologics, Data Requirements for Preclinical Studies, Data Requirements for Clinical Trial Application, Data Requirements for Market Authorization Application, Post-Market Data for Similar Biologics, Pharmacovigilance. GMP and GDP. — 12 Hrs

2 USA: Introduction to Biologics; biologics, biological and biosimilars, different biological products, difference between generic drug and biosimilars, laws, regulations and guidance on biologics/ biosimilars, development and approval of biologics and biosimilars (IND, PMA, BLA, NDA, 510(k), pre-clinical and clinical development considerations, advertising, labelling and packing of biologics — 12 Hrs

3 European Union: Introduction to Biologics; directives, scientific guidelines and guidance related to biologics in EU, comparability/ biosimilarity assessment, Plasma master file, TSE/ BSE evaluation, development and regulatory approval of biologics (Investigational medicinal products and biosimilars), pre-clinical — 12 Hrs

	and clinical development considerations; stability, safety, advertising, labelling and packing of biologics in EU	
4	Vaccine regulations in India, US and European Union: Clinical evaluation, Marketing authorisation, Registration or licensing, Quality assessment, Pharmacovigilance, Additional requirements Blood and Blood Products Regulations in India, US and European Union: Regulatory Requirements of Blood and/or Its Components Including Blood Products, Label Requirements, ISBT (International Society of Blood Transfusion) and IHN (International Haemovigilence Network)	12 Hrs
5	Herbal Products: Quality, safety and legislation for herbal products in India, USA and European Union.	12 Hrs

REFERENCES

1. FDA Regulatory Affairs: A Guide for Prescription Drugs, Medical Devices, and Biologics, Douglas J. Pisano , David S. Mantus ; Informa ,2008
2. Biological Drug Products: Development and Strategies; Wei Wang , Manmohan Singh ; wiley ,2013
3. Development of Vaccines: From Discovery to Clinical Testing; Manmohan Singh , Indresh K. Srivastava ;Wiley, 2011
4. www.who.int/biologicals/en
5. www.fda.gov/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/
6. www.ihn-org.com
7. www.isbtweb.org
8. Guidelines on Similar Biologics: Regulatory Requirements for Marketing Authorization in India
9. www.cdsco.nic.in
10. www.ema.europa.eu › scientific guidelines › Biologicals
11. www.fda.gov/biologicsbloodVaccines/GuidanceCompliance Regulatory Information (Biologics)

REGULATORY ASPECTS OF MEDICAL DEVICES
(MRA 203T)

Scope

This course is designed to impart the fundamental knowledge on the medical devices and in vitro diagnostics, basis of classification and product life cycle of medical devices, regulatory requirements for approval of medical devices in regulated countries like US, EU and Asian countries along with WHO regulations. It prepares the students to learn in detail on the harmonization initiatives, quality and ethical considerations, regulatory and documentation requirements for marketing medical devices and IVDs in regulated countries.

Objectives

Upon completion of the course, the student shall be able to know

- basics of medical devices and IVDs, process of development, ethical and quality considerations
- harmonization initiatives for approval and marketing of medical devices and IVDs
- regulatory approval process for medical devices and IVDs in India, US, Canada, EU, Japan and ASEAN
- clinical evaluation and investigation of medical devices and IVDs

Theory — 60 Hrs

1. Medical Devices: Introduction, Definition, Risk based classification and Essential Principles of Medical Devices and IVDs. Differentiating medical devices IVDs and Combination Products from that of pharmaceuticals, History of Medical Device Regulation, Product Lifecycle of Medical Devices and Classification of Medical Devices. — 12 Hrs

   IMDRF/GHTF: Introduction, Organizational Structure, Purpose and Functions, Regulatory Guidelines, Working Groups, Summary Technical Document (STED), Global Medical Device Nomenclature (GMDN).

2. Ethics: Clinical Investigation of Medical Devices, Clinical Investigation Plan for Medical Devices, Good Clinical Practice for Clinical Investigation of medical devices (ISO 14155:2011) — 12 Hrs

   Quality: Quality System Regulations of Medical Devices: ISO 13485, Quality Risk Management of Medical Devices: ISO 14971, Validation and Verification of Medical device, Adverse Event Reporting of Medical device

3	USA: Introduction, Classification, Regulatory approval process for Medical Devices (510k) Premarket Notification, Pre-Market Approval (PMA), Investigational Device Exemption (IDE) and In vitro Diagnostics, Quality System Requirements 21 CFR Part 820, Labeling requirements 21 CFR Part 801, Post marketing surveillance of MD and Unique Device Identification (UDI). Basics of In vitro diagnostics, classification and approval process.	12 Hrs
4	European Union: Introduction, Classification, Regulatory approval process for Medical Devices (Medical Device Directive, Active Implantable Medical Device Directive) and In vitro Diagnostics (In Vitro Diagnostics Directive), CE certification process. Basics of In vitro diagnostics, classification and approval process.	12 Hrs
5	ASEAN, China & Japan: Medical Devices and IVDs, Regulatory registration procedures, Quality System requirements and clinical evaluation and investigation. IMDRF study groups and guidance documents.	12 Hrs

REFERENCES

1. FDA regulatory affairs: a guide for prescription drugs, medical devices, and biologics by Douglas J. Pisano, David Mantus.
2. Medical Device Development: A Regulatory Overview by Jonathan S. Kahan
3. Medical Product Regulatory Affairs: Pharmaceuticals, Diagnostics, Medical Devices by John J. Tobin and Gary Walsh
4. Compliance Handbook for Pharmaceuticals, Medical Devices and Biologics by Carmen Medina
5. Country Specific Guidelines from official websites.

REGULATORY ASPECTS OF FOOD & NUTRACEUTICALS
(MRA 204T)

Scope

This course is designed to impart the fundamental knowledge on Regulatory Requirements, Registration and Labeling Regulations of Nutraceuticals in India, USA and Europe.

It prepares the students to learn in detail on Regulatory Aspects for nutraceuticals and food supplements.

Objectives

Upon completion of the course, the student shall be able to

- Know the regulatory Requirements for nutraceuticals
- Understand the regulation for registration and labeling of nutraceuticals and food supplements in India, USA and Europe.

Theory		60 Hrs
1.	Nutraceuticals: Introduction, History of Food and Nutraceutical Regulations, Meaning of Nutraceuticals, Dietary Supplements, Functional Foods, Medical Foods, Scope and Opportunities in Nutraceutical Market.	12 Hrs
2	Global Aspects: WHO guidelines on nutrition. NSF International: Its Role in the Dietary Supplements and Nutraceuticals Industries, NSF Certification, NSF Standards for Food And Dietary Supplements. Good Manufacturing Practices for Nutraceuticals.	12 Hrs
3	India : Food Safety and Standards Act, Food Safety and Standards Authority of India: Organization and Functions, Regulations for import, manufacture and sale of nutraceutical products in India, Recommended Dietary Allowances (RDA) in India.	12 Hrs
4	USA: US FDA Food Safety Modernization Act, Dietary Supplement Health and Education Act. U.S. regulations for manufacture and sale of nutraceuticals and dietary supplements, Labelling Requirements and Label Claims for Dietary Supplements, Recommended Dietary Allowances (RDA) in the U.S	12 Hrs

5	European Union: European Food Safety Authority (EFSA): Organization and Functions. EU Directives and regulations for manufacture and sale of nutraceuticals and dietary supplements. Nutrition labelling. European Regulation on Novel Foods and Novel Food Ingredients. Recommended Dietary Allowances (RDA) in Europe.	12 Hrs

REFERENCES

1. Regulation of Functional Foods and Nutraceuticals: A Global Perspective by Clare M. Hasler (Wiley Online Library)
2. Nutraceutical and Functional Food Regulations in the United States and Around the World by Debasis Bagchi (Academic Press, Elsevier)
3. http://www.who.int/publications/guidelines/nutrition/en/
4. http://www.europarl.europa.eu/RegData/etudes/STUD/2015/536324/IPOL_STU(2015)536324_EN.pdf
5. Handbook of Nutraceuticals by Yashwant Pathak (CRC Press)
6. Food Regulation: Law, Science, Policy and Practice by Neal D. Fortin (Wiley)
7. Country Specific Guidelines from official websites.

REGULATORY AFFAIRS PRACTICAL - II
(MRA 205P)

1. Case studies on
2. Change Management/ Change control. Deviations
3. Corrective & Preventive Actions (CAPA)
4. Documentation of raw materials analysis as per official monographs
5. Preparation of audit checklist for various agencies
6. Preparation of submission to FDA using eCTD software
7. Preparation of submission to EMA using eCTD software
8. Preparation of submission to MHRA using eCTD software
9. Preparation of Biologics License Applications (BLA)
10. Preparation of documents required for Vaccine Product Approval
11. Comparison of clinical trial application requirements of US, EU and India of Biologics
12. Preparation of Checklist for Registration of Blood and Blood Products
13. Registration requirement comparison study in 5 emerging markets (WHO) and preparing check list for market authorization
14. Registration requirement comparison study in emerging markets (BRICS) and preparing check list for market authorization
15. Registration requirement comparison study in emerging markets (China and South Korea) and preparing check list for market authorization
16. Registration requirement comparison study in emerging markets (ASEAN) and preparing check list for market authorization
17. Registration requirement comparison study in emerging markets (GCC) and preparing check list for market authorization
18. Checklists for 510k and PMA for US market
19. Checklist for CE marking for various classes of devices for EU
20. STED Application for Class III Devices
21. Audit Checklist for Medical Device Facility
22. Clinical Investigation Plan for Medical Devices

PHARMACEUTICALBIOTECHNOLOGY(MPB)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPB 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 Hrs

1. a. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. 12 Hrs

   IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

   b. Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   c. Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy. 12 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy	12 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution and applications of the following: a) Paper chromatography b) Thin Layer chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Affinity chromatography	12 Hrs
5	a. Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing b. X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder diffration technique, Types of crystals and applications of X-ray diffraction.	12 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi.
7. Pharmaceutical Analysis- Modern methods – Part B - J W Munson, Volume 11, Marcel Dekker Series

MICROBIAL AND CELLULAR BIOLOGY
(MPB 102T)

Scope

This subject is designed to provide the advanced knowledge to the biotechnology students in invaluable areas of advanced microbiology which plays a crucial role in determining its future use and applications in medicine, drug discovery and in pharmaceutical industry.

Objective

At the completion of this course it is expected that the students will get an understanding about the following aspects;

- Importance of Microorganisms in Industry
- Central dogma of molecular biology
- Structure and function of cell and cell communication
- Cell culture technology and its applications in pharmaceutical industries.
- Microbial pathogenesis and correlating it to rational use of antimicrobial agents.

THEORY 60Hrs

1. Microbiology 12 Hrs

Introduction – Prokaryotes and Eukaryotes. Bacteria, fungi, actionomycetes and virus - structure, chemistry and morphology, cultural, physiological and reproductive features. Methods of isolation, cultivation and maintenance of pure cultures. Industrially important microorganisms - examples and applications

2 Molecular Biology: Structure of nucleus and chromosome, Nucleic acids and composition, structure and types of DNA and RNA. Central dogma of molecular biology: Replication, Transcription and translation. 12 Hrs

Gene regulation

Gene copy number, transcriptional control and translational control.

RNA processing

Modification and Maturation, RNA splicing, RNA editing, RNA amplification. Mutagenesis and repair mechanisms, types of mutants, application of mutagenesis in stain improvement, gene mapping of plasmids- types purification and application. Phage genetics, geneticorganization, phage mutation and lysogeny.

3	Cell structure and function Cell organelles, cytoskeleton & cell movements, basic aspectsof cell regulation, bioenergetics and fuelling reactions of aerobics and anaerobics,secondary metabolism & its applications. Cell communication, cell cycle and apoptosis, mechanism of cell division. Celljunctions/adhesion and extra cellular matrix, germ cells and fertilization, histology – thelife and death of cells in tissues. Cell Cycle and Cytoskeleton Cell Division and its Regulation, G-Protein CoupledReceptors, Kinases, Nuclear receptors, Cytoskeleton & cell movements, IntermediateFilaments. Apoptosis and Oncogenes Programmed Cell Death, Tumor cells, carcinogens & repair. Differentiation and Developmental Biology Fertilization, Events of Fertilization, In vitro Fertilization, Embryonic Germ Cells, Stem Cells and its Application.	12 Hrs
4	Principles of microbial nutrition Physical and chemical environment for microbial growth, Stability and degeneration of microbial cultures. Growth of animal cells in culture General procedure for cell culture, Nutrient composition, Primary, established and transformed cell cultures, applications of cell cultures in pharmaceutical industry and research. Growth of viruses in cell culture propagation and enumeration. In-vitro screening techniques- cytotoxicity, anti-tumor, anti-viral assays.	12 Hrs
5	Microbial pathology Identifying the features of pathogenic bacteria, fungi and viruses. Mechanism of microbial pathogenicity, etiology and pathology of common microbial diseases and currently recommended therapies for common bacterial, fungal & viral infections. Mechanism of action of antimicrobial agents and possible sites of chemotherapy.	12 Hrs

REFERENCES

1. W.B. Hugo and A.D. Russel: Pharmaceutical Microbiology, Blackwell Scientific publications, Oxford London.
2. Prescott and Dunn, Industrial Microbiology, CBS Publishers & Distributors, Delhi.
3. Pelczar, Chan Kreig, Microbiology, Tata McGraw Hill edn.
4. David Freifelder, Molecular Biology, 2nd edition, Narosa Publishing House.
5. R. Ian Freshney, Culture of animal cells – A manual of Basic techniques, 6th edition, Wileys publication house.
6. David Baltimore,Molecular cell biology, W H Freeman & Co publishers.
7. Cell biology vol-I,II,III by Julio E.Cells
8. Bergeys manual of systematic bacteriology, Williams and Wilkins- A Waverly company.

BIOPROCESS ENGINEERING AND TECHNOLOGY
(MPB 103T)

Scope

This paper has been designed to provide the knowledge to the biotechnology students in invaluable areas of bioprocess technology to develop skills to modify, design and operate different types of fermenters, to understand and implement various fermentation procedures, to train students in scale up fermentation operations.

Objective

At the completion of this subject it is expected that students will be able to,

- Understand basics and design of fermentation technology
- Scale up and scale down processing of fermentation technology
- Bioprocessing of the industrially important microbial metabolites in industries and R & D organizations.
- Regulation governing the manufacturing of biological products
- Understand and conduct fermentation process kinetics.

THEORY		60 Hrs
1.	Introduction to fermentation technology Basic principles of fermentation Study of the design and operation of bioreactor Ancillary parts and function, impeller design and agitation, power requirements on measurements and control of dissolved oxygen, carbon dioxide, temperature, pH and foam. Types of bioreactor CSTR, tower, airlift, bubble column, packed glass bead, hollow fiber, configuration and application Computer control of fermentation process System configuration and application	12 Hrs
2	Mass transfer Theory, diffusional resistance to oxygen requirements of microorganisms, measurements of mass transfer co- efficient and factor affecting them, effects of aeration and agitation on mass transfer, supply of air, air compressing, cleaning and sterilization of air and plenum ventilation, air sampling and testing standards for air purity.	12 Hrs

Rheology

Rheological properties of fermentation system and their importance in bioprocessing.

3 Scale up of fermentation process — 12 Hrs

Principles, theoretical considerations, techniques used, media for fermentation, HTST sterilization, advantage and disadvantage, liquid sterilization.

Cultivation and immobilized culture system

Cultivation system - batch culture, continuous culture, synchronous cultures, fed batch culture. Graphical plot representing the above systems.

Introduction to immobilization

Techniques, immobilization of whole cell, immobilized culture system to prepare fine chemicals. Immobilization of enzymes and their applications in the industry. Reactors for immobilized systems and perspective of enzyme engineering.

4 Scale down of fermentation process — 12 Hrs

Theory, equipment design and operation, methods of filtration, solvent extraction, chromatographic separation, crystallization turbidity analysis and cell yield determination, metabolic response assay, enzymatic assay, bioautographic techniques and disruption of cells for product recovery.

Isolation and screening

Primary and secondary, maintenance of stockculture, strain improvement for increased yield.

5 Bioprocessing of the industrially important microbial metabolites — 12 Hrs

a) Organic solvents – Alcohol and Glycerol
b) Organic acids - Citric acids, Lactic acids,
c) Amino acids - Glutamic acids, Lysine, Cyclic AMP and GMP
d) Antibiotics - Penicillin, Streptomycin, Griseofulvin,
e) Vitamins - B12, Riboflavin and Vitamin C

Biosynthetic pathways for some secondary metabolites, microbial transformation of steroids and alkaloids

Regulation governing the manufacturing of biological products .

REFERENCES

1. Peter Stanbury, Allan Whitaker, Stephen Hall, Principles of Fermentation technology, Elsevier stores.
2. L.E. Casida, Industrial Microbiology, John Wiley & sons Inc.
3. F.M. Asubel, Current protocols in molecular biology, volume I and II, John Wiley Publishers.
4. Biotol Board, Bioreactor design and product yield, Butterworth and Helhemann Publishers.
5. H. Patel, Industrial microbiology, Macmillan India Limited.

ADVANCED PHARMACEUTICAL BIOTECHNOLOGY
(MPB 104T)

Scope

This paper has been designed to provide the knowledge to the students to develop skills of advanced techniques of isolation and purification of enzymes, to enrich students with current status of development of vaccines and economic importance of biotechnology products.

Objective

At the completion of this subject it is expected that students will be able to

- Understand about the latest technology development in biotechnology technique, tools and their uses in drug and vaccine development.
- Identify appropriate sources of enzymes.
- Understand and perform genetic engineering techniques in gene manipulation, r-DNA technology and gene amplification.
- Understand the overview of pharmacogenomics.
- Learn the regulatory approval process and key regulatory agencies for new drugs, biologics, devices, and drug-device combinations.

THEORY 60 Hrs

1. Enzyme Technology 12 Hrs

Classification, general properties of enzymes, dynamics of enzymatic activity,sources of enzymes, extraction and purification, pharmaceutical,therapeutic and clinical application. Production of amyloglucosidase, glucose isomerase,amylase and trypsin.

2 Genetic Engineering 12 Hrs

Techniques of gene manipulation, cloning strategies,procedures, cloning vectors expression vectors, recombinant selection andscreening, expression in E.coli and yeast.

Site directed mutagenesis, polymerase chain reaction, and analysis of DNAsequences.

Gene library and cDNA

Applications of the above technique in the production of,

- Regulatory proteins - Interferon, Interleukins
- Blood products - Erythropoietin
- Vaccines - Hepatitis-B
- Hormones - Insulin

3	Therapeutic peptides Study on controlled and site specified delivery of therapeutic peptides and proteins through various routes of administration. Transgenic animals Production of useful proteins in transgenic animals and gene therapy. Human Genome The human genome project-a brief study, Human chromosome – Structure and classification, chromosomal abnormalities – Syndromes	12 Hrs
4	Signal transduction Introduction, cell signaling pathways, Ion channels, Sensors and effectors, ON and OFF mechanisms, Spatial and temporal aspects of signaling, cellular process, development, cell cycle and proliferation, neuronal signaling, cell stress, inflammatory responses and cell death, signaling defects and diseases. Oncogenes Introduction, definition, various oncogenes and their proteins.	12 Hrs
5	Microbial Biotransformation Biotransformation for the synthesis of chiral drugs and steroids. Microbial Biodegradation Biodegradation of xenobiotics, chemical and industrial wastes, Production of single-cell protein, Applications of microbes in environmental monitoring. Biosensors Definition, characteristics of ideal biosensors, types of biosensors, biological recognition elements, transducers, application of biosensors.	12 Hrs

REFERENCES

1. Biotechnology-The biological principles: MD Trevan, S Boffey, KH Goulding and P.F. Stanbury.
2. Immobilization of cells and enzymes: HosevearKennadycabral& Bicker staff
3. Principles of Gene Manipulating: RW Old and S.B.Primrose.
4. Molecular Cell Biology: Harvey Lodish, David Baltimore, Arnold Berk, S LawenceZipursky, Paul Matsudaira, James Darnell.
5. Modern Biotechnology: S.B Primrose

6. Gene transfer and expression protocols-methods in Molecular Biology, vol. VII, Edit E.T. Murray
7. Current protocols in Molecular Biology, Vo1.I & II:F.M. Asubel, John wiley Publishers
8. Current protocols in cellular biology, Vo1.1 & II John wiley publishers.
9. Principles of human genetics; by Curt Stern, published by W.H. Freeman.

PHARMACEUTICAL BIOTECHNOLOGY PRACTICAL - I
(MPB 105P)

1. Analysis of Pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry
7. Isolation and Purification of microorganism from the soil
8. Microbial contamination of Water and biochemical parameters.
9. Determination of Minimum Inhibitory concentration by gradient plate technique and serial dilution method.
10. UV- survival curve and Dark repair
11. Sterility test for pharmaceutical preparations
12. Sub culturing of cells and cytotoxicity assays.
13. Construction of growth curve and determination of specific growth rate and doubling time
14. Fermentation process of alcohol and wine production
15. Fermentation of vitamins and antibiotics
16. Whole cell immobilization engineering
17. Thermal death kinetics of bacteria
18. Replica plating
19. Bio-autography.
20. Isolation and estimation of DNA
21. Isolation and estimation of RNA
22. Isolation of plasmids
23. Agarose gel electrophoresis.
24. Transformation techniques
25. SDS - polyacrylamide gel electrophoresis for proteins
26. Polymerase chain reaction technique.

PROTEINS AND PROTEIN FORMULATIONS
(MPB 201T)

Scope

This course is designed to impart knowledge and skills necessary for knowing fundamental aspects of proteins and their formulations is a part of drug research and development process. Basic theoretical discussions of the principles of more integrated and coherent use of information for protein formulation and design are provided to help the students to clarify the various biological concepts of protein.

Objective

At the completion of this course it is expected that students will be able to understand,

- Various methods of purification of proteins
- Peptides in drug development
- Protein identification and characterization
- Protein based formulations
- Sequencing proteins

THEORY 60 Hrs

1. Protein engineering — 12 Hrs

   Concepts for protein engineering. Isolation and purification of proteins, Stability and activity based approaches of protein engineering, Chemical and Physical Considerations in Protein and Peptide Stability, Different methods for protein engineering, gene shuffling, and direct evolution.

2 Peptidomimetics — 12 Hrs

   Introduction, classification; Conformationally restricted peptides, design, pseudopeptides, peptidomimetics and transition state analogs; Biologically active template; Amino acid replacements; Peptidomimetics and rational drug design; CADD techniques in peptidomimetics; Development of non peptide peptidomimetics.

3 Proteomics — 12 Hrs

   Protein identification and characterization: Methods/strategies, protein identification, de novo protein characterization, Isotope labelling, N- and C-terminal tags.

2-Dimensional gel electrophoresis

Methods including immobilized pH gradients (IPGs), resolution, reproducibility and image analysis, future developments

4	Protein formulation Different strategies used in the formulation of DNA and proteins, Analytical and biophysical parameters of proteins and DNA in pre-formulation, Liposomes, Neon-spears, Neon-particulate system, PEGylation, Biological Activity, Biophysical Characterization Techniques, Forced degradation studies of protein.	12 Hrs
5	Methods of protein sequencing Various methods of protein sequencing, characterisation, Edman degradation, Tryptic and/or Chymotryptic Peptide Mapping.	12 Hrs

REFERENCES

1. H. Lodhishet. Al. Molecular Cell Biology, W. H. Freeman and Company
2. Protein Purification – Hand Book, Amersham pharmacia biotech
3. EngelbertBuxbaum, Fundamentals of Protein Structure and Function, Springer Science
4. Sheldon J. Park, Jennifer R. Cochran, Protein Engineering and Design, CRC press.
5. Robert K. Skopes. Protein purification, principle and practice, springer link.
6. David Whitford, Proteins-Structure and Function, John Wiley & Sons Ltd.
7. James Swarbrick, Protein Formulation and Delivery Informa Healthcare USA,Inc.
8. Rodney Pearlman, Y. John Wang Formulation, Characterization, and Stability of Protein Drugs, Kluwer Academic Publishers.

IMMUNOTECHNOLOGY
(MPB 202T)

Scope

This course is designed to impart knowledge on production and engineering of antibodies, the application of antigens, the design of (recombinant) vaccines, strategies for immune intervention, etc. The Immunotechnology - based techniques will be used for therapeutics and diagnostics, industries in the production, quality control and quality assurance, and in R&D.

Objective

After this course, the students will be able to:-

- Understand the techniques like immunodiagnostic tests,
- Characterization of lymphocytes, purification of antigens and antibody, etc.
- Access health problems with immunological background;
- Develop approaches for the immune intervention of diseases

THEORY 60 Hrs

1. Fundamental aspects of immunology 12 Hrs

Introduction, cells and organs of the immune system, cellular basis of Immune response, primary and secondary lymphoid organs, antigen antibody and their structure.

Types of immune responses, anatomy of immune response.

Overview of innate and adaptive Immunity.

Humoral Immunity

B - Lymphocytes and their activation. Structure and function of immunoglobulins, idiotypes and anti idiotypic antibodies.

Cell mediated Immunity

Thymus derived lymphocytes (T cells) - their ontogeny and types, MHC complex, antigen presenting cells (APC), mechanisms of T cell activation, macrophages, dendritic cells, langerhans cells, mechanism of phagocytosis

2 Immune Regulation and Tolerance 12 Hrs

Complement activation and types and their biological functions, cytokines and their role in immune response.

Hypersensitivity

Hypersensitivity Types I-IV, Hypersensitivity reactions and treatment

Autoimmune diseases

3 Vaccine technology 12 Hrs

Vaccine and their types, conventional vaccines, novel methods for vaccine production, antiidiotype vaccine, DNA vaccine, genetically engineered vaccine, iscoms, synthetic peptides, and immunodiagnostics.

Stem cell technology

Stem cell technology and applications to immunology

4 Hybridoma Technology 12 Hrs

Hybridoma techniques – fusion methods for myeloma cells and B-Lymphocytes, selection and screening techniques. Production and purification of monoclonal antibodies and their applications in Pharmaceutical industry.

5 Immunological Disorder 12 Hrs

Autoimmune disorders and types, pathogenic mechanisms, treatment, experimental models of auto immune diseases, primary and secondary immunodeficiency disorders.

Immunodiagnosis

Antigen antibody interaction – Precipitation reaction, Agglutination reactions, Principles and applications of ELISA, Radio Immuno Assay, Western blot analysis, immune-electrophoresis, immuno fluorescence, chemiluminescence assay, complement fixation reaction.

REFERENCES

1. J. Kubey, Immunology – an Introduction.
2. S.C. Rastogi, Immunodiagonstics, New Age International.
3. Ashim Chakravarthy, Immunology and Immunotechnology, Oxford University Press.
4. E. Benjamini, Molecular Immunology.

BIOINFORMATICS AND COMPUTATIONAL BIOTECHNOLOGY
(MPB 203T)

Scope

This paper has been designed to provide the advanced knowledge to the biotechnology students in invaluable areas of advanced bioinformatics which plays a crucial role in determining its future use and applications in medicine, drug discovery and in pharmaceutical industry.

Objectives

Upon completion of this course it is expected that the students will be able to understand,

- Use of computers in developing a new drugs
- Biological concepts for bioinformatics
- Proteins and their diversity
- Various gene finding methods
- Searching the biological databases
- Target searching
- Various methods of drug designing

THEORY 60 Hrs

1. Introduction to Bioinformatics — 12 Hrs

   Definition and History of Bioinformatics, Internet and Bioinformatics, Introduction to Data Mining, Applications of Data Mining to Bioinformatics,

   Biological Database

   Protein and nucleic acid databases. Structural data bases. Collecting and storing the sequence and Applications of Bioinformatics.

2 Sequence analysis — 12 Hrs

   Sequence alignment, pair wise alignment techniques, multiple sequence analysis, multiple sequence alignment; Flexible sequence similarity searching with the FAST3 program package, the use of CLUSTAL W and CLUSTAL X for the multiple sequence alignment. Tools used for sequence analysis.

3 Protein informatics — 12 Hrs

   Introduction; Force field methods; Energy, buried and exposed residues, side chains and neighbours; Fixed regions, hydrogen bonds, mapping properties onto surfaces; Fitting monomers, R &

S fit of conformers, assigning secondary structures; Sequence alignment-methods, evaluation, scoring; Protein completion, backbone construction and side chain addition; Small peptide methodology, software accessibility, building peptides; Protein displays; Substructure manipulations, annealing.

Protein structure prediction

Protein folding and model generation; Secondary structure prediction, analyzing secondary structures; Protein loop searching, loop generating methods, loop analysis; Homology modeling, concepts of homology modeling, potential applications, description, methodology, homologous sequence identification; Align structures, align model sequence; Construction of variable and conserved regions, threading techniques, Topology fingerprint approach for prediction, evaluation of alternate models; Structure prediction on a mystery sequence, structure aided sequence techniques of structure prediction, structural profiles, alignment algorithms, mutation tables, prediction, validation, sequence based methods of structure prediction, prediction using inverse folding, fold prediction; Significance analysis, scoring techniques, sequence- sequence scoring.

Docking

Docking problems, methods for protein- ligand docking, validation studies and applications; Screening small molecule databases, docking of combinatorial libraries, input data, analyzing docking results.

4 Diversity of Genomes 12 Hrs

Prokaryotic and Eukaryotic Gene Families. Genome Analysis: Introduction, Gene prediction methods, Gene mapping and applications- Genetic and Physical Mapping, Integrated map, Sequence assembly and gene expression.

Completed Genomes

Bacterium, Nematode, Plant and Human

Evolution of Genomes

Lateral or Horizontal Transfer among Genomes, Transcriptome and Proteome-General Account

Phylogenetic analysis

Evolutionary Change in Nucleotide Sequences, Rates and Patterns of Nucleotide Substitution, Models for Nucleotide Substitution, Construction of Phylogenetic Tree, Genome Annotation technique.

5	Target searching and Drug Designing Target and lead, timeline for drug development, target discovery, target modulators, In-silico gene expression, microarray, and lead discovery, libraries of ligands, active site analysis, and prediction of drug quality.	12 Hrs

REFERENCES

1. David W. Mount, Bioinformatics Sequence and Genome Analysis, CBS Publishers and Distributors
2. S. C. Rastogiet. al. Bioinformatics- Concepts Skill and Applications, CBS Publishers and Distributors
3. T. E. Creighton, Protein Structure and Molecular Properties, W. H.Freeman and Company
4. Andreas D. Baxevanis, B. F. Francis Ouellette, Bioinformatics; A Practical Guide to the Analysis of Genes and Proteins, John Wiley & Sons, Inc.
5. Arthur M. Lesk, Introduction to Bioinformatics, Oxford University Press.
6. Shui Qing Ye. Bioinformatics: A Practical Approach, Chapman & Hall/CRC.
7. David Posada, Bioinformatics for DNA Sequence Analysis, Humana press.
8. Lesk, A.M. Introduction to Bioinformatics. Oxford University Press.
9. Letovsky, S.I. Bioinformatics. Kluwer Academic Publishers.
10. Baldi, P. and Brunak, S. Bioinformatics. The MIT Press.

BIOLOGICAL EVALUATION OF DRUG THERAPY
(MPB 204T)

Scope

This paper has been designed to provide the knowledge to the biotechnology students to understand the importance of biological and evaluation of drug therapy of biological medicines.

Objective

At the completion of this subject it is expected that students will be able to,

- Understand about the general concept of standardization of biological.
- Understand the importance of transgenic animals and knockout animals.
- Understand the biological medicines in development of various diseases.
- Learn the biological evaluation of drugs in vitro and in vivo

THEORY 60 Hrs

1. Biological Standardization 12 Hrs

General principles, Scope and limitation of bio-assay, bioassay of some official drugs.

Preclinical drug evaluation

Preclinical drug evaluation of its biological activity, potency and toxicity-Toxicity test in animals including acute, sub-acute and chronic toxicity, ED50 and LD50 determination, special toxicity test like teratogenecity and mutagenecity.

Guidelines for toxicity studies

Various guidelines for toxicity studies. Animal experiments assessing safety of packaging materials.

2 Pyrogens 12 Hrs

Pyrogens: Sources, Chemistry and properties of bacterial pyrogens and endotoxins, Official pyrogen tests.

Microbiological assay

Assay of antibiotics and vitamins.

Biological evaluation of drugs

Screening and evaluation (including principles of screening, development of models for diseases: In vivo models / In vitro models / cell line study).

3	Biologic Medicines in Development for various diseases - By Therapeutic Category • Genetic Disorders • Eye related Disorders • Digestive Disorders • Diabetes/Related Conditions • Cardiovascular Disease • Cancer/Related Conditions • Blood Disorders • Autoimmune Disorders • Infectious Diseases • Neurologic Disorders • Skin Diseases • Organe Transplantation Biologic Medicines in Development for various diseases – by Product Category • Antisense • Vaccines • Recombinant Hormones/Proteins • Monoclonal Antibodies (mAb) • Interferons • Growth Factors • Gene Therapy • RNA Interference	12 Hrs
4	Regulatory aspects : drugs, biologics and medical devices An introduction to the regulations and documents necessary for approval of a medical product. Regulatory consideration Regulatory consideration for pre-clinical testing and clinical testing of drugs, biologics and medical devices. New Drug Applications for Global Pharmaceutical Product Approvals	12 Hrs
5	Bioavailability Objectives and consideration in bio-availability studies of Biopharmaceuticals, Concept of equivalents, Measurements of bio-availability.	12 Hrs

Determination of the rate of absorption, Bioequivalence and its importance, Regulatory aspects of bio-availability and bioequivalence studies for conventional dosage forms and controlled drug delivery systems of Biopharmaceuticals.

Pharmacokinetics

Pharmacokinetics:- Basic consideration, Pharmacokinetic models, Application of Pharmacokinetics in new drug development of Biopharmaceuticals and designing of dosage forms and Novel drug delivery systems of Biopharmaceuticals.

REFERENCES

1. Perkins F.T., Hennessen W. Standardization and Control of Biologicals Produced by Recombinant DNA Technology, International Association of Biological Standardization
2. J.H. Burn., Biological Standardization, Oxford University Press
3. Drug Discovery and Evaluation in Pharmacology assay: Vogel
4. Chow, Shein, Ching, Design and analysis of animal studies in pharmaceutical development,
5. Nodine and Siegler, Animal and Clinical pharmacologic Techniques in Drug Evaluation.
6. Screening methods in pharmacology (vol I & II), R.A. Turner.

PHARMACEUTICAL BIOTECHNOLOGY PRACTICAL - II
(MPB 205P)

1. Protein identification
2. Protein characterization
3. Protein biochemistry
4. Recombinant DNA Technology
5. Protein expression
6. Protein formulations
7. Database searching
8. Sequence analysis methods
9. Protein structure prediction
10. Gene annotation methods
11. Phylogenetic analysis
12. Protein, DNA binding studies
13. Preparation of DNA for PCR applications – Isolation, Purity and Quantification
14. Introduction to PCR – working of PCR, Programming.
15. Introduction to RT-PCR – working, programming.
16. Primer design using softwares.
17. Gene DNA amplification by random / specific primers.
18. Southern Hybridization
19. Western Blotting
20. Gene transformation

PHARMACYPRACTICE(MPP)

CLINICAL PHARMACY PRACTICE (MPP 101T)

Scope

This course is designed to impart the basic knowledge and skills that are required to practice pharmacy including the provision of pharmaceutical care services to both healthcare professionals and patients in clinical settings.

Objectives

Upon completion of this course it is expected that students shall be able to :

- Understand the elements of pharmaceutical care and provide comprehensive patient care services
- Interpret the laboratory results to aid the clinical diagnosis of various disorders
- Provide integrated, critically analyzed medicine and poison information to enable healthcare professionals in the efficient patient management

THEORY 60 Hrs

1. Introduction to Clinical Pharmacy: Definition, evolution and scope of clinical pharmacy, International and national scenario of clinical pharmacy practice, Pharmaceutical care — 12 Hrs

   Clinical Pharmacy Services: Ward round participation, Drug therapy review (Drug therapy monitoring including medication order review, chart endorsement, clinical review and pharmacist interventions)

2 Clinical Pharmacy Services: Patient medication history interview, Basic concept of medicine and poison information services, Basic concept of pharmacovigilance, Hemovigilance, Materiovigilance and AEFI, Patient medication counselling, Drug utilisation evaluation, Documentation of clinical pharmacy services, Quality assurance of clinical pharmacy services. — 12 Hrs

3 Patient Data Analysis: — 12 Hrs

Patient Data & Practice Skills: Patient's case history - its structure and significances in drug therapy management, Common medical abbreviations and terminologies used in clinical practice, Communication skills: verbal and non-verbal communications, its applications in patient care services.

	Lab Data Interpretation: Hematological tests, Renal function tests, Liver function tests	
4	Lab Data Interpretation: Tests associated with cardiac disorders, Pulmonary function tests, Thyroid function tests, Fluid and electrolyte balance, Microbiological culture sensitivity tests	12 Hrs
5	Medicines & Poison Information Services Medicine Information Service: Definition and need for medicine information service, Medicine information resources, Systematic approach in answering medicine information queries, Preparation of verbal and written response, Establishing a drug information centre. Poison Information Service: Definition, need, organization and functions of poison information centre.	12 Hrs

REFERENCES

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Practice Standards and Definitions - The Society of Hospital Pharmacists of Australia
3. Basic skills in interpreting laboratory data - Scott LT, American Society of Health System Pharmacists Inc
4. Relevant review articles from recent medical and pharmaceutical literature.

PHARMACOTHERAPEUTICS-I
(MPP 102T)

Scope

This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Describe and explain the rationale for drug therapy
- Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence
- Discuss the clinical controversies in drug therapy and evidence based medicine
- Prepare individualized therapeutic plans based on diagnosis
- Identify the patient specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effect/s)

THEORY 60 Hrs

Etiopathogenesis and pharmacotherapy of diseases associated with following systems

1.	Cardiovascular system: Hypertension, Congestive cardiac failure, Acute coronary syndrome, Arrhythmias, Hyperlipidemias.	12 Hrs
2	Respiratory system: Asthma, Chronic obstructive airways disease, Drug induced pulmonary diseases Endocrine system: Diabetes, Thyroid diseases	12 Hrs
3	Gastrointestinal system: Peptic ulcer diseases, Reflux esophagitis, Inflammatory bowel diseases, Jaundice & hepatitis	12 Hrs
4	Gastrointestinal system: Cirrhosis, Diarrhea and Constipation, Drug-induced liver disease	12 Hrs
	Hematological diseases: Anemia, Deep vein thrombosis, Drug induced hematological disorders	

5	Bone and joint disorders: Rheumatoid arthritis, Osteoarthritis, Gout, Osteoporosis	12 Hrs
	Dermatological Diseases: Psoriasis, Eczema and scabies, impetigo, drug induced skin disorders	
	Ophthalmology: Conjunctivitis, Glaucoma	

REFERENCES

1. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach- Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-– McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

HOSPITAL & COMMUNITY PHARMACY
(MPP 103T)

Scope

This course is designed to impart basic knowledge and skills that are required to practice pharmacy in both hospital and community settings.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Understand the organizational structure of hospital pharmacy
- Understand drug policy and drug committees
- Know about procurement & drug distribution practices
- Know the admixtures of radiopharmaceuticals
- Understand the community pharmacy management
- Know about value added services in community pharmacies

THEORY 60 Hrs

1.	Introduction to Hospitals – Definition, classification, organizational structure Hospital Pharmacy: Definition, Relationship of hospital pharmacy department with other departments, Organizational structure, legal requirements, work load statistics, Infrastructural requirements, Hospital Pharmacy Budget and Hospital Pharmacy management Hospital Drug Policy: Pharmacy & Therapeutics Committee, Infection Control committee, Research & Ethics Committee, Management of Medicines as per NABH	12 Hrs
2	Hospital Formulary Guidelines and its development, Developing Therapeutic guidelines, Drug procurement process, and methods of Inventory control, Methods of Drug distribution, Intravenous admixtures, Hospital Waste Management	12 Hrs
3	Education and training: Training of technical staff, training and continuing education for pharmacists, Pharmacy students, Medical staff and students, Nursing staff and students, Formal and informal meetings and lectures, Drug and therapeutics newsletter. Community Pharmacy Practice: Definition, roles & responsibilities of community pharmacists, and their relationship with other health care providers.	12 Hrs

Community Pharmacy management: Legal requirements to start community pharmacy, site selection, lay out & design, drug display, super drug store model, accounts and audits, Good dispensing practices, Different softwares & databases used in community pharmacies. Entrepreneurship in community pharmacy.

4	Prescription – Legal requirements & interpretation, prescription related problems Responding to symptoms of minor ailments: Head ache, pyrexia, menstrual pains, food and drug allergy, OTC medication: Rational use of over the counter medications Medication counseling and use of patient information leaflets Medication adherence – Definition, factors influencing adherence behavior, strategies to improve medication adherence Patient referrals to the doctors ADR monitoring in community pharmacies	12 Hrs
5	Health Promotion – Definition and health promotion activities, family planning, Health screening services, first aid, prevention of communicable and non-communicable diseases, smoking cessation, Child & mother care National Health Programs- Role of Community Pharmacist in Malaria and TB control programs Home Medicines review program – Definition, objectives, Guidelines, method and outcomes Research in community pharmacy Practice	12 Hrs

REFERENCES

1. Hospital Pharmacy - Hassan WE. Lea and Febiger publication.
2. Textbook of hospital pharmacy - Allwood MC and Blackwell.
3. Avery's Drug Treatment, Adis International Limited.
4. Community Pharmacy Practice – Ramesh Adepu, BSP Publishers, Hyderabad
5. Remington Pharmaceutical Sciences.
6. Relevant review articles from recent medical and pharmaceutical literature

CLINICAL RESEARCH
(MPP 104T)

Scope

This course aims to provide the students an opportunity to learn drug development process especially the phases of clinical trials and also the ethical issues involved in the conduct of clinical research. Also, it aims to imparts knowledge and develop skills on conceptualizing, designing, conducting and managing clinical trials.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Know the new drug development process.
- Understand the regulatory and ethical requirements.
- Appreciate and conduct the clinical trials activities
- Know safety monitoring and reporting in clinical trials
- Manage the trial coordination process

THEORY 60 Hrs

1. Drug development process: Introduction, various approaches to drug discovery, Investigational new drug application submission Ethics in Biomedical Research: Ethical Issues in Biomedical Research – Principles of ethics in biomedical research, Ethical committee [institutional review board] - its constitution and functions, Challenges in implementation of ethical guidelines, ICH GCP guidelines and ICMR guidelines in conduct of Clinical trials, Drug Safety Reporting. 12 Hrs

2 Types and Designs used in Clinical Research: Planning and execution of clinical trials, Various Phases of clinical trials, Bioavailability and Bioequivalence studies, Randomization techniques (Simple randomization, restricted randomization, blocking method and stratification), Types of research designs based on Controlling Method (Experimental, Quasi experimental, and Observational methods) Time Sequences (Prospective and Retrospective), Sampling methods (Cohort study, case Control study and cross sectional study), Health outcome measures (Clinical & Physiological, Humanistic and economic)
Clinical Trial Study team: Roles and responsibilities of: Investigator, Study Coordinator, Sponsor, Monitor, Contract Research Organization. 12 Hrs

3	Clinical trial Documents: Guidelines to the preparation of following documents: Protocols, Investigator's Brochure, Informed Consent Form, Case report forms, Contracts and agreements, Dairy Cards Clinical Trial Start up activities: Site Feasibility Studies, Site/Investigator selection, Pre-study visit, Investigator meeting, Clinical trial agreement execution, Ethics committee document preparation and submission	12 Hrs
4	Investigational Product: Procurement and Storage of investigation product Filing procedures: Essential documents for clinical trial, Trial Master File preparation and maintenance, Investigator Site File, Pharmacy File, Site initiation visit, Conduct, Report and Follow up Clinical Trial Monitoring and Close out: Preparation and conduct of monitoring visit: Review of source documents, CRF, ICF, IP storage, accountability and reconciliation, Study Procedure, EC communications, Safety reporting, Monitoring visit reporting and follow-up Close-Out visit: Study related documents collection, Archival requirement, Investigational Product reconciliation and destruction, Close-Out visit report.	12 Hrs
5	Quality Assurance and Quality Control in Clinical Trials: Types of audits, Audit criteria, Audit process, Responsibilities of stakeholders in audit process, Audit follow-up and documentation, Audit resolution and Preparing for FDA inspections, Fraud and misconduct management Data Management Infrastructure and System Requirement for Data Management: Electronic data capture systems, Selection and implementation of new systems, System validation and test procedures, Coding dictionaries, Data migration and archival Clinical Trial Data Management: Standard Operating Procedures, Data management plan, CRF & Data base design considerations, Study set-up, Data entry, CRF tracking and corrections, Data cleaning, Managing laboratory and ADR data, Data transfer and database lock, Quality Control and Quality Assurance in CDM, Data mining and warehousing.	12 Hrs

REFERENCES

1. Principles and practice of pharmaceutical medicine, Second edition. Authors:Lionel. D. Edward, Aadrew.J.Flether Anthony W Fos , Peter D Sloaier Publisher:Wiley;
2. Handbook of clinical research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone
3. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.
4. Central Drugs Standard Control Organization. Good Clinical Practices-Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health.
5. International Conference on Harmonisation of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonised Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.
6. Ethical Guidelines for Biomedical Research on Human Subjects. Indian Council of Medical Research, New Delhi.
7. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, John Wiley and Sons.
8. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
9. Goodman & Gilman: JG Hardman, LE Limbard, McGraw Hill Publications.
10. Relevant review articles from recent medical and pharmaceutical literature.

PHARMACY PRACTICE PRACTICAL – I
(MPP 105P)

Pharmacy Practice practical component includes experiments covering important topics of the courses Clinical Pharmacy Practice, Pharmacotherapeutics-I, Hospital & Community Pharmacy and Clinical Research.

List of Experiments (24)

1. Treatment Chart Review (one)
2. Medication History Interview (one)
3. Patient Medication Counseling (two)
4. Drug Information Query (two)
5. Poison Information Query (one)
6. Lab Data Interpretation (two)
7. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
8. ABC Analysis of a given list of medications (one)
9. Preparation of content of a medicine, with proper justification, for the inclusion in the hospital formulary (one)
10. Formulation and dispensing of a given IV admixtures (one)
11. Preparation of a patient information leaflet (two)
12. Preparation of Study Protocol (one)
13. Preparation of Informed Consent Form (one)

PRINCIPLES OF QUALITY USE OF MEDICINES
(MPP 201T)

Scope:

This course is designed to impart basic knowledge and skills that are required to practice quality use of medicines (QUM) in different healthcare settings and also to promote quality use of medicines, in clinical practice, through evidence-based medicine approach.

Objectives:

Upon completion of this course it is expected that students shall be able to:

- Understand the principles of quality use of medicines
- Know the benefits and risks associated with use of medicines
- Understand regulatory aspects of quality use of medicines
- Identify and resolve medication related problems
- Promote quality use of medicines
- Practice evidence-based medicines

THEORY 60 Hrs

1.	Introduction to Quality use of medicines (QUM): Definition and Principles of QUM, Key partners and responsibilities of the partners, Building blocks in QMC, Evaluation process in QMC, Communication in QUM, Cost effective prescribing.	12 Hrs
2	Concepts in QUM Evidence based medicine: Definition, concept of evidence based medicine, Approach and practice of evidence based medicine in clinical settings Essential drugs: Definition, need, concept of essential drug, National essential drug policy and list Rational drug use: Definition, concept and need for rational drug use, Rational drug prescribing, Role of pharmacist in rational drug use.	12 Hrs
3	QUM in various settings: Hospital settings, Ambulatory care/Residential care, Role of health care professionals in promoting the QUM, Strategies to promote the QUM, Impact of QUM on E-health, integrative medicine and multidisciplinary care. QUM in special population: Pediatric prescribing, Geriatric prescribing, Prescribing in pregnancy and lactation, Prescribing in immune compromised and organ failure patients.	12 Hrs

4	Regulatory aspects of QUM in India: Regulation including scheduling, Regulation of complementary medicines, Regulation of OTC medicines, Professional responsibility of pharmacist, Role of industry in QUM in medicine development.	12 Hrs
5	Medication errors: Definition, categorization and causes of medication errors, Detection and prevention of medication errors, Role of pharmacist in monitoring and management of medication errors Pharmacovigilance: Definition, aims and need for pharmacovigilance, Types, predisposing factors and mechanism of adverse drug reactions (ADRs), Detection, reporting and monitoring of ADRs, Causality assessment of ADRs, Management of ADRs, Role of pharmacist in pharmacovigilance.	12 Hrs

REFERENCES:

1. A Textbook of Clinical Pharmacy Practice – Essential concepts and skills – Parthasarathi G, Karin Nyfort-Hansen and Milap Nahata
2. Andrews EB, Moore N. Mann's Pharmacovigilance
3. Dipiro JT, Talbert RL, Yee GC. Pharmacotherapy: A Pathophysiologic Approach
4. Straus SE, Richardson WS, Glasziou P, Haynes RB. Evidence-Based Medicine: How to practice and teach it
5. Cohen MR. Medication Errors
6. Online:
   - http://medicinesaustralia.com.au/files/2012/05/MA_QUM_External_Reduced.pdf
   - http://curriculum.racgp.org.au/statements/quality-use-of-medicines/
   - http://www.rug.nl/research/portal/files/14051541/Chapter_2.pdf
7. Relevant review articles from recent medical and pharmaceutical literature.

PHARMACOTHERAPEUTICS II
(MPP 202T)

Scope

This course aims to enable the students to understand the different treatment approaches in managing various disease conditions. Also, it imparts knowledge and skills in optimizing drug therapy of a patient by individualizing the treatment plan through evidence-based medicines.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Describe and explain the rationale for drug therapy
- Summarize the therapeutic approach for management of various disease conditions including reference to the latest available evidence
- Discuss the clinical controversies in drug therapy and evidence based medicine
- Prepare individualized therapeutic plans based on diagnosis
- Identify the patient specific parameters relevant in initiating drug therapy, and monitoring therapy (including alternatives, time- course of clinical and laboratory indices of therapeutic response and adverse effect/s)

THEORY		60 Hrs
1.	Nervous system: Epilepsy, Parkinson's disease, Stroke, Headache, Alzheimer's disease, Neuralgias and Pain pathways and Pain management.	12 Hrs
2	Psychiatric disorders: Schizophrenia, Depression, Anxiety disorders, Sleep disorders, Drug induced psychiatric disorders Renal system: Acute renal failure, Chronic renal failure, Renal dialysis, Drug induced renal disease	12 Hrs
3	Infectious diseases: General guidelines for the rational use of antibiotics and surgical prophylaxis, Urinary tract infections, Respiratory tract infections, Gastroenteritis, Tuberculosis, Malaria, Bacterial endocarditis, Septicemia.	12 Hrs
4	Infectious diseases: Meningitis, HIV and opportunistic infections, Rheumatic fever, Dengue fever, H1N1, Helmenthiasis, Fungal infections Gynecological disorders: Dysmenorrhea, Hormone replacement therapy.	12 Hrs

5	Oncology: General principles of cancer chemotherapy, pharmacotherapy of breast cancer, lung cancer, head & neck cancer, hematological malignancies, Management of nausea and vomiting, Palliative care	12 Hrs

REFERENCES

1. Roger and Walker. Clinical Pharmacy and Therapeutics - Churchill Livingstone publication.
2. Joseph T. Dipiro et al. Pharmacotherapy: A Pathophysiologic Approach- Appleton & Lange
3. Robins SL. Pathologic basis of disease -W.B. Saunders publication
4. Eric T. Herfindal. Clinical Pharmacy and Therapeutics- Williams and Wilkins Publication
5. Lloyd Young and Koda-Kimble MA Applied Therapeutics: The clinical Use of Drugs- Lippincott Williams and Wilkins
6. Chisholm- Burns Wells Schwinghammer Malone and Joseph P Dipiro. Pharmacotherapy Principles and practice-– McGraw Hill Publication
7. Carol Mattson Porth. Principles of Pathophysiology- Lippincott Williams and Wilkins
8. Harrison's. Principles of Internal Medicine - McGraw Hill
9. Relevant review articles from recent medical and pharmaceutical literature

CLINICAL PHARMACOKINETICS AND THERAPEUTIC DRUG MONITORING
(MPP 203T)

Scope

This course is designed to enable students to understand the basics principles and applications of pharmacokinetics in designing the individualized dosage regimen, to interpret the plasma drug concentration profile in altered pharmacokinetics, drug interactions and in therapeutic drug monitoring processes to optimize the drug dosage regimen. Also, it enables students to understand the basic concepts of pharmacogenetics, pharmacometrics for modeling and simulation of pharmacokinetic data.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Design the drug dosage regimen for individual patients
- Interpret and correlate the plasma drug concentrations with patients' therapeutic outcomes
- Recommend dosage adjustment for patients with renal/ hepatic impairment
- Recommend dosage adjustment for paediatrics and geriatrics
- Manage pharmacokinetic drug interactions
- Apply pharmacokinetic parameters in clinical settings
- Interpret the impact of genetic polymorphisms of individuals on pharmacokinetics and or pharmacodynamics of drugs
- Do pharmacokinetic modeling for the given data using the principles of pharmacometrics

THEORY 60 Hrs

1. Introduction to Clinical pharmacokinetics: Compartmental and Non compartmental models, Renal and non-renal clearance, Organ extraction and models of hepatic clearance, Estimation and determinants of bioavailability, Multiple dosing, Calculation of loading and maintenance doses 12 Hrs

   Designing of dosage regimens: Determination of dose and dosing intervals, Conversion from intravenous to oral dosing, Nomograms and Tabulations in designing dosage regimen.

2	Pharmacokinetics of Drug Interaction: Pharmacokinetic drug interactions, Inhibition and Induction of Drug metabolism, Inhibition of Biliary Excretion Pharmacogenetics: Genetic polymorphism in Drug metabolism: Cytochrome P-450 Isoenzymes, Genetic Polymorphism in Drug Transport and Drug Targets, Pharmacogenetics and Pharmacokinetic / Pharmacodynamic considerations Introduction to Pharmacometrics: Introduction to Bayesian Theory, Adaptive method or Dosing with feedback, Analysis of Population pharmacokinetic Data.	12 Hrs
3	Non Linier Mixed Effects Modelling: The Structural or Base Model, Modeling Random Effects, Modeling Covariate Relationships, Mixture Model, Estimation Methods, Model Building Techniques, Covariate Screening Methods, Testing the model assumptions, Precision of the parameter estimates and confidence intervals, Model misspecification and violation of the model assumptions, Model Validation, Simulation of dosing regimens and dosing recommendations, Pharmacometrics software.	12 Hrs
4	Altered Pharmacokinetics: Drug dosing in the elderly, Drug dosing in the paediatrics, Drug dosing in the obese patients, Drug dosing in the pregnancy and lactation, Drug dosing in the renal failure and extracorporeal removal of drugs, Drug dosing in the in hepatic failure.	12 Hrs
5	Therapeutic Drug monitoring: Introduction, Individualization of drug dosage regimen (Variability – Genetic, age, weight, disease and Interacting drugs), Indications for TDM, Protocol for TDM, Pharmacokinetic/Pharmacodynamic Correlation in drug therapy, TDM of drugs used in the following conditions: Cardiovascular disease: Digoxin, Lidocaine, Amiodarone; Seizure disorders: Phenytoin, Carbamazepine, Sodium Valproate; Psychiatric conditions: Lithium, Fluoxetine, Amitriptyline; Organ transplantations: Cyclosporine; Cytotoxic Agents: Methotrexate, 5-FU, Cisplatin; Antibiotics: Vancomycin, Gentamicin, Meropenem.	12 Hrs

REFERENCES

1. Leon Shargel, Susanna Wu-Pong, Andrew Yu. Applied Biopharmaceutics & Pharmacokinetics. New York: Mc Graw Hill.
2. Peter L. Bonate. Pharmacokinetic - Pharmacodynamic Modeling and Simulation. Springer Publications.
3. Michael E. Burton, Leslie M. Shaw, Jerome J. Schentag, William E.Evans. Applied Pharmacokinetics & Pharmacodynamics: Principles of Therapeutic Drug Monitoring. lippincott Williams & Wilkins.
4. Steven How-Yan Wong, Irving Sunshine. Handbook of Analytical Therapeutic Drug Monitoring and Toxicology. CRC Press, USA.
5. Soraya Dhillon, Andrzej Kostrzewski. Clinical pharmacokinetics. 1st edition. London: Pharmaceutical Press.
6. Joseph T.Dipiro, William J.Spruill, William E.Wade, Robert A.Blouin and Jane M.Pruemer .Concepts in Clinical Pharmacokinetics. American Society of Health-System Pharmacists, USA.
7. Malcolm Rowland, Thomas N. Tozer .Clinical Pharmacokinetics and pharmacodynamics: concepts and applications. lippincott Williams & Wilkins, USA.
8. Evans, Schentag, Jusko. Applied pharmacokinetics. American Society of Health system Pharmacists, USA.
9. Michael E. Winter. Basic Clinical Pharmacokinetics. lippincott Williams & Wilkins, USA.
10. Milo Gibaldi. Biopharmaceutics and Clinical Pharmacokinetics. Pharma Book Syndicate, USA.
11. Dhillon and Kostrzewski. Clinical pharmacokinetics. Pharmaceutical Press, London.
12. John E .Murphy. Clinical Pharmacokinetics. 5th edition. US: American Society of Health- System Pharmacist, USA.
13. Relevant review articles from recent medical and pharmaceutical literature

PHARMACOEPIDEMIOLOGY & PHARMACOECONOMICS
(MPP 204T)

Scope

This course enables students to understand various pharmacoepidemiological methods and their clinical applications. Also, it aims to impart knowledge on basic concepts, assumptions, terminology, and methods associated with Pharmacoeconomics and health related outcomes, and when should be appropriate Pharmacoeconomic model should be applied for a health care regimen.

Objectives

Upon completion of this course it is expected that students shall be able to:

- Understand the various epidemiological methods and their applications
- Understand the fundamental principles of Pharmacoeconomics.
- Identify and determine relevant cost and consequences associated with pharmacy products and services.
- Perform the key Pharmacoeconomics analysis methods
- Understand the Pharmacoeconomic decision analysis methods and its applications.
- Describe current Pharmacoeconomic methods and issues.
- Understand the applications of Pharmacoeconomics to various pharmacy settings.

THEORY 60 Hrs

1. Introduction to Pharmacoepidemiology: Definition, Scope, Need, Aims & Applications; Outcome measurement: Outcome measures, Drug use measures: Monetary units, Number of prescriptions, units of drug dispensed, defined daily doses, prescribed daily doses, Diagnosis and Therapy surveys, Prevalence, Incidence rate, Monetary units, number of prescriptions, unit of drugs dispensed, defined daily doses and prescribed daily doses, medications adherence measurements. Concept of risk: Measurement of risk, Attributable risk and relative risk, Time- risk relationship and odds ratio — 12 Hrs

2 Pharmacoepidemiological Methods: Qualitative models: Drug Utilization Review; Quantitative models: case reports, case series, Cross sectional studies, Cohort and case control studies, Calculation of Odds' ratio, Meta analysis models, Drug effects study in populations: Spontaneous reporting, Prescription event — 12 Hrs

monitoring, Post marketing surveillance, Record linkage systems, Applications of Pharmacoepidemiology

3	Introduction to Pharmacoeconomics: Definition, history of Pharmacoeconomics, Need of Pharmacoeconomic studies in Indian healthcare system. Cost categorization and resources for cost estimation: Direct costs. Indirect costs. Intangible costs. Outcomes and Measurements of Pharmacoeconomics: Types of outcomes: Clinical outcome, Economic outcomes, Humanistic outcomes; Quality Adjusted Life Years, Disability Adjusted Life Years Incremental Cost Effective Ratio, Average Cost Effective Ratio. Person Time, Willingness To Pay, Time Trade Off and Discounting.	12 Hrs
4	Pharmacoeconomic evaluations: Definition, Steps involved, Applications, Advantages and disadvantages of the following Pharmacoeconomic models: Cost Minimization Analysis (CMA), Cost Benefit Analysis (CBA), Cost Effective Analysis (CEA), Cost Utility Analysis (CUA), Cost of Illness (COI), Cost Consequences Analysis (COA).	12 Hrs
5	Definition, Steps involved, Applications, Advantages and disadvantages of the following: Health related quality of life (HRQOL): Definition, Need for measurement of HRQOL, Common HRQOL measures. Definition, Steps involved, Applications of the following: Decision Analysis and Decision tree, Sensitivity analysis, Markov Modeling, Software used in pharmacoeconomic analysis, Applications of Pharmacoeconomics.	12 Hrs

REFERENCES

1. Rascati K L. Essentials of Pharmacoeconomics, Woulters Kluwer Lippincott Williams & Wilkins, Philadelphia.
2. Thomas E Getzen. Health economics. Fundamentals and Flow of Funds. John Wiley & Sons, USA.
3. Andrew Briggs, Karl Claxton, Mark Sculpher. Decision Modelling for Health Economic Evaluation, Oxford University Press, London.
4. Michael Drummond, Mark Sculpher, George Torrence, Bernie O'Brien and Greg Stoddart. Methods for the Economic Evaluation of Health Care Programmes Oxford University Press, London.

5. George E Mackinnon III. Understanding health outcomes and pharmacoeconomics.
6. Graker, Dennis. Pharmacoeconomics and outcomes.
7. Walley, Pharmacoeconomics.
8. Pharmacoeconomic – ed. by Nowakowska – University of Medical Sciences, Poznan.
9. Relevant review articles from recent medical and pharmaceutical literature

PHARMACY PRACTICE PRACTICAL - II
(MPP 205P)

Pharmacy Practice practical component includes experiments covering important topics of the courses Principles of Quality Use of Medicines, Pharmacotherapeutics-II, Clinical Pharmacokinetics & Therapeutic Drug Monitoring and Pharmacoepidemiology and Pharmacoeconomics.

List of Experiments (24)

1. Causality assessment of adverse drug reactions (three)
2. Detection and management of medication errors (three)
3. Rational use of medicines in special population (three)
4. Presentation of clinical cases of various disease conditions adopting Pharmaceutical Care Plan Model (eight)
5. Calculation of Bioavailability and Bioequivalence from the given data (two)
6. Interpretation of Therapeutic Drug Monitoring reports of a given patient (three)
7. Calculation of various Pharmacoeconomic outcome analysis for the given data (two)

PHARMACOLOGY (MPL)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPL 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know about,

- Chemicals and Excipients
- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 Hrs

1. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy, Difference/ Derivative spectroscopy. 10 Hrs

   IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy, Data Interpretation.

   Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence (Characterestics of drugs that can be analysed by flourimetry), Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy. 10 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	10 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: j) Thin Layer chromatography k) High Performance Thin Layer Chromatography l) Ion exchange chromatography m) Column chromatography n) Gas chromatography o) High Performance Liquid chromatography p) Ultra High Performance Liquid chromatography q) Affinity chromatography r) Gel Chromatography	10 Hrs
5	Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	10 Hrs
6	Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.	10 Hrs

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.
9. Textbook of Pharmaceutical Analysis, KA.Connors, 3rd Edition, John Wiley & Sons, 1982.

ADVANCED PHARMACOLOGY - I
(MPL 102T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, this subject helps the students to understand the concepts of drug action and mechanisms involved

Objectives

Upon completion of the course the student shall be able to :

- Discuss the pathophysiology and pharmacotherapy of certain diseases
- Explain the mechanism of drug actions at cellular and molecular level
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

THEORY 60 Hrs

1. General Pharmacology 12 Hrs

a. Pharmacokinetics: The dynamics of drug absorption, distribution, biotransformation and elimination. Concepts of linear and non-linear compartment models. Significance of Protein binding.

b. Pharmacodynamics: Mechanism of drug action and the relationship between drug concentration and effect. Receptors, structural and functional families of receptors, quantitation of drug receptors interaction and elicited effects.

2 Neurotransmission 12 Hrs

a. General aspects and steps involved in neurotransmission.

b. Neurohumoral transmission in autonomic nervous system (Detailed study about neurotransmitters- Adrenaline and Acetyl choline).

c. Neurohumoral transmission in central nervous system (Detailed study about neurotransmitters- histamine, serotonin, dopamine, GABA, glutamate and glycine].

d. Non adrenergic non cholinergic transmission (NANC). Co-transmission

Systemic Pharmacology

A detailed study on pathophysiology of diseases, mechanism of action, pharmacology and toxicology of existing as well as novel drugs used in the following systems

Autonomic Pharmacology

Parasympathomimetics and lytics, sympathomimetics and lytics, agents affecting

neuromuscular junction

3	Central nervous system Pharmacology General and local anesthetics Sedatives and hypnotics, drugs used to treat anxiety. Depression, psychosis, mania, epilepsy, neurodegenerative diseases. Narcotic and non-narcotic analgesics.	12 Hrs
4	Cardiovascular Pharmacology Diuretics, antihypertensives, antiischemics, anti- arrhythmics, drugs for heart failure and hyperlipidemia. Hematinics, coagulants , anticoagulants, fibrinolytics and anti-platelet drugs	12 Hrs
5	Autocoid Pharmacology The physiological and pathological role of Histamine, Serotonin, Kinins Prostaglandins Opioid autocoids. Pharmacology of antihistamines, 5HT antagonists.	12 Hrs

REFEERENCES

1. The Pharmacological Basis of Therapeutics, Goodman and Gillman's
2. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J,Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers.
3. Basic and Clinical Pharmacology by B.G Katzung
4. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Graham Smith. Oxford textbook of Clinical Pharmacology.
7. Avery Drug Treatment
8. Dipiro Pharmacology, Pathophysiological approach.
9. Green Pathophysiology for Pharmacists.

10. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
11. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APC Avichal Publishing Company
12. KD.Tripathi. Essentials of Medical Pharmacology.
13. Modern Pharmacology with Clinical Applications, Craig Charles R. & Stitzel Robert E., Lippincott Publishers.
14. Clinical Pharmacokinetics & Pharmacodynamics : Concepts and Applications - Malcolm Rowland and Thomas N.Tozer, Wolters Kluwer, Lippincott Williams & Wilkins Publishers.
15. Applied biopharmaceutics and Pharmacokinetics, Pharmacodynamics and Drug metabolism for industrial scientists.
16. Modern Pharmacology, Craig CR. & Stitzel RE, Little Brown & Company.

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS - I
(MPL 103T)

Scope

This subject is designed to impart the knowledge on preclinical evaluation of drugs and recent experimental techniques in the drug discovery and development. The subject content helps the student to understand the maintenance of laboratory animals as per the guidelines, basic knowledge of various in-vitro and in-vivo preclinical evaluation processes

Objectives

Upon completion of the course the student shall be able to,

- Appraise the regulations and ethical requirement for the usage of experimental animals.
- Describe the various animals used in the drug discovery process and good laboratory practices in maintenance and handling of experimental animals
- Describe the various newer screening methods involved in the drug discovery process
- Appreciate and correlate the preclinical data to humans

THEORY 60 Hrs

1. Laboratory Animals 12 Hrs

Common laboratory animals: Description, handling and applications of different species and strains of animals.

Transgenic animals: Production, maintenance and applications
Anaesthesia and euthanasia of experimental animals.
Maintenance and breeding of laboratory animals.
CPCSEA guidelines to conduct experiments on animals

Good laboratory practice.
Bioassay-Principle, scope and limitations and methods

2 Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. 12 Hrs

General principles of preclinical screening. CNS Pharmacology: behavioral and muscle co ordination, CNS stimulants and

depressants, anxiolytics, anti-psychotics, anti epileptics and nootropics. Drugs for neurodegenerative diseases like Parkinsonism, Alzheimers and multiple sclerosis. Drugs acting on Autonomic Nervous System.

3	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Respiratory Pharmacology: anti-asthmatics, drugs for COPD and anti allergics. Reproductive Pharmacology: Aphrodisiacs and antifertility agents Analgesics, antiinflammatory and antipyretic agents. Gastrointestinal drugs: anti ulcer, anti -emetic, anti-diarrheal and laxatives.	12 Hrs
4	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Cardiovascular Pharmacology: antihypertensives, antiarrythmics, antianginal, antiatherosclerotic agents and diuretics. Drugs for metabolic disorders like anti-diabetic, antidyslipidemic agents. Anti cancer agents. Hepatoprotective screening methods.	12 Hrs
5	Preclinical screening of new substances for the pharmacological activity using in vivo, in vitro, and other possible animal alternative models. Iimmunomodulators, Immunosuppressants and immunostimulants General principles of immunoassay: theoretical basis and optimization of immunoassay, heterogeneous and homogenous immunoassay systems. Immunoassay methods evaluation; protocol outline, objectives and preparation. Immunoassay for digoxin and insulin Limitations of animal experimentation and alternate animal experiments. Extrapolation of in vitro data to preclinical and preclinical to humans	12 Hrs

REFERENCES

1. Biological standardization by J.H. Burn D.J. Finney and I.G. Goodwin
2. Screening methods in Pharmacology by Robert Turner. A
3. Evaluation of drugs activities by Laurence and Bachrach
4. Methods in Pharmacology by Arnold Schwartz.
5. Fundamentals of experimental Pharmacology by M.N.Ghosh
6. Pharmacological experiment on intact preparations by Churchill Livingstone
7. Drug discovery and Evaluation by Vogel H.G.
8. Experimental Pharmacology by R.K.Goyal.
9. Preclinical evaluation of new drugs by S.K. Guta
10. Handbook of Experimental Pharmacology, SK.Kulkarni
11. Practical Pharmacology and Clinical Pharmacy, SK.Kulkarni, 3rd Edition.
12. David R.Gross. Animal Models in Cardiovascular Research, 2nd Edition, Kluwer Academic Publishers, London, UK.
13. Screening Methods in Pharmacology, Robert A.Turner.
14. Rodents for Pharmacological Experiments, Dr.Tapan Kumar chatterjee.
15. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi (Author), Ajay Prakash (Author)

CELLULAR AND MOLECULAR PHARMACOLOGY
(MPL 104T)

Scope:

The subject imparts a fundamental knowledge on the structure and functions of cellular components and help to understand the interaction of these components with drugs. This information will further help the student to apply the knowledge in drug discovery process.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the receptor signal transduction processes.
- Explain the molecular pathways affected by drugs.
- Appreciate the applicability of molecular pharmacology and biomarkers in drug discovery process.
- Demonstrate molecular biology techniques as applicable for pharmacology

THEORY		60 Hrs
1.	Cell biology Structure and functions of cell and its organelles Genome organization. Gene expression and its regulation, importance of siRNA and micro RNA, gene mapping and gene sequencing Cell cycles and its regulation. Cell death- events, regulators, intrinsic and extrinsic pathways of apoptosis. Necrosis and autophagy.	12 Hrs
2	Cell signaling Intercellular and intracellular signaling pathways. Classification of receptor family and molecular structure ligand gated ion channels; G-protein coupled receptors, tyrosine kinase receptors and nuclear receptors. Secondary messengers: cyclic AMP, cyclic GMP, calcium ion, inositol 1,4,5-trisphosphate, (IP3), NO, and diacylglycerol. Detailed study of following intracellular signaling pathways: cyclic AMP signaling pathway, mitogen-activated protein kinase (MAPK) signaling, Janus kinase (JAK)/signal transducer and activator of transcription (STAT) signaling pathway.	12 Hrs

3	Principles and applications of genomic and proteomic tools DNA electrophoresis, PCR (reverse transcription and real time), Gene sequencing, micro array technique, SDS page, ELISA and western blotting, Recombinant DNA technology and gene therapy Basic principles of recombinant DNA technology-Restriction enzymes, various types of vectors. Applications of recombinant DNA technology. Gene therapy- Various types of gene transfer techniques, clinical applications and recent advances in gene therapy.	12 Hrs
4	Pharmacogenomics Gene mapping and cloning of disease gene. Genetic variation and its role in health/ pharmacology Polymorphisms affecting drug metabolism Genetic variation in drug transporters Genetic variation in G protein coupled receptors Applications of proteomics science: Genomics, proteomics, metabolomics, functionomics, nutrigenomics Immunotherapeutics Types of immunotherapeutics, humanisation antibody therapy, Immunotherapeutics in clinical practice	12 Hrs
5	a. Cell culture techniques Basic equipments used in cell culture lab. Cell culture media, various types of cell culture, general procedure for cell cultures; isolation of cells, subculture, cryopreservation, characterization of cells and their application. Principles and applications of cell viability assays, glucose uptake assay, Calcium influx assays Principles and applications of flow cytometry b. Biosimilars	12 Hrs

REFERENCES:

1. The Cell, A Molecular Approach. Geoffrey M Cooper.
2. Pharmacogenomics: The Search for Individualized Therapies. Edited by J. Licinio and M -L. Wong
3. Handbook of Cell Signaling (Second Edition) Edited by Ralph A. et.al
4. Molecular Pharmacology: From DNA to Drug Discovery. John Dickenson et.al
5. Basic Cell Culture protocols by Cheril D.Helgason and Cindy L.Miller
6. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
7. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
8. Current porotocols in molecular biology vol I to VI edited by Frederick M.Ausuvel et la.

PHARMACOLOGICAL PRACTICAL - I
(MPL 105P)

1. Analysis of pharmacopoeial compounds and their formulations by UV Vis spectrophotometer
2. Simultaneous estimation of multi component containing formulations by UV spectrophotometry
3. Experiments based on HPLC
4. Experiments based on Gas Chromatography
5. Estimation of riboflavin/quinine sulphate by fluorimetry
6. Estimation of sodium/potassium by flame photometry

Handling of laboratory animals.

1. Various routes of drug administration.
2. Techniques of blood sampling, anesthesia and euthanasia of experimental animals.
3. Functional observation battery tests (modified Irwin test)
4. Evaluation of CNS stimulant, depressant, anxiogenics and anxiolytic, anticonvulsant activity.
5. Evaluation of analgesic, anti-inflammatory, local anesthetic, mydriatic and miotic activity.
6. Evaluation of diuretic activity.
7. Evaluation of antiulcer activity by pylorus ligation method.
8. Oral glucose tolerance test.
9. Isolation and identification of DNA from various sources (Bacteria, Cauliflower, onion, Goat liver).
10. Isolation of RNA from yeast
11. Estimation of proteins by Braford/Lowry's in biological samples.
12. Estimation of RNA/DNA by UV Spectroscopy
13. Gene amplification by PCR.
14. Protein quantification Western Blotting.
15. Enzyme based in-vitro assays (MPO, AChEs, α amylase, α glucosidase).
16. Cell viability assays (MTT/Trypan blue/SRB).
17. DNA fragmentation assay by agarose gel electrophoresis.
18. DNA damage study by Comet assay.
19. Apoptosis determination by fluorescent imaging studies.
20. Pharmacokinetic studies and data analysis of drugs given by different routes of administration using softwares
21. Enzyme inhibition and induction activity
22. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (UV)
23. Extraction of drug from various biological samples and estimation of drugs in biological fluids using different analytical techniques (HPLC)

REFERENCES

1. CPCSEA, OECD, ICH, USFDA, Schedule Y, EPA guidelines,
2. Fundamentals of experimental Pharmacology by M.N.Ghosh
3. Handbook of Experimental Pharmacology by S.K. Kulkarni.
4. Drug discovery and Evaluation by Vogel H.G.
5. Spectrometric Identification of Organic compounds - Robert M Silverstein,
6. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman,
7. Vogel's Text book of quantitative chemical analysis - Jeffery, Basset, Mendham, Denney,
8. Basic Cell Culture protocols by Cheril D. Helgason and Cindy L.Mille
9. Basic Cell Culture (Practical Approach) by J. M. Davis (Editor)
10. Animal Cell Culture: A Practical Approach by John R. Masters (Editor)
11. Practical Manual of Experimental and Clinical Pharmacology by Bikash Medhi(Author), Ajay Prakash (Author) Jaypee brothers' medical publishers Pvt. Ltd

ADVANCED PHARMACOLOGY - II
(MPL 201T)

Scope

The subject is designed to strengthen the basic knowledge in the field of pharmacology and to impart recent advances in the drugs used for the treatment of various diseases. In addition, the subject helps the student to understand the concepts of drug action and mechanism involved

Objectives

Upon completion of the course the student shall be able to:

- Explain the mechanism of drug actions at cellular and molecular level
- Discuss the Pathophysiology and pharmacotherapy of certain diseases
- Understand the adverse effects, contraindications and clinical uses of drugs used in treatment of diseases

	THEORY	60 Hrs
1.	Endocrine Pharmacology Molecular and cellular mechanism of action of hormones such as growth hormone, prolactin, thyroid, insulin and sex hormones Anti-thyroid drugs, Oral hypoglycemic agents, Oral contraceptives, Corticosteroids. Drugs affecting calcium regulation	12 Hrs
2	Chemotherapy Cellular and molecular mechanism of actions and resistance of antimicrobial agents such as ß-lactams, aminoglycosides, quinolones, Macrolide antibiotics. Antifungal, antiviral, and anti-TB drugs.	12 Hrs
3	Chemotherapy Drugs used in Protozoal Infections Drugs used in the treatment of Helminthiasis Chemotherapy of cancer Immunopharmacology Cellular and biochemical mediators of inflammation and immune response. Allergic or hypersensitivity reactions. Pharmacotherapy of asthma and COPD. Immunosuppressants and Immunostimulants	12 Hrs

4	GIT Pharmacology Antiulcer drugs, Prokinetics, antiemetics, anti-diarrheals and drugs for constipation and irritable bowel syndrome. Chronopharmacology Biological and circadian rhythms, applications of chronotherapy in various diseases like cardiovascular disease, diabetes, asthma and peptic ulcer	12 Hrs
5	Free radicals Pharmacology Generation of free radicals, role of free radicals in etiopathology of various diseases such as diabetes, neurodegenerative diseases and cancer. Protective activity of certain important antioxidant Recent Advances in Treatment: Alzheimer's disease, Parkinson's disease, Cancer, Diabetes mellitus	12 Hrs

REFERENCES

1. The Pharmacological basis of therapeutics- Goodman and Gill man's
2. Principles of Pharmacology. The Pathophysiologic basis of drug therapy by David E Golan et al.
3. Basic and Clinical Pharmacology by B.G -Katzung
4. Pharmacology by H.P. Rang and M.M. Dale.
5. Hand book of Clinical Pharmacokinetics by Gibaldi and Prescott.
6. Text book of Therapeutics, drug and disease management by E T. Herfindal and Gourley.
7. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
8. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists
9. Robbins & Cortan Pathologic Basis of Disease, 9th Ed. (Robbins Pathology)
10. A Complete Textbook of Medical Pharmacology by Dr. S.K Srivastava published by APC Avichal Publishing Company.
11. KD.Tripathi. Essentials of Medical Pharmacology
12. Principles of Pharmacology. The Pathophysiologic basis of drug Therapy by David E Golan, Armen H, Tashjian Jr, Ehrin J,Armstrong, April W, Armstrong, Wolters, Kluwer-Lippincott Williams & Wilkins Publishers

PHARMACOLOGICAL AND TOXICOLOGICAL SCREENING METHODS-II
(MPL 202T)

Scope:

This subject imparts knowledge on the preclinical safety and toxicological evaluation of drug & new chemical entity. This knowledge will make the student competent in regulatory toxicological evaluation.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various types of toxicity studies.
- Appreciate the importance of ethical and regulatory requirements for toxicity studies.
- Demonstrate the practical skills required to conduct the preclinical toxicity studies.

THEORY — 60 Hrs

1.	Basic definition and types of toxicology (general, mechanistic, regulatory and descriptive) Regulatory guidelines for conducting toxicity studies OECD, ICH, EPA and Schedule Y OECD principles of Good laboratory practice (GLP) History, concept and its importance in drug development	12 Hrs
2	Acute, sub-acute and chronic- oral, dermal and inhalational studies as per OECD guidelines. Acute eye irritation, skin sensitization, dermal irritation & dermal toxicity studies. Test item characterization- importance and methods in regulatory toxicology studies	12 Hrs
3	Reproductive toxicology studies, Male reproductive toxicity studies, female reproductive studies (segment I and segment III), teratogenecity studies (segment II) Genotoxicity studies (Ames Test, in vitro and in vivo Micronucleus and Chromosomal aberrations studies) In vivo carcinogenicity studies	12 Hrs
4	IND enabling studies (IND studies)- Definition of IND, importance of IND, industry perspective, list of studies needed for IND submission.	12 Hrs

	Safety pharmacology studies- origin, concepts and importance of safety pharmacology. Tier1- CVS, CNS and respiratory safety pharmacology, HERG assay. Tier2- GI, renal and other studies	
5	Toxicokinetics- Toxicokinetic evaluation in preclinical studies, saturation kinetics Importance and applications of toxicokinetic studies. Alternative methods to animal toxicity testing.	12 Hrs

REFERENCES

1. Hand book on GLP, Quality practices for regulated non-clinical research and development (http://www.who.int/tdr/publications/documents/glp-handbook.pdf).
2. Schedule Y Guideline: drugs and cosmetics (second amendment) rules, 2005, ministry of health and family welfare (department of health) New Delhi
3. Drugs from discovery to approval by Rick NG.
4. Animal Models in Toxicology, 3rd Edition, Lower and Bryan
5. OECD test guidelines.
6. Principles of toxicology by Karen E. Stine, Thomas M. Brown.
7. Guidance for Industry M3(R2) Nonclinical Safety Studies for the Conduct of Human Clinical Trials and Marketing Authorization for Pharmaceuticals (http://www.fda.gov/downloads/drugs/guidancecomplianceregulatoryinformation/guidances/ucm073246.pdf)

PRINCIPLES OF DRUG DISCOVERY
(MPL 203T)

Scope:

The subject imparts basic knowledge of drug discovery process. This information will make the student competent in drug discovery process

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the various stages of drug discovery.
- Appreciate the importance of the role of genomics, proteomics and bioinformatics in drug discovery
- Explain various targets for drug discovery.
- Explain various lead seeking method and lead optimization
- Appreciate the importance of the role of computer aided drug design in drug discovery

THEORY		60 Hrs
1.	An overview of modern drug discovery process: Target identification, target validation, lead identification and lead Optimization. Economics of drug discovery. Target Discovery and validation-Role of Genomics, Proteomics and Bioinformatics. Role of Nucleic acid microarrays, Protein microarrays, Antisense technologies, siRNAs, antisense oligonucleotides, Zinc finger proteins. Role of transgenic animals in target validation.	12 Hrs
2	Lead Identification- combinatorial chemistry & high throughput screening, in silico lead discovery techniques, Assay development for hit identification. Protein structure Levels of protein structure, Domains, motifs, and folds in protein structure. Computational prediction of protein structure: Threading and homology modeling methods. Application of NMR and X-ray crystallography in protein structure prediction	12 Hrs
3	Rational Drug Design Traditional vs rational drug design, Methods followed in traditional drug design, High throughput screening, Concepts of Rational Drug Design, Rational Drug Design Methods: Structure and Pharmacophore based approaches	12 Hrs

	Virtual Screening techniques: Drug likeness screening, Concept of pharmacophore mapping and pharmacophore based Screening,	
4	Molecular docking: Rigid docking, flexible docking, manual docking; Docking based screening. De novo drug design. Quantitative analysis of Structure Activity Relationship History and development of QSAR, SAR versus QSAR, Physicochemical parameters, Hansch analysis, Fee Wilson analysis and relationship between them.	12 Hrs
5	QSAR Statistical methods – regression analysis, partial least square analysis (PLS) and other multivariate statistical methods. 3D-QSAR approaches like COMFA and COMSIA Prodrug design-Basic concept, Prodrugs to improve patient acceptability, Drug solubility, Drug absorption and distribution, site specific drug delivery and sustained drug action. Rationale of prodrug design and practical consideration of prodrug design	12 Hrs

REFERENCES

1. MouldySioud. Target Discovery and Validation Reviews and Protocols: Volume 2 Emerging Molecular Targetsand Treatment Options. 2007 Humana Press Inc.
2. Darryl León. Scott MarkelIn. Silico Technologies in Drug Target Identification and Validation. 2006 by Taylor and Francis Group, LLC.
3. Johanna K. DiStefano. Disease Gene Identification. Methods and Protocols. Springer New York Dordrecht Heidelberg London.
4. Hugo Kubiny. QSAR: Hansch Analysis and Related Approaches. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
5. Klaus Gubernator, Hans-Joachim Böhm. Structure-Based Ligand Design. Methods and Principles in Medicinal Chemistry. Publisher Wiley-VCH
6. Abby L . Parrill. M . Rami Reddy. Rational Drug Design. Novel Methodology and Practical Applications. ACS Symposium Series; American Chemical Society: Washington, DC, 1999.
7. J. Rick Turner. New drug development design, methodology and, analysis. John Wiley & Sons, Inc., New Jersey.

CLINICAL RESEARCH AND PHARMACOVIGILANCE
(MPL 204T)

Scope:

This subject will provide a value addition and current requirement for the students in clinical research and pharmacovigilance. It will teach the students on conceptualizing, designing, conducting, managing and reporting of clinical trials. This subject also focuses on global scenario of Pharmacovigilance in different methods that can be used to generate safety data. It will teach the students in developing drug safety data in Pre-clinical, Clinical phases of Drug development and post market surveillance.

Objectives:

Upon completion of the course, the student shall be able to,

- Explain the regulatory requirements for conducting clinical trial
- Demonstrate the types of clinical trial designs
- Explain the responsibilities of key players involved in clinical trials
- Execute safety monitoring, reporting and close-out activities
- Explain the principles of Pharmacovigilance
- Detect new adverse drug reactions and their assessment
- Perform the adverse drug reaction reporting systems and communication in Pharmacovigilance

THEORY — 60 Hrs

1. Regulatory Perspectives of Clinical Trials: — 12 Hrs
   Origin and Principles of International Conference on Harmonization - Good Clinical Practice (ICH-GCP) guidelines
   Ethical Committee: Institutional Review Board, Ethical Guidelines for Biomedical Research and Human Participant- Schedule Y, ICMR
   Informed Consent Process: Structure and content of an Informed Consent Process Ethical principles governing informed consent process
2. Clinical Trials: Types and Design — 12 Hrs
   Experimental Study- RCT and Non RCT,
   Observation Study: Cohort, Case Control, Cross sectional
   Clinical Trial Study Team
   Roles and responsibilities of Clinical Trial Personnel: Investigator, Study Coordinator, Sponsor, Contract Research Organization and its management

3	Clinical Trial Documentation- Guidelines to the preparation of documents, Preparation of protocol, Investigator Brochure, Case Report Forms, Clinical Study Report Clinical Trial Monitoring- Safety Monitoring in CT Adverse Drug Reactions: Definition and types. Detection and reporting methods. Severity and seriousness assessment.Predictability and preventability assessment, Management of adverse drug reactions; Terminologies of ADR.	12 Hrs
4	Basic aspects, terminologies and establishment of pharmacovigilance History and progress of pharmacovigilance, Significance of safety monitoring, Pharmacovigilance in India and international aspects, WHO international drug monitoring programme, WHO and Regulatory terminologies of ADR, evaluation of medication safety, Establishing pharmacovigilance centres in Hospitals, Industry and National programmes related to pharmacovigilance. Roles and responsibilities in Pharmacovigilance	12 Hrs
5	Methods, ADR reporting and tools used in Pharmacovigilance International classification of diseases, International Non-proprietary names for drugs, Passive and Active surveillance, Comparative observational studies, Targeted clinical investigations and Vaccine safety surveillance. Spontaneous reporting system and Reporting to regulatory authorities, Guidelines for ADRs reporting. Argus, Aris G Pharmacovigilance, VigiFlow, Statistical methods for evaluating medication safety data.	12 Hrs
6	Pharmacoepidemiology, pharmacoeconomics, safety pharmacology	12 Hrs

REFERENCES

1. Central Drugs Standard Control Organization- Good Clinical Practices, Guidelines for Clinical Trials on Pharmaceutical Products in India. New Delhi: Ministry of Health;2001.
2. International Conference on Harmonization of Technical requirements for registration of Pharmaceuticals for human use. ICH Harmonized Tripartite Guideline. Guideline for Good Clinical Practice.E6; May 1996.

3. Ethical Guidelines for Biomedical Research on Human Subjects 2000. Indian Council of Medical Research, New Delhi.
4. Textbook of Clinical Trials edited by David Machin, Simon Day and Sylvan Green, March 2005, John Wiley and Sons.
5. Clinical Data Management edited by R K Rondels, S A Varley, C F Webbs. Second Edition, Jan 2000, Wiley Publications.
6. Handbook of clinical Research. Julia Lloyd and Ann Raven Ed. Churchill Livingstone.
7. Principles of Clinical Research edited by Giovanna di Ignazio, Di Giovanna and Haynes.

PHARMACOLOGICAL PRACTICAL - II
(MPL 205P)

1. To record the DRC of agonist using suitable isolated tissues preparation.
2. To study the effects of antagonist/potentiating agents on DRC of agonist using suitable isolated tissue preparation.
3. To determine to the strength of unknown sample by matching bioassay by using suitable tissue preparation.
4. To determine to the strength of unknown sample by interpolation bioassay by using suitable tissue preparation
5. To determine to the strength of unknown sample by bracketing bioassay by using suitable tissue preparation
6. To determine to the strength of unknown sample by multiple point bioassay by using suitable tissue preparation.
7. Estimation of PA_2 values of various antagonists using suitable isolated tissue preparations.
8. To study the effects of various drugs on isolated heart preparations
9. Recording of rat BP, heart rate and ECG.
10. Recording of rat ECG
11. Drug absorption studies by averted rat ileum preparation.
12. Acute oral toxicity studies as per OECD guidelines.
13. Acute dermal toxicity studies as per OECD guidelines.
14. Repeated dose toxicity studies- Serum biochemical, haematological, urine analysis, functional observation tests and histological studies.
15. Drug mutagenicity study using mice bone-marrow chromosomal aberration test.
16. Protocol design for clinical trial.(3 Nos.)
17. Design of ADR monitoring protocol.
18. In-silico docking studies. (2 Nos.)
19. In-silico pharmacophore based screening.
20. In-silico QSAR studies.
21. ADR reporting

REFERENCES

1. Fundamentals of experimental Pharmacology-by M.N.Ghosh
2. Hand book of Experimental Pharmacology-S.K.Kulakarni
3. Text book of in-vitro practical Pharmacology by Ian Kitchen
4. Bioassay Techniques for Drug Development by Atta-ur-Rahman, Iqbal choudhary and William Thomsen
5. Applied biopharmaceutics and Pharmacokinetics by Leon Shargel and Andrew B.C.Yu.
6. Handbook of Essential Pharmacokinetics, Pharmacodynamics and Drug Metabolism for Industrial Scientists.

PHARMACOGNOSY (MPG)

MODERN PHARMACEUTICAL ANALYTICAL TECHNIQUES (MPG 101T)

Scope

This subject deals with various advanced analytical instrumental techniques for identification, characterization and quantification of drugs. Instruments dealt are NMR, Mass spectrometer, IR, HPLC, GC etc.

Objectives

After completion of course student is able to know,

- The analysis of various drugs in single and combination dosage forms
- Theoretical and practical skills of the instruments

THEORY 60 Hrs

1. UV-Visible spectroscopy: Introduction, Theory, Laws, Instrumentation associated with UV-Visible spectroscopy, Choice of solvents and solvent effect and Applications of UV-Visible spectroscopy. 12 Hrs

   IR spectroscopy: Theory, Modes of Molecular vibrations, Sample handling, Instrumentation of Dispersive and Fourier - Transform IR Spectrometer, Factors affecting vibrational frequencies and Applications of IR spectroscopy

   Spectroflourimetry: Theory of Fluorescence, Factors affecting fluorescence, Quenchers, Instrumentation and Applications of fluorescence spectrophotometer.

   Flame emission spectroscopy and Atomic absorption spectroscopy: Principle, Instrumentation, Interferences and Applications.

2 NMR spectroscopy: Quantum numbers and their role in NMR, Principle, Instrumentation, Solvent requirement in NMR, Relaxation process, NMR signals in various compounds, Chemical shift, Factors influencing chemical shift, Spin-Spin coupling, Coupling constant, Nuclear magnetic double resonance, Brief outline of principles of FT-NMR and 13C NMR. Applications of NMR spectroscopy.1 12 Hrs

3	Mass Spectroscopy: Principle, Theory, Instrumentation of Mass Spectroscopy, Different types of ionization like electron impact, chemical, field, FAB and MALDI, APCI, ESI, APPI Analyzers of Quadrupole and Time of Flight, Mass fragmentation and its rules, Meta stable ions, Isotopic peaks and Applications of Mass spectroscopy.	10 Hrs
4	Chromatography: Principle, apparatus, instrumentation, chromatographic parameters, factors affecting resolution, isolation of drug from excipients, data interpretation and applications of the following: a) Thin Layer chromatography b) High Performance Thin Layer Chromatography c) Ion exchange chromatography d) Column chromatography e) Gas chromatography f) High Performance Liquid chromatography g) Ultra High Performance Liquid chromatography h) Affinity chromatography i) Gel Chromatography	10 Hrs
5	Electrophoresis: Principle, Instrumentation, Working conditions, factors affecting separation and applications of the following: a) Paper electrophoresis b) Gel electrophoresis c) Capillary electrophoresis d) Zone electrophoresis e) Moving boundary electrophoresis f) Iso electric focusing X ray Crystallography: Production of X rays, Different X ray methods, Bragg's law, Rotating crystal technique, X ray powder technique, Types of crystals and applications of X-ray diffraction.	10 Hrs
6	Potentiometry: Principle, working, Ion selective Electrodes and Application of potentiometry. Thermal Techniques: Principle, thermal transitions and Instrumentation (Heat flux and power-compensation and designs), Modulated DSC, Hyper DSC, experimental parameters (sample preparation, experimental conditions, calibration, heating and	10 Hrs

cooling rates, resolution, source of errors) and their influence, advantage and disadvantages, pharmaceutical applications. Differential Thermal Analysis (DTA): Principle, instrumentation and advantage and disadvantages, pharmaceutical applications, derivative differential thermal analysis (DDTA). TGA: Principle, instrumentation, factors affecting results, advantage and disadvantages, pharmaceutical applications.

REFERENCES

1. Spectrometric Identification of Organic compounds - Robert M Silverstein, Sixth edition, John Wiley & Sons, 2004.
2. Principles of Instrumental Analysis - Doglas A Skoog, F. James Holler, Timothy A. Nieman, 5th edition, Eastern press, Bangalore, 1998.
3. Instrumental methods of analysis – Willards, 7th edition, CBS publishers.
4. Practical Pharmaceutical Chemistry – Beckett and Stenlake, Vol II, 4th edition, CBS Publishers, New Delhi, 1997.
5. Organic Spectroscopy - William Kemp, 3rd edition, ELBS, 1991.
6. Quantitative Analysis of Drugs in Pharmaceutical formulation - P D Sethi, 3rd Edition, CBS Publishers, New Delhi, 1997.
7. Pharmaceutical Analysis - Modern Methods – Part B - J W Munson, Vol 11, Marcel. Dekker Series
8. Spectroscopy of Organic Compounds, 2nd edn., P.S/Kalsi, Wiley estern Ltd., Delhi.

ADVANCED PHARMACOGNOSY - I
(MPG 102T)

SCOPE

To learn and understand the advances in the field of cultivation and isolation of drugs of natural origin, various phytopharmaceuticals, nutraceuticals and their medicinal use and health benefits.

OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- advances in the cultivation and production of drugs
- various phyto-pharmaceuticals and their source, its utilization and medicinal value.
- various nutraceuticals/herbs and their health benefits
- Drugs of marine origin
- Pharmacovigilance of drugs of natural origin

THEORY 60 Hrs

1. Plant drug cultivation: General introduction to the importance of Pharmacognosy in herbal drug industry, Indian Council of Agricultural Research, Current Good Agricultural Practices, Current Good Cultivation Practices, Current Good Collection Practices, Conservation of medicinal plants- Ex-situ and In-situ conservation of medicinal plants. 12 Hrs

2 Marine natural products: General methods of isolation and purification, Study of Marine toxins, Recent advances in research in marine drugs, Problems faced in research on marine drugs such as taxonomical identification, chemical screening and their solution. 12 Hrs

3 Nutraceuticals: Current trends and future scope, Inorganic mineral supplements, Vitamin supplements, Digestive enzymes, Dietary fibres, Cereals and grains, Health drinks of natural origin, Antioxidants, Polyunsaturated fatty acids, Herbs as functional foods, Formulation and standardization of neutraceuticals, Regulatory aspects, FSSAI guidelines, Sources, name of marker compounds and their chemical nature, medicinal uses and health benefits of following 12 Hrs

i) Spirulina ii) Soya bean iii) Ginseng iv) Garlic v) Broccoli vi) Green and Herbal Tea vii) Flax seeds viii) Black cohosh ix) Turmeric.

4 Phytopharmaceuticals: Occurrence, isolation and characteristic features (Chemical nature, uses in pharmacy, medicinal and health benefits) of following. 12 Hrs

a) Carotenoids – i) α and β - Carotene ii) Xanthophyll (Lutein)
b) Limonoids – i) d-Limonene ii) α – Terpineol
c) Saponins – i) Shatavarins
d) Flavonoids – i) Resveratrol ii) Rutin iii) Hesperidin iv) Naringin v) Quercetin
e) Phenolic acids- Ellagic acid
f) Vitamins
g) Tocotrienols and Tocopherols
h) Andrographolide, Glycolipids, Gugulipids, Withanolides, Vascine, Taxol
i) Miscellaneous

5 Pharmacovigilance of drugs of natural origin: WHO and AYUSH guidelines for safety monitoring of natural medicine, Spontaneous reporting schemes for biodrug adverse reactions, bio drug-drug and bio drug-food interactions with suitable examples. 12 Hrs

REFERENCES (Latest Editions of)

1. Pharmacognosy - G. E. Trease and W.C. Evans. Saunders Edinburgh, New York.
2. Pharmacognosy-Tyler, Brady, Robbers
3. Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
4. Text Book of Pharmacognosy by T.E. Wallis
5. Marine Natural Products-Vol.I to IV.
6. Natural products: A lab guide by Raphael Ikan , Academic Press 1991.
7. Glimpses of Indian Ethano Pharmacology, P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute, 1995.
8. Medicinal natural products (a biosynthetic approach), Paul M. Dewick, John Wiley & Sons Ltd., England, 1998.
9. Chemistry of Marine Natural Products- Paul J. Schewer 1973.
10. Herbal Drug Industry by RD. Choudhary, Eastern Publisher, New Delhi, 1996.
11. Cultivation of Medicinal Plants by C.K. Atal & B.M. Kapoor.
12. Cultivation and Utilization of Aromatic Plants, C.K. Atal & B.M. Kapoor
13. Cultivation of medicinal and aromatic crops, AA Farooqui and B.S. Sreeramu. University Press, 2001.

14. Natural Products from Plants, 1st edition, by Peter B. Kaufman, CRC Press, New York, 1998
15. Recent Advances in Phytochemistry- Vol. 1&4: Scikel Runeckles- Appleton Century crofts.
16. Text book of Pharmacognosy, C.K.Kokate, Purohit, Ghokhale, Nirali Prakasshan, 1996.
17. Pharmacognosy and Pharmacobiotechnology, Ashutoshkar, New Age Publications, New Delhi.

PHYTOCHEMISTRY
(MPG 103T)

SCOPE

Students shall be equipped with the knowledge of natural product drug discovery and will be able to isolate, identify and extract and the phyto-constituents

OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- different classes of phytoconstituents, their biosynthetic pathways, their properties, extraction and general process of natural product drug discovery
- phytochemical fingerprinting and structure elucidation of phytoconstituents.

THEORY 60 Hrs

1. Biosynthetic pathways and Radio tracing techniques: Constituents & their Biosynthesis, Isolation, Characterization and purification with a special reference to their importance in herbal industries of following phyto-pharmaceuticals containing drugs: 12 Hrs
   a) Alkaloids: Ephedrine, Quinine, Strychynine, Piperine, Berberine, Taxol, Vinca alkoloids.
   b) Glycosides: Digitoxin, Glycyrrhizin, Sennosides, Bacosides, Quercitin.
   c) Steroids: Hecogenin, guggulosterone and withanolides
   d) Coumarin: Umbelliferone.
   e) Terpenoids: Cucurbitacins

2 Drug discovery and development: History of herbs as source of drugs and drug discovery, the lead structure selection process, structure development, product discovery process and drug registration, Selection and optimization of lead compounds with suitable examples from the following source : artemesin, andrographolides. Clinical studies emphasising on phases of clinical trials, protocol design for lead molecules. 12 Hrs

3 Extraction and Phytochemical studies: Recent advances in extractions with emphasis on selection of method and choice of solvent for extraction, successive and exhaustive extraction and other methods of extraction commonly used like microwave 12 Hrs

assisted extraction, Methods of fractionation. Separation of phytoconstituents by latest CCCET, SCFE techniques including preparative HPLC and Flash column chromatography.

4	Phytochemical finger printing: HPTLC and LCMS/GCMS applications in the characterization of herbal extracts. Structure elucidation of phytoconstituents.	12 Hrs
5	Structure elucidation of the following compounds by spectroscopic techniques like UV, IR, MS, NMR (1H, 13C) a. Carvone, Citral, Menthol b. Luteolin, Kaempferol c. Nicotine, Caffeine iv) Glycyrrhizin.	12 Hrs

REFERENCES (Latest Editions of)

1. Organic chemistry by I.L. Finar Vol.II
2. Pharmacognosy by Trease and Evans, ELBS.
3. Pharmacognosy by Tylor and Brady.
4. Text book of Pharmacognosy by Wallis.
5. Clark's isolation and Identification of drugs by A.C. Mottal.
6. Plant Drug Analysis by Wagner & Bladt.
7. Wilson and Gisvolds text book of Organic Medicinnal and Pharmaceutical Chemistry by Deorge. R.F.
8. The Chemistry of Natural Products, Edited by R.H. Thomson, Springer International Edn. 1994.
9. Natural Products Chemistry Practical Manual by Anees A Siddiqui and SeemiSiddiqui
10. Organic Chemistry of Natural Products, Vol. 1&2. Gurdeep R Chatwal.
11. Chemistry of Natural Products- Vol. 1 onwards IWPAC.
12. Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I&II
13. Medicinal Natural products – a biosynthetic approach, Dewick PM, John Wiley & Sons, Toronto, 1998.
14. Chemistry of Natural Products, Bhat SV, Nagasampagi BA, Meenakshi S, Narosa Publishing House, New Delhi.
15. Pharmacognosy & Phytochemistry of Medicinal Plants, 2nd edition, Bruneton J, Interceptt Ltd., New York, 1999.

INDUSTRIAL PHARMACOGNOSTICAL TECHNOLOGY
(MPG 104T)

SCOPE

To understand the Industrial and commercial potential of drugs of natural origin, integrate traditional Indian systems of medicine with modern medicine and also to know regulatory and quality policy for the trade of herbals and drugs of natural origin.

OBJECTIVES

By the end of the course the student shall be able to know,

- the requirements for setting up the herbal/natural drug industry.
- the guidelines for quality of herbal/natural medicines and regulatory issues.
- the patenting/IPR of herbals/natural drugs and trade of raw and finished materials.

THEORY 60 Hrs

1. Herbal drug industry: Infrastructure of herbal drug industry involved in production of standardized extracts and various dosage forms. Current challenges in upgrading and modernization of herbal formulations. Entrepreneurship Development, Project selection, project report, technical knowledge, Capital venture, plant design, layout and construction. Pilot plant scale -up techniques, case studies of herbal extracts. Formulation and production management of herbals. 12 Hrs

2 Regulatory requirements for setting herbal drug industry: Global marketing management. Indian and international patent law as applicable herbal drugs and natural products. Export - Import (EXIM) policy, TRIPS. 12 Hrs

Quality assurance in herbal/natural drug products.
Concepts of TQM, GMP, GLP, ISO-9000.

3 Monographs of herbal drugs: General parameters of monographs of herbal drugs and comparative study in IP, USP, Ayurvedic Pharmacopoeia, Siddha and Unani Pharmacopoeia, American herbal pharmacopoeia, British herbal pharmacopoeia, WHO guidelines in quality assessment of herbal drugs.

4	Testing of natural products and drugs: Herbal medicines - clinical laboratory testing. Stability testing of natural products, protocols.	12 Hrs
5	Patents: Indian and international patent laws, proposed amendments as applicable to herbal/natural products and process. Geographical indication, Copyright, Patentable subject maters, novelty, non obviousness, utility, enablement and best mode, procedure for Indian patent filing, patent processing, grant of patents, rights of patents, cases of patents, opposition and revocation of patents, patent search and literature, Controllers of patents.	12 Hrs

REFERENCES (Latest Editions of)

1. Herbal drug industry by R.D. Choudhary (1996), Eastern Publisher, New Delhi.
2. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine by Pulok K Mukharjee (2003), Ist Edition, Business horizons Robert Verpoorte, New Delhi.
3. Quality control of herbal drugs by Pulok K Mukarjee (2002), Business Horizons Pharmaceutical Publisher, New Delhi.
4. PDR for Herbal Medicines (2000), Medicinal Economic Company, New Jersey.
5. Indian Herbal Pharmacopoeia (2002), IDMA, Mumbai.
6. Text book of Pharmacognosy by C.K. Kokate, Purohit, Gokhlae (1996), Nirali Prakashan, New Delhi.
7. Text book of Pharmacognosy and Phytochemistry by Vinod D. Rangarl (2002), Part I & II, Career Publication, Nasik, India.
8. Plant drug analysis by H.Wagner and S.Bladt, Springer, Berlin.
9. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern Publisher, New Delhi.
10. Phytochemical Dictionary. Handbook of Bioactive Compounds from Plants by J.B.Harborne, (1999), IInd Edition, Taylor and Francis Ltd, UK.
11. Herbal Medicine. Expanded Commission E Monographs by M.Blumenthal, (2004), IST Edition,
12. Drug Formulation Manual by D.P.S.Kohli and D.H.Shah (1998), Eastern Publisher, New Delhi.

PHARMACOGNOSY PRACTICAL - I
(MPG 105P)

1. Analysis of Pharmacopoeial compounds of natural origin and their formulations by UV Vis spectrophotometer
2. Analysis of recorded spectra of simple phytoconstituents
3. Experiments based on Gas Chromatography
4. Estimation of sodium/potassium by flame photometry
5. Development of fingerprint of selected medicinal plant extracts commonly used in herbal drug industry viz. Ashwagandha, Tulsi, Bael, Amla, Ginger, Aloe, Vidang, Senna, Lawsonia by TLC/HPTLC method.
6. Methods of extraction
7. Phytochemical screening
8. Demonstration of HPLC- estimation of glycerrhizin
9. Monograph analysis of clove oil
10. Monograph analysis of castor oil.
11. Identification of bioactive constituents from plant extracts
12. Formulation of different dosage forms and their standardisation.

MEDICINAL PLANT BIOTECHNOLOGY
(MPG 201T)

SCOPE

To explore the knowledge of Biotechnology and its application in the improvement of quality of medicinal plants

OBJECTIVES

Upon completion of the course, the student shall be able to,

- Know the process like genetic engineering in medicinal plants for higher yield of Phytopharmaceuticals.
- Use the biotechnological techniques for obtaining and improving the quality of natural products/medicinal plants

THEORY 60 Hrs

1. Introduction to Plant biotechnology: Historical perspectives, prospects for development of plant biotechnology as a source of medicinal agents. Applications in pharmacy and allied fields. Genetic and molecular biology as applied to pharmacognosy, study of DNA, RNA and protein replication, genetic code, regulation of gene expression, structure and complicity of genome, cell signaling, DNA recombinant technology. 12 Hrs

2 Different tissue culture techniques: Organogenesis and embryogenesis, synthetic seed and monoclonal variation, Protoplast fusion, Hairy root multiple shoot cultures and their applications. Micro propagation of medicinal and aromatic plants. Sterilization methods involved in tissue culture, gene transfer in plants and their applications. 15 Hrs

3 Immobilisation techniques & Secondary Metabolite Production: Immobilization techniques of plant cell and its application on secondary metabolite Production. Cloning of plant cell: Different methods of cloning and its applications. Advantages and disadvantages of plant cell cloning. Secondary metabolism in tissue cultures with emphasis on production of medicinal agents. Precursors and elicitors on production of secondary metabolites. 15 Hrs

4 Biotransformation and Transgenesis: Biotransformation, bioreactors for pilot and large scale cultures of plant cells and retention of biosynthetic potential in cell culture. Transgenic 13 Hrs

plants, methods used in gene identification, localization and sequencing of genes. Application of PCR in plant genome analysis.

5	Fermentation technology: Application of Fermentation technology, Production of ergot alkaloids, single cell proteins, enzymes of pharmaceutical interest.	05 Hrs

REFERENCES (Latest Editions of)

1. Plant tissue culture, Bhagwani, vol 5, Elsevier Publishers.
2. Plant cell and Tissue Culture (Lab. Manual), JRMM. Yeoman.
3. Elements in biotechnology by PK. Gupta, Rastogi Publications, New Delhi.
4. An introduction to plant tissue culture by MK. Razdan, Science Publishers.
5. Experiments in plant tissue culture by John HD and Lorin WR., Cambridge University Press.
6. Pharmaceutical biotechnology by SP. Vyas and VK. Dixit, CBS Publishers.
7. Plant cell and tissue culture by Jeffrey W. Pollard and John M Walker, Humana press.
8. Plant tissue culture by Dixon, Oxford Press, Washington DC, 1985
9. Plant tissue culture by Street.
10. Pharmacognosy by G. E. Trease and WC. Evans, Elsevier.
11. Biotechnology by Purohit and Mathur, Agro-Bio, 3rd revised edition.
12. Biotechnological applications to tissue culture by Shargool, Peter D, Shargoal, CKC Press.
13. Pharmacognosy by Varo E. Tyler, Lynn R. Brady and James E. Robberrt, That Tjen, NGO.
14. Plant Biotechnology, Ciddi Veerasham.

ADVANCED PHARMACOGNOSY - II
(MPG 202T)

SCOPE

To know and understand the Adulteration and Deterioration that occurs in herbal/natural drugs and methods of detection of the same. Study of herbal remedies and their validations, including methods of screening

OBJECTIVES

Upon completion of the course, the student shall be able to know the,

- validation of herbal remedies
- methods of detection of adulteration and evaluation techniques for the herbal drugs
- methods of screening of herbals for various biological properties

THEORY 60 Hrs

1.	Herbal remedies – Toxicity and Regulations: Herbals vs Conventional drugs, Efficacy of Herbal medicine products, Validation of herbal therapies, Pharmacodynamic and Pharmacokinetic issues.	12 Hrs
2	Adulteration and Deterioration: Introduction, Types of Adulteration/ Substitution of Herbal drugs, Causes and Measures of Adulteration, Sampling Procedures, Determination of Foreign Matter, DNA Finger printing techniques in identification of drugs of natural origin, detection of heavy metals, pesticide residues, phytotoxin, microbial contamination in herbs and their formulations.	12 Hrs
3	Ethnobotany and Ethnopharmacology: Ethnobotany in herbal drug evaluation, Impact of Ethnobotany in traditional medicine, New development in herbals, Bio-prospecting tools for drug discovery, Role of Ethnopharmacology in drug evaluation, Reverse Pharmacology.	12 Hrs
4	Analytical Profiles of herbal drugs: Andrographis paniculata, Boswellia serata, Coleus forskholii, Curcuma longa, Embelica officinalis, Psoralea corylifolia.	12 Hrs
5	Biological screening of herbal drugs: Introduction and Need for Phyto-Pharmacological Screening, New Strategies for evaluating	12 Hrs

Natural Products, In vitro evaluation techniques for Antioxidants, Antimicrobial and Anticancer drugs. In vivo evaluation techniques for Anti-inflammatory, Antiulcer, Anticancer, Wound healing, Antidiabetic, Hepatoprotective, Cardio protective, Diuretics and Antifertility, Toxicity studies as per OECD guidelines.

REFERENCES (Latest Editions of)

1. Glimpses of Indian Ethano Pharmacology by P. Pushpangadam. Ulf Nyman. V.George Tropical Botanic Garden & Research Institute.
2. Natural products: A lab guide by Raphael Ikan, Academic Press.
3. Pharmacognosy - G. E. Trease and W.C. Evans. WB. Saunders Edinburgh, New York.
4. Pharmacognosy-Tyler, Brady, Robbers, Lee & Fetiger.
5. Modem Methods of Plant Analysis- Peach & M.V. Tracey, Vol. I & II, Springer Publishers.
6. Herbal Drug Industry by RD. Choudhary, Eastern Publishers, New Delhi.
7. Text book of Pharmacognosy by C.K.Kokate, Purohit, Ghokhale, Nirali Prakashan.
8. Text Book of Pharmacognosy by T.E. Wallis, J & A Churchill Ltd., London.
9. Quality control of herbal drugs by Pulok K Mukherjee, Business Horizons Pharmaceutical Publishers, New Delhi.
10. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
11. Text book of Pharmacognosy and Phytochemistry by Vinod D. RangarI, Part I & II, Career Publication, Nasik, India.
12. Plant drug analysis by H.Wagner and S.Bladt, 2nd edition, Springer, Berlin.
13. Standardization of Botanicals. Testing and extraction methods of medicinal herbs by V. Rajpal (2004), Vol.I, Eastern PublisherS, New Delhi.
14. Herbal Medicine. Expanded Commission E Monographs, M.Blumenthal.

INDIAN SYSTEMS OF MEDICINE
(MPG 203T)

SCOPE

To make the students understand thoroughly the principles, preparations of medicines of various Indian systems of medicine like Ayurveda, Siddha, Homeopathy and Unani. Also focusing on clinical research of traditional medicines, quality assurance and challenges in monitoring the safety of herbal medicines.

OBJECTIVES

After completion of the course, student is able to

- To understand the basic principles of various Indian systems of medicine
- To know the clinical research of traditional medicines, Current Good Manufacturing Practice of Indian systems of medicine and their formulations.

THEORY 60 Hrs

1. Fundamental concepts of Ayurveda, Siddha, Unani and Homoeopathy systems of medicine — 12 Hrs

   Different dosage forms of the ISM.

   Ayurveda: Ayurvedic Pharmacopoeia, Analysis of formulations and bio crude drugs with references to: Identity, purity and quality.

   Siddha: Gunapadam (Siddha Pharmacology), raw drugs/Dhatu/Jeevam in Siddha system of medicine, Purification process (Suddhi).

2 Naturopathy, Yoga and Aromatherapy practices — 12 Hrs

   a) Naturopathy - Introduction, basic principles and treatment modalities.

   b) Yoga - Introduction and Streams of Yoga. Asanas, Pranayama, Meditations and Relaxation techniques.

   c) Aromatherapy – Introduction, aroma oils for common problems, carrier oils.

3 Formulation development of various systems of medicine — 12 Hrs

   Salient features of the techniques of preparation of some of the important class of Formulations as per Ayurveda, Siddha, Homeopathy and Unani Pharmacopoeia and texts. Standardization,

   Shelf life and Stability studies of ISM formulations.

4	Schedule T – Good Manufacturing Practice of Indian systems of medicine Components of GMP (Schedule – T) and its objectives, Infrastructural requirements, working space, storage area, machinery and equipments, standard operating procedures, health and hygiene, documentation and records. Quality assurance in ISM formulation industry - GAP, GMP and GLP. Preparation of documents for new drug application and export registration. Challenges in monitoring the safety of herbal medicines: Regulation, quality assurance and control, National/Regional Pharmacopoeias.	12 Hrs
5	TKDL, Geographical indication Bill, Government bills in AYUSH, ISM, CCRAS, CCRS, CCRH, CCRU	12 Hrs

REFERENCES (Latest Editions of)

1. Ayurvedic Pharmacopoeia, The Controller of Publications, Civil Lines, Govt. of India, New Delhi.
2. Hand Book on Ayurvedic Medicines, H. Panda, National Institute of Industrial Research, New Delhi.
3. Ayurvedic System of Medicine, Kaviraj Nagendranath Sengupata, Sri Satguru Publications, New Delhi.
4. Ayurvedic Pharmacopoeia. Formulary of Ayurvedic Medicines, IMCOPS, Chennai.
5. Homeopathic Pharmacopoeia. Formulary of Homeopathic Medicines, IMCOPS, Chennai.
6. Homeopathic Pharmacy : An introduction & Hand book, Steven B. Kayne, Churchill Livingstone, New York.
7. Indian Herbal Pharmacopoeia, IDMA, Mumbai.
8. British Herbal Pharmacopoeia, bRITISH Herbal Medicine Association, UK.
9. GMP for Botanicals - Regulatory and Quality issues on Phytomedicine, Pulok K Mukharjee, Business Horizons, New Delhi.
10. Indian System of Medicine and Homeopathy in India, Planning and Evaluation Cell, Govt. of India, New Delhi.
11. Essential of Food and Nutrition, Swaminathan, Bappco, Bangalore.
12. Clinical Dietitics and Nutrition, F.P. Antia, Oxford University Press, Delhi.
13. Yoga - The Science of Holistic Living by V.K.Yoga, Vivekananda Yoga Prakashna Publishing, Bangalore.

HERBAL COSMETICS
(MPG 204T)

SCOPE

This subject deals with the study of preparation and standardization of herbal/natural cosmetics. This subject gives emphasis to various national and international standards prescribed regarding herbal cosmeceuticals.

OBJECTIVES

After completion of the course, student shall be able to,

- understand the basic principles of various herbal/natural cosmetic preparations
- current Good Manufacturing Practices of herbal/natural cosmetics as per the regulatory authorities

THEORY 60 Hrs

1.	Introduction: Herbal/natural cosmetics, Classification & Economic aspects. Regulatory Provisions relation to manufacture of cosmetics: - License, GMP, offences & Penalties, Import & Export of Herbal/natural cosmetics, Industries involved in the production of Herbal/natural cosmetics.	12 Hrs
2	Commonly used herbal cosmetics, raw materials, preservatives, surfactants, humectants, oils, colors, and some functional herbs, preformulation studies, compatibility studies, possible interactions between chemicals and herbs, design of herbal cosmetic formulation.	12 Hrs
3	Herbal Cosmetics : Physiology and chemistry of skin and pigmentation, hairs, scalp, lips and nail, Cleansing cream, Lotions, Face powders, Face packs, Lipsticks, Bath products, soaps and baby product, Preparation and standardisation of the following : Tonic, Bleaches, Dentifrices and Mouth washes & Tooth Pastes, Cosmetics for Nails.	12 Hrs
4	Cosmeceuticals of herbal and natural origin: Hair growth formulations, Shampoos, Conditioners, Colorants & hair oils, Fairness formulations, vanishing & foundation creams, anti-sun burn preparations, moisturizing creams, deodorants.	12 Hrs

5	Analysis of Cosmetics, Toxicity screening and test methods: Quality control and toxicity studies as per Drug and Cosmetics Act.	12 Hrs

REFERENCES (Latest Editions of)

1. Panda H. Herbal Cosmetics (Hand book), Asia Pacific Business Press Inc, New Delhi.
2. Thomson EG. Modern Cosmetics, Universal Publishing Corporation, Mumbai.
3. P.P.Sharma. Cosmetics - Formulation, Manufacturing & Quality Control, Vandana Publications, New Delhi.
4. Supriya K B. Handbook of Aromatic Plants, Pointer Publishers, Jaipur.
5. Skaria P. Aromatic Plants (Horticulture Science Series), New India Publishing Agency, New Delhi.
6. Kathi Keville and Mindy Green. Aromatheraphy (A Complete Guide to the Healing Art), Sri Satguru Publications, New Delhi.
7. Chattopadhyay PK. Herbal Cosmetics & Ayurvedic Medicines (EOU), National Institute of Industrial Research, Delhi.
8. Balsam MS & Edward Sagarin. Cosmetics Science and Technology, Wiley Interscience, New York.

HERBAL COSMETICS PRACTICALS
(MPG 205P)

1. Isolation of nucleic acid from cauliflower heads
2. Isolation of RNA from yeast
3. Quantitative estimation of DNA
4. Immobilization technique
5. Establishment of callus culture
6. Establishment of suspension culture
7. Estimation of aldehyde contents of volatile oils
8. Estimation of total phenolic content in herbal raw materials
9. Estimation of total alkaloid content in herbal raw materials
10. Estimation of total flavonoid content in herbal raw materials
11. Preparation and standardization of various simple dosage forms from Ayurvedic, Siddha, Homoeopathy and Unani formulary
12. Preparation of certain Aromatherapy formulations
13. Preparation of herbal cosmetic formulation such as lip balm, lipstick, facial cream, herbal hair and nail care products
14. Evaluation of herbal tablets and capsules
15. Preparation of sunscreen, UV protection cream, skin care formulations.
16. Formulation & standardization of herbal cough syrup.

Semester III

MRM 301T - Research Methodology & Biostatistics

UNIT – I

General Research Methodology: Research, objective, requirements, practical difficulties, review of literature, study design, types of studies, strategies to eliminate errors/bias, controls, randomization, crossover design, placebo, blinding techniques.

UNIT – II

Biostatistics: Definition, application, sample size, importance of sample size, factors influencing sample size, dropouts, statistical tests of significance, type of significance tests, parametric tests(students "t" test, ANOVA, Correlation coefficient, regression), non-parametric tests (wilcoxan rank tests, analysis of variance, correlation, chi square test), null hypothesis, P values, degree of freedom, interpretation of P values.

UNIT – III

Medical Research: History, values in medical ethics, autonomy, beneficence, non-maleficence, double effect, conflicts between autonomy and beneficence/non-maleficence, euthanasia, informed consent, confidentiality, criticisms of orthodox medical ethics, importance of communication, control resolution, guidelines, ethics committees, cultural concerns, truth telling, online business practices, conflicts of interest, referral, vendor relationships, treatment of family members, sexual relationships, fatality.

UNIT – IV

CPCSEA guidelines for laboratory animal facility: Goals, veterinary care, quarantine, surveillance, diagnosis, treatment and control of disease, personal hygiene, location of animal facilities to laboratories, anesthesia, euthanasia, physical facilities, environment, animal husbandry, record keeping, SOPs, personnel and training, transport of lab animals.

UNIT – V

Declaration of Helsinki: History, introduction, basic principles for all medical research, and additional principles for medical research combined with medical care.

PHARMACY COUNCIL OF INDIA
Combined Council's Building, Kotla Road,
Aiwan-E-Ghalib Marg, New Delhi-110 002.
Website : www.pci.nic.

RESEARCH AND PUBLICATION ETHICS

Theory

Unit-I PHILOSOPHY AND ETHICS

Introduction to philosophy: Definition, nature and scope, concept, branches Ethics: definition, moral philosophy, nature of moral judgments and reactions. Publication Misconduct: Group discussions: subject specific ethical issues, FFP, authorship, conflicts of interest, complaints and appeals: example and fraud from India and abroad

Unit-II Scientific misconduct

Ethics with respect to science and research; Intellectual honesty and research integrity; scientific misconducts: falsification, fabrication, and plagiarism (FFP); redundant publications: duplicate and overlapping publications, salami slicing; selective reporting and misrepresentation of data. Software tools: Use of plagiarism software like Turnitin, Urkund, and other open access software tools.

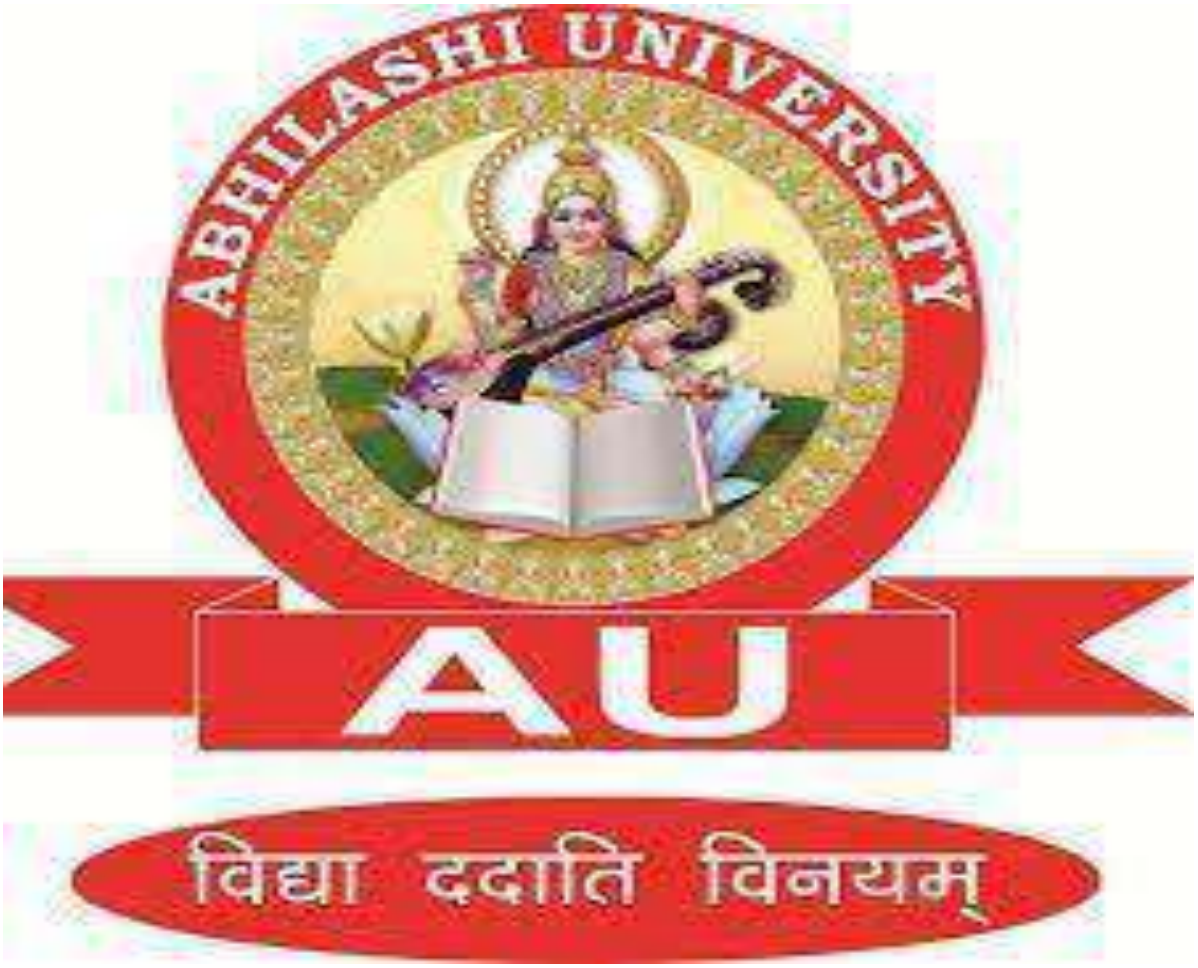
Unit-III Publication Ethics

Definition, introduction and importance, Best practices/ standards setting initiatives and guidelines: COPE, WAME, etc. Conflicts of interest; publication misconduct: definition, concept, problems that lead to unethical behavior and vice versa, types; violation of publication ethics, authorship and contributorship; identification of publication misconduct, complaints and appeals; Predatory publishers and journals. Databases and Research Metrics: Databases: Indexing databases, Citation databases, web of science, Scopus, etc.

Practice

Unit-IV Open access publications

Open access publications and initiatives; SHERPA/RoMEO online resources to check to check publisher copyright & self-archiving Policies; Software tool to identify predatory publications developed by SPPU; Journal finder/ journal suggestion tools viz. UGC care listed journal, Elsevier Suggested journal finder, Springer journal suggester, Impact factor of journal as per journal citation report, SNIP, SJR, IPP, Cite Score; Metrics: h-Index, g- Index, i-10 index, Publons, Google Scholar etc.



SYLLABUS

Masters of Business Administration

ASSESMENT BASED ON THE FOLLOWING CRITERIA

Sr.No	Assessment Criteria	Percentage To total 100 marks
1	Assignments	08
2	Attendance	05
3	Mid-Term Examination: 1st	08
4	Mid-Term Examination: 2nd	08
5	Class Test	05
6	Quizzes and Presentation	03
7	Attitude and Discussion	03
8	Sub-total (Total Marks of Assessment)	40
9	End- Term Theory Examination	60
10	Total Marks Allotted	100

Note: End -Semester theory examination will be of sixty marks, while remaining forty marks pertains to internal assessment based on the above mentioned criteria. In theory paper, Candidates need to attempt five questions in all. Q.No.1 is compulsory with short- type answers containing twenty marks covering the whole syllabus. Further, two questions will be set from each unit where one question is compulsory (under each unit). In all, examination time will be of three hours.

FIRST YEAR

SEMESTER-I

Course No.	Subject	Contact Hours				Credits	Examination		
		L	T	P	Total		IA	EA	Total
AUMBA-101	Management Practices and Organizational Behavior	4		-	4	4	40	60	100
AUMBA-102	Business Environment	4		-	4	4	40	60	100
AUMBA-103	Human Values and Professional Ethics	4		-	4	4	40	60	100
AUMBA-104	Computer Application in Business	4	-	-	4	4	40	60	100
AUMBA-105	Financial Management	4	-	-	4	4	40	60	100
AUMBA-106	Business Research Methods	4	-	-	4	4	40	60	100
AUMBA-107	Strategic Management	4	-	-	4	4	40	60	100
Total Credits		**28**		**-**	**28**	**28**			**700**

Legend: L-lecture,T-Tutorial,P-Practical

SEMESTER-II

Course Code	Course Title	Contact Hours				Credit	Examination		
		L	T	P	Total		IA	EA	Total
AUMBA-201	Business Statistics and Computing Skill	3	1	-	4	4	40	60	100
AUMBA-202	Production and Operation Management	4	-	-	4	4	40	60	100
AUMBA-203	Communication and Marketing Skill	4	-	-	4	4	40	60	100
AUMBA-205(*)	Specialization Group– (major)	4	-	-	4	4	40	60	100
AUMBA-206(*)	Specialization Group– (major)	4	-	-	4	4	40	60	100
AUMBA-207(*)	Specialization Group – (minor)	4	-	-	4	4	40	60	100
Total Credits		**23**	**1**	**-**	**24**	**24**			**600**

Legend:*L-lecture, T-tutorial,P-Practical*

SECOND YEAR
SEMESTER-III

Course Code	Course Title	Contact Hours				Credit	Examination		
		L	T	P	Total		IA	EA	Total
AUMBA-301	Entrepreneurship Development	4	-	-	4	4	40	60	100
AUMBA-302	International Finance and Tax Planning	4	-	-	4	4	40	60	100
AUMBA-303	Supply Chain Management	4	-	-	4	4	40	60	100
AUMBA-304(*)	Specialization Group– (major)	4	-	-	4	4	40	60	100
AUMBA-305(*)	Specialization Group– (major)	4	-	-	4	4	40	60	100
AUMBA-306(*)	Specialization Group – (minor)	4	-	-	4	4	40	60	100
Total Credits		**24**	**-**	**-**	**24**	**24**			**600**

SEMESTER-IV

Course Code	Course Title	Contact Hours				Credit	Examination		
		L	T	P	Total		IA	EA	Total
AUMBA-401	Summer Training	-	4	-	4	4	40	60	100
AUMBA-402	Research Project	-	4	-	4	4	40	60	100
Total Credits		**-**	**8**	**-**	**8**	**8**			**200**

At the end of Third semester, all students will have to undergo Industrial Training of Six months with an industrial, business or service organization by taking up a project study. The condition of successfully completing the programmers' shall not be deemed to have been satisfied unless a student's undergoes Industrial training under the supervision of the department in the organizations as approved by the Department/Faculty from tune to time. Each student will be required to submit a project report to the Department for the work undertaken during this period within one month of the commencement of the fourth Semester for the purpose of evaluation in the third semester.

Each student will have to choose research project based on his major specialization in consultation with his allotted project guide.

Instructions:

This scheme follows the standard of credits where each lecture hour (per week) is equal to 1 credit and each tutorial/ practical hour (per week) is equal to half credit.

Each credit is equal to 25 marks so subject's maximum marks would be defined accordingly.

SPECIALIZATIONS

FINANCE

2nd Semester

Advanced Financial Management (AUMBAFM-01) (Major)

Security Analysis and Investment Management (AUMBAFM-02) (Major)

Management of Banking Operations (AUMBAFM-03) (Minor)

3rd Semester

Principles of Insurance and Banking (AUMBAFM-04) (Major)

Strategic Financial Management (AUMBAFM-05) (Major)

Management of Financial Services (AUMBAFM-06) (Minor)

MARKETING

2nd Semester

Advertising and Sales Management (AUMBAMK-01)(Major)

Consumer Behaviour (AUMBAMK-02) (Major)

Rural Marketing (AUMBAMK-03)(Minor)

3rd Semester

Marketing of Service (AUMBAMK-04) (Major)

Retail Management (AUMBAMK-05) (Major)

Sales & Distribution Management (AUMBAMK-06) (Minor)

HUMAN RESOURCE MANAGEMENT (HRM)

2nd Semester

Management of Industrial Relations (AUMBAHR-01) (Major)

Labor Legislation (AUMBAHR-02) (Major)

Industrial/Organizational Psychology (AUMBAHR-03) (Minor)

3rd Semester

Human Resource Planning and Development (AUMBAHR-04) (Major)

Team Building & Leadership (AUMBAHR-05) (Major)

Personal Growth and Training & Development (AUMBAHR-06) (Minor)

INFORMATION TECHNOLOGY (IT)

2nd Semester

Relational Database Management System (AUMBAIT-01)(Major)

E-commerce and IT enabled Services (AUMBAIT-02) (Major)

System Analysis & Design & Software Engineering (AUMBAIT-03) (Minor)

3rd Semester

Data Communication & Networks (AUMBAIT-04) (Major)

Enterprise Resource Planning (ERP) (AUMBAIT-05) (Major)

Internet& Web Designing (AUMBAIT-06) (Minor)

INTERNATIONAL BUSINESS (IB)

2nd Semester

International Marketing (AUMBAIB-01) (Major)

International Business Environment and Foreign Exchange Economics (AUMBAIB-02) (Major)

Export Management and Documentation (AUMBAIB-03) (minor)

3rd Semester

International Logistic Management (AUMBAIB-04) (Major)

International Financial Management (AUMBAIB-05) (Major)

International business ethics and social responsibility (AUMBAIB-06) (Minor)

Semester-1

MANAGEMENT PRACTICIES AND ORGANISATIONAL BEHAVIOUR (AUMBA-101)

COURSE OBJECTIVE: To provide an overview of theories and practices in Management and organizational behavior in individual, group and organizational level.

COURSE OUTCOMES: Students will have a better understanding of Management practices in organization. They will know the framework for managing individual and group performance

UNIT-I

Management: Nature, purpose and scope of management, Functions, Development of Management Theories (Classical, Neo-Classical and Modern)

Planning: Types of plans, planning process, Management by objectives,Decision-Making process, styles of decision making

UNIT-II

Organizing: Organizational design and structure, Delegation, Authority & power – concept & distinction, Line and staff organizations.

Controlling: Concept, Types of Control, Control Techniques, Staffing: Human Resource Management and Selection

UNIT-III

Foundations of Organizational Behavior: The nature and determinants of organizational behavior need for knowledge of OB, contributing disciplines to the field, OB Model

Perception : Concept, Nature, Process, Importance of Perception.

Personality: Concept, Types and Theories of Personality, Personality Attitude and Job Satisfaction.

UNIT-IV

Leadership: Basic Approaches (Trait Theories, Behavioral Theories & Contingency Theories) & Contemporary Issues in Leadership.

Conflict: levels of conflict, resolving conflicts; power and politics: sources of power, use of power Organization culture and Organizational Change: Effects of culture, changing Organizational culture forces of change, Resistance to change, the change process

TEXT BOOKS:

1. Stephen P. Robins, Organizational Behavior, PHI Learning / Pearson Education, 15 th edition, 2012.

2. Fred Luthans, Organizational Behavior, McGraw Hill, 12 th Edition, 2005.

REFERENCE BOOKS:

1.Robbins, S.P., Judge, T.A., Sanghi, S (2010). Organizational Behaviour, Pearson Education.

2. Stoner, R. James A.F., Edward Freeman Daniel R Gilbert Jr., Management 6TH Ed, .Prentice-Hall of India

3. Stoner, Freeman & Gilbert Jr - Management (Prentice Hall of India, 6thEdition)

4. Koontz Harold &Weihrich Heinz – Essentials of management (Tata McGraw Hill, 5th Edition 2009) 5. Robbins S.P. and Decenzo David A. - Fundamentals of Management: Essential Concepts andApplications (Pearson Education, 6th Ed).

6. Weihrich Heinz and Koontz Harold - Management: A Global and Entrepreneurial Perspective (McGraw Hill, 12thEdition 2008)

7. Mc Shane & Von Glinov, OrganisationalBehaviour, 6 th Edition, Tata Mc Graw Hill, 2012.

BUSINESS ENVIRONMENT (AUMBA-102)

Course Objectives

- To explore the internal and external environment in which businesses operate.
- To make student familiar with the economic operational and financial framework of businesses.
- To examine the critical opportunities and threats that arises from an analysis of internal and external business conditions

Course Outcomes

Upon successful completion of the course, students will be able to
Discuss the supply and demand theory and its impact on businesses.
Explain the effects of government policy on the economic environment and industries.
Outline how an entity operates in a business environment.
Describe how financial information is utilized in business.
Explain the legal framework that regulates the business in general.

UNIT-I

Environmental Scanning: Different Aspects of Business Environment.
Economic Systems: Capitalist system/Market economy; Socialist system and Mixed Economy, **Indian Economy:** Basic Features of Indian Economy, Government Business Relationship. Micro and Macro Environment.

UNIT-II

Economic Policy: Monetary and Fiscal Policies in India, India's Trade Policy.
Economic Reforms: Liberalization; Privatization; Globalization and its Implications for India. EXIM Policy; FEMA, FERA

UNIT-III

Social Responsibility of Business: Concept, rationale, and barriers of social responsibility, Ethics and social responsibility of management.
The Environment Protection Act, 1986.

UNIT-IV

International Economic Environment: Emergence of Globalization, Control of Foreign Direct Investment, Benefits and Problems from MNCs, GATT,WTO-its role and functions, implications for India; Devaluation of Rupee.

Suggested Readings:

1. Saleem, Shaikh (2010). Business Environment, 2nd edition, Pearson Education.

2. S.K.Misra&Puri: Indian Economy (Its Development Experience), Himalaya Publishing House Pvt.Ltd.

3. R,uddarDatt& K.P.M. Sundaram(2010) : Indian Economy, S.Chand& Co.

4. Mungekar,Nachana&ManoharRao(2011) : Indian Economy in the New Millenium, Himalaya PublishingHouse Pvt. Ltd.

5. G.Rama Krishna & A.G. Moss V.Suguna(2009): Economic Reforms in India- Retrospect and Prospect,Himalaya Publishing House Pvt. Ltd.

6. M.R. Das: WTO Opportunities and Challenges for Indian Banking, Himalaya Publishing House Pvt. Ltd.

7. Misra&Puri: Economic Environment of Business, Himalaya Publishing House Pvt. Ltd

HUMAN VALUES AND PROFESIONAL & ETHICS (AUMBA-103)

Course Objectives

- Identify the core values that shape the ethical behavior of a student.
- To create an awareness on Ethics and Human Values.
- To study the moral issues and decisions confronting individuals and organizations.
- To study the related issues about the moral ideals, character, policies, and relationships of people and corporations involved in management related activities.

Course Outcomes

Upon successful completion of the course, students will be able to

- Learn the moral issues and problems; find the solution to those problems.
- Learn the need for professional ethics, codes of ethics and roles, concept of safety, risk assessment.
- Gain exposure to Environment Ethics; know their responsibilities and rights

UNIT-I

Concept of Values: Types of Values; Human Values in Management; Relevance of Values in Modern Management; Values for Managers. Leadership and Human Values; Inter-personal Relations and Human Values; Stress Management and Human Values; Team Building and Values.

Business Ethics: The Changing Environment and Stakeholder Management, Relevance of Ethics and Values in Business, Spiritual Values. Modern Business Ethics and Dilemmas.

UNIT-II

Value Education: understanding value education, self-exploration as the process of value education, continuous happiness and prosperity-the basic human aspirations, right understanding, relationship and physical facilities,happiness and prosperity –current scenario.

UNIT-III

Harmony in the human being: understanding human being as the co - existence of self (I)and the body ,Discriminating between the needs of self (I) and the body , Understanding harmony in the self ,harmony of the self (II) with the body. Program to ensure Sanyam and Swasthya.

UNIT-IV

Harmony in the family and society: harmony in the family –the basic unit of human interaction, values in human to human relationship, trust –the fundamental values in the relationship, respect–as the right evaluation, understanding harmony in the society vision for the universal human order

Harmony in the nature (Existence): Understanding harmony in the nature, interconnectedness, self-regulation.

Suggested Books:

1. Weiss, Joseph W (2009). Business Ethics: Concepts & Cases, Cengage Learning.
2. Colin Fisher and Alan Lovell (2009). Business ethics and values: Individual, Corporate and International Perspectives, Prentice Hall.
3. Gaur R. R, R Sangal, G P Bagaria (2011). Human values and professional ethics (excel books)
4. Fernando A.C., (2009). Business Ethics: An Indian Perspective, Prentice Publications

5. Nagarazan R.S. (2008). Professional ethics and Human values New Age International

COMPUTER APPLICATIONS IN BUSINESS (AUMBA-104)

Course Objectives

- To explore information technology tools.
- To develop an understanding of the data processing systems existing in organizations.

Course Outcomes

Upon successful completion of the course, students will be able to
Discuss the communication network and networking devices.
Explain the effects of AI.
Outline of application and system software.
Familiarizingthe students with IT concepts.
Explain the use of enterprise systems.

UNIT-I

Introduction to Computers: Classification, Components of Computer System, Introduction to High level and low level languages.

Computer Hardware: CPU, Basic Logic Gates, Computer Memory and Mass Storage Devices, Computer Hierarchy, Input and Output devices.

Software: Application Software and System Software, Basic concepts of operating systems, Artificial Intelligence, Flow charts and data flow diagrams.

UNIT-II

Networking concepts: Sending and reading e-mails. Practical on Internet using emails, Use of search engines.

Word processing: MS-Word, word basics, formatting text and documents, working with header and footer, tables and sorting, graphics.

UNIT-III

Spreadsheets and their uses in business: Excel basics, Rearranging, Worksheets, Excel formatting techniques, using formulas and functions. Power Point: Basics, Creating and delivering presentations.

Functional and Enterprise Systems: Emerging Trends in Information Technology, MIS(Management Information System).

UNIT-IV

Computer Networks and Internet: Goals and Objectives of Computer Networks, Local Area Network, Metropolitan Area Network, Wide Area Network.

The Internet, Intranet and Extranets: Overview of the Internet, Services provided by Internet, World Wide Web.

Suggested Readings:

1. ITL Education Solutions (2009). Introduction to Information Technology, Pearson Education.
2. Turban, Rainer and Potter (2009). Introduction to information technology, 2nd Edition, John Wiley and Sons.
3. Joseph A. Brady and Ellen F Monk (2007).Problem Solving Cases in Microsoft and Excel, Fourth Annual Edition, Thomson Learning.
4. Saini A. K.andPradeep Kumar (2007).Computer Applications in Management, Anmol Publications.
5. Deepak Bharihoke, (2009). Fundamentals of Information Technology, 3rd Edition, Excel Books.
6. V.Raja Raman,(2009). Fundamentals of Computers,PHI,New Delhi
7. Leon &leon :Introduction to Computers,Vikas Publishing house,NewDelhi

\

FINANCIAL MANAGEMENT (AUMBA-105)

Course Objectives: The course has been designed to acquaint the students with the conceptual framework of the key decision areas in multinational business finance. The objective of the course is to provide an overview of the financial environment in which multinational firms operate.

Course Learning Outcomes:

Upon successful completion of the course, the students will be able to

Understand the concept of Financial Management and various sources of finance.

Have the knowledge and skills to select and employ base level tools for capital structure using different types of approaches.

UNIT-I

Introduction to Financial Management: Meaning, Scope, Finance Function, Financial Goals, Limitations.

Sources of Finance: Types- Advantages and Limitations of Equity Shares, Preference Shares, Debentures, Term-Loans, Right Issue, Venture Capital, Private Equity GDR, ADR.

UNIT-II

Capital Structure: Meaning, Determinants, Assumptions, Net Income and Operating Income Approach, Traditional Position, M-M Position, EBIT and EPS Analysis.

Management of Working Capital: Meaning of WC; Need of WC Management; Determinants of WC, Operating Cycle.

UNIT-III

Cash Management: Meaning; Facets of Cash Management; Motives for Holding Cash; Optimal Cash Balance; Short-Term and Long-Term Cash Forecasting.

Inventory Management: Meaning; Need to hold Inventory; Objective of Inventory Management; Inventory Investment Analysis; Inventory Control System.

UNIT-IV

Capital Budgeting: Meaning; Basic Principles of Costs and Benefits; Investment Criteria; Pay back Method; Accounting Rate of Return Method; Net Present Value Method; Benefit -Cost

Ratio; Internal Rate of Return; **Dividend Decisions:** Meaning and Types of Dividend; Issues in Dividend Policy; Traditional Model; Walter Model; Gordon Model; Miller and Modigliani Model.

Suggested Readings:

1. Khan, M. Y. and Jain P. K. (2011). Financial Management, Text, Problems & Cases, 5th Edition, Tata McGraw Hill Company, New Delhi.

2. Maheshwari, S.N.(2009). Financial Management – Principles & Practice, 13th Edition, Sultan Chand & Sons.

3. Prasanna, Chandra (2011) Financial Management: Theory and Practice, 7th Edition, Tata McGraw Hill.

4. Bhalla. V. K.(2009). Financial Management and Policy: Text and Cases, 9th Edition, Anmol Publications Pvt. Ltd.

5. I.M. Pandey (2010): Financial Management, Vikas Publishing House

6. James C. Van(2009): Financial Management, Pearson Education Horne Policy Asia

7. Brealy and Myres: Principles of Corporate Finance, Tata McGraw Hill

BUSINESS RESEARCH METHODS (AUMBA-106)

Course Objectives

- Understand some basic concepts of research and its methodologies
- Select and define appropriate research problem and parameters
- Organize and conduct research in a more appropriate manner
- Write a research report and thesis

Course Outcomes

Upon successful completion of the course, the students will be able to

Demonstrate knowledge of research processes (reading, evaluating, and developing)

Perform literature reviews using print and online resources

Identify, explain, compare, and prepare the key elements of a research proposal/report

Define and develop a possible research interest area using specific research designs

UNIT-I

Introduction to Research: Definition, Scope, significance Limitations, and Types. Definition of Business Research; Types of Research , Objectives of Research

Research Process: Steps in the Research Process; Reviewing of Literature; Formulating A Research Problem.

UNIT-II

Research Designs: Exploratory, Descriptive and Experimental Research Design.

Data Collection: Secondary Data, Primary Data and Methods of Collection. Scaling Techniques, Attitude Measurement Techniques.

UNIT-III

Sample Design: Sampling, Concepts, Principles; Types of Sampling – Probability, Non Probability, Mixed Sampling Designs, Sample Size Determination.

Statistical technique: Selecting an Appropriate Statistical technique; Field Work and Tabulation, coding, Editing. Interpretation of Data and Report Writing.

UNIT-IV

Hypothesis: Functions, Characteristics, Types of Hypotheses, Testing of Hypothesis, Constructing the Hypothesis.

Techniques for Data Analysis –ANOVA, Discriminant Analysis, Factor Analysis, Conjoint Analysis, Multidimensional Scaling and Clustering Methods.

Suggested Readings:-

1) Ranjit Kumar (2009) Research Methodology, 2nd edition, Pearson Education.

2) NareshMalhotra and S Dash (2009) Marketing Research, 5th edition, Pearson Prentice Hall.

3) Robert Stine and D Foster (2010) Statistics for Business, 1st edition, Pearson Education.

4) Richard Levin and DS Rubin (2009) Statistics for Management, 7th edition, Pearson Education.

5) C.R.Kothari (2014) ,Research Methodology

6) S.L.Gupta ,Marketing Research, Excel Books.

7) Luck,David J and Ronald S.Rubir (2009). Marketing Research ,Prentice Hall India Ltd.

STRATEGIC MANAGEMENT (AUMBA-107)

Course Objectives

- To provide a broader understanding of the issues related to different types of strategies.
- To discuss regarding different environments that affect organizations.

Course Outcomes

Upon successful completion of the course, the students will be able to

Have knowledge about various types of strategies and decisions related to strategic management.

Understand about various levels of business as well as corporate level strategies.

Get familiar about the implementation, evaluation and control of strategies.

UNIT-I

Understanding strategy and Strategic Management: Strategic management process. Strategic decision making,

Defining strategic intent: Vision, Mission Goals and Objectives. Characteristics of a good mission statement.

External environment analysis: Strategically relevant components of external environment. Industry analysis – Porter's five forces model, Strategic group mapping,

UNIT- II

Internal environment analysis: Resource based view of an organization, Value chain analysis, **Business level Strategies**: Porter's framework of competitive strategies: Cost leadership, **corporate level strategies:** Growth strategies – horizontal and vertical integration

UNIT-III

Portfolio Strategies: BCG Model, GE Business Planning Matrix, Growth of the Firm**:** Internal Development, Mergers & Acquisitions, and Strategic Alliances..

UNIT-IV

Strategy Implementation: Strategy-structure fit, developing and modifying organizational structure. Evaluation and Control**:** Nature of strategy evaluation, Strategy evaluation frame work, the balanced Score Card, Benchmarking.

Suggested Readings:

1. Lasserre, Philippe (2009). Global Strategic Management, Palgrave MacMillan.

2. John D Daniels, Lee H Radebaugh Daniel P Sullivan ,PrashantSalwan (2010). International Business Environments and Operations, Pearson Education

3. Tamer Cavusgil, Gary Knight (2011). International Business: Strategy, Management and the New Realities, 1st Edition, Pearson Education.

4. Kark Rajneesh (2008). Competing with the Best: Strategic Management of Indian Companies in a Globalizing Arena Penguin Books.

5. AzharKazmi (2009). Business Policy and Strategic Management. Tata McGraw Hill, New Delhi

6. Jauch&Glueek(2009) : Business Policy and Strategic Management

Semester -II

BUSINESS STATISTICS AND COMPUTING SKILLS (AUMBA-201)

Course Objectives

Provide a basic knowledge of the application of mathematics and statistics to business disciplines;

Develop the ability to analyse and interpret data to provide meaningful information to assist in making management decisions;

Develop an ability to apply modern quantitative tools (Microsoft Excel) to data analysis in a business context.

Course Outcomes:

Produce appropriate graphical and numerical descriptive statistics for different types of data.

Conduct and interpret a variety of hypothesis tests to aid decision making in a business context.

Use simple/multiple regression models to analyse the underlying relationships between the variables through hypothesis testing.

UNIT-I

Classification of data and construction of Frequency Distribution: Graphic Presentation of Data, Meaning & Types.

Introduction of Descriptive Statistics: Measures of Central Tendency; Measures of Dispersion Range, Mean Deviation, and Standard Deviation, Skewness & Kurtosis.

UNIT-II

Theory of Probability: Basic concepts, Additive and Multiplicative Rule, Idea of Conditional Probability, Concept of Random Variable and its mathematical expectation.

Theoretical Distributions: Binomial, Poisson and Normal Distribution.

UNIT-III

Statistical Inference: Concept of Sampling Distribution, Parameter & Statistics, Standard Error. Testing of Hypothesis: Large Sample Tests, Small Sample Test (t Test-single sample mean and

difference of means tests; F test-Variance Ratio test; Z test-single proportion, difference of proportions single sample mean and Difference of Means; (chi square) test-Independence of Attributes.

UNIT-IV

Correlation Analysis: Rank Method and Karl Pearson's Coefficient of Correlation and Properties of Correlation.

Regression Analysis: Simple Linear Regression Model, Specification of the Model, Assumptions, Least Square Estimates of Parameters and their properties, Coefficient of Determination and Interpretation of Coefficients.

Suggested Readings:

1. Richard Levin and DS Rubin (2011) Statistics for Management, 7th edition, Pearson Education.

2. Gupta, S.P. & Gupta M.P. (2012) Business Statistics, 16th edition, Sultan Chand and Sons.

3. Sharma, J.K. (2009). Operations Research: Theory and Applications, 4th ed. Macmillan. 4. J. K. Sharma: Business Statistics, Pearson Publication, New Delhi.

5. Amir D Aczel&Sounderpandian (2010): Complete Business Statistics, Tata McGraw Hill Publishing Company Ltd.

6. Levin &Kapoor (2009) : Statistics For Management, Prentice Hall

7. U.K. Srivastava, Shenoy&Sharma(2009): Quantitative Techniques for Management, New Age International, New Delhi. 8. P.N. Arora& S. Arora(2011): Statistics for Management, S. Chand &Co., New Delhi.

3. Prasanna, Chandra (2011) Financial Management: Theory and Practice, 7th Edition, Tata McGraw Hill.

4. Bhalla. V. K.(2009). Financial Management and Policy: Text and Cases, 9th Edition, Anmol Publications Pvt. Ltd.

5. I.M. Pandey (2010): Financial Management, Vikas Publishing House

6. James C. Van(2009): Financial Management, Pearson Education Horne Policy Asia

7. Brealy and Myres: Principles of Corporate Finance, Tata McGraw Hill

PRODUCTION AND OPERATIONS MANAGEMENT (AUMBA-202)

Course objectives:

This course is designed to help the students understand the role of operations in improving the efficiency of an organization including both manufacturing and service one and also help them appreciate the linkage of operations with corporate strategy and other functional domains including marketing and finance.

Course Outcomes:
1. Understand the role of operations in both manufacturing and service organizations and the significance of operations strategy in the overall business.

2. Understand the importance of facilities location decision in the whole supply chain in globalized operations and learn the tools relating to facilities location.

3. Understand different types of production processes and facility layout suitable for manufacturing different categories of products.

4. Understand the elemental processes involved in designing a product and a service.

UNIT-I

Production and Operations Management: Concepts, Functions.

Product Design &Development: Characteristics, Product Development Process (Technical), Product Development Process, Product Development Techniques.

UNIT-II

Facility Location: Importance, Factors in Location Analysis, Location Analysis Techniques.

Facility Layout: Objectives, Advantages, Basic Types of Layouts.

Capacity Planning: Concepts, Factors Affective Capacity Planning, Capacity Planning Decisions.

Production Planning & Control (PPC): Concepts, Objectives, Functions

Work Study: Productivity, Method Study, Work Measurement.

UNIT-III

Materials Management: Concepts, Objectives.

Introduction to modern Productivity techniques: Just In Time: Introduction, Kanban System, Total quality Management & Six Sigma.

UNIT-IV

Project Management: CPM and PERT: introduction, time estimates, slack, float, finding critical paths, problem solving.

Maintenance Management: Concepts, Objectives, Functions, Types of Maintenance.

Suggested Readings:

1. Mahadevan B. (2010).Production Operations Management: Theory and Practice,2nd Edition, Pearson Education.

2. Chase, R.B, et. Al (2010). Operations Management for Competitive Advantage, Tata McGraw Hill, New Delhi

3. Stevenson W. J (2009). Operations Management, 9th Edition, Tata McGraw Hill, New Delhi

4. Nair (2009) . Production & Operation Management, Tata McGraw Hill

5. Adam &Ebert(2009). Production & Operation Management, Prentice Hall India

6. Krajewski&Ritzman: Operations Management, Pearson Education Asia

7. SN Chary: Production & Operations Management, Tata McGraw Hill

COMMUNICATION AND MARKETING SKILLS (AUMBA-203)

Course objectives:

This course is designed to help the students understand the role of communication in management to convey information & instructions. To explain why good communication skills are important. Describe models and methods for communication.

Course Outcomes:

1. Understand the role of communication in personal and professional success.

2. Develop awareness of appropriate communication strategies.

3. Analyze a variety of communication acts.

UNIT-I

Introduction of Communication: Role of communication, defining and classifying communication, purpose of communication, process of communication, importance of communication in management, barriers & gateway in communication, 7 C's of communication.

Employment Communication: Writing CVs, Group discussions, interview, types of interview, media interviews, Impact of Technological Advancement on Business Communication.

UNIT-II

Oral Communication: What is oral Communication, principles of successful oral communication, two sides of effective oral communication, effective listening, non–verbal communication.
Written Communication: Purpose of writing, clarity in writing, principles of effective writing, writing technique.

UNIT-III

Business letters: Introduction to business letters, Types of business letter, writing memos, what is a report purpose, kinds and objectives of reports.
Case method of Learning: Understanding the case method of learning, different types of cases, case analysis approaches.

UNIT-IV

Group Communication: Meetings, Notice, Planning meetings, timing, venue of meetings, leading meetings, Minutes of Meeting, Media management, press conference, Seminars/workshop, conferences, Business etiquettes.

Suggested Readings:

1. Lesikar et al (2011). Business Communication: Making Connections in a Digital World. Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Boove, C.L., Thill, J.V. &Chaturvedi, M. (2011). Business Communication Today, Pearson.
3. M. K. Sehgal& V. Khetrapal(2010) - Business Communication (Excel Books).
4. RajendraPal(2009) - Business Communication (Sultanchand& Sons Publication).
5. P.D. Chaturvedi(2009). Busines Communication (Pearson Education, 2nd Edition
6. Lesikar RV & Pettit Jr. JD .Basic Business Communication : Theory & Application (Tata Mc Grow Hill, 10th Edition).
7. TaylerShinley(2011) . Communication for Business (Pearson Education, 4th Edition.

ADVANCED FINANCIAL MANAGEMENT (AUMBAFM-01)

COURSE OBJECTIVES:

Facilitate student to

1. Understand the operational nuances of a Finance Manager.

2. Comprehend the technique of making decisions related to finance function.

COURSE OUTCOMES: Possess the techniques of managing finance in an organization.

UNIT-I

Foundations of Finance: Financial management – An overview- Time value of money, objective of Financial Managemnt.

Decision Tree Analysis: Capital Expenditure Decision Under Conditions of Risk and Uncertainly.

UNIT-II

Investment Decisions : Capital Budgeting: Principles and techniques - Nature of capital budgeting- Identifying relevant cash flows - Evaluation Techniques: Payback, Accounting rate of return, Net Present Value, Internal Rate of Return,

UNIT-III

Working capital management: Determination of level of current assets. Sources for financing working capital. Bank finance for working capital. Working capital financing: Short term financing of working capital, long term financing of working capital. Working capital leverage.

UNIT-IV

Financial Modeling: Introduction and type of Financial Modeling and Application of Financial Modeling, Simulation Techniques using Monte Carlo.

Suggested Readings:

1. Bierman, Harold. Lease Vs.: Buy Decision. Englewood Cliffs, New Jersey, Prentice Hall Ins.
2. Fogler, H and Ganpathy : Financial Econometrics Englewood Cliffs, New Jersey, Prentice Hall Inc.,1982.

3. Ievy, H. and Sarnat H. Capital Investment and Financial Decision, Englewood Cliffs New Jersey, Prentice Hall Inc., 1982.
4. Van Home, James C. : Financial Management and Policy, Englewood Cliffs, New Jersey. Prentice Hall of India, 1990
5. Sapirio, Edverd, Financial Decision Analysis.Aswat Damodaran, Corporate Finance Theory and practice, John Wiley & Sons, 3rd edition,2013.

6. M.Y. Khan and P.K.Jain Financial management, Text, Problems and cases Tata McGraw Hill, 5 th edition, 2008.

7. I. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 10th edition, 2007.

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT (AUMBAFM-02)

Course Objectives

- To acquaint the students with the working of security market and principles of security analysis; and
- To develop the skills required for portfolio management so as to be able to judge the competitive position of firms in capital market and review the related business decisions.

Course Outcomes

Upon successful completion of the course, the students will be able to

Understand the characteristics of different financial assets such as money market instruments, bonds, and stocks, and how to buy and sell these assets in financial markets.

Have the knowledge and skills to select and employ base level tools for financial analysis using time value of money, cost of capital and interest rates.

Have the knowledge and skills to analyze companies for investment purposes.

Know how to apply different valuation models to evaluate fixed income securities, stocks, and how to use different derivative securities to manage their investment risks.

UNIT-I

Introduction to Investment Management: Concept and objectives of investment, Difference between Investment and Speculation, Investment and Gambling, Meaning of Investment Management, Investment Management Process, Investment Alternatives, Features of Investment Avenues.

Risk and Return: Concept of Risk, Components of Investment Risk, Measurement of Risk Concept of Return, Relationship between Risk and Return.

Introduction to Indian Stock Market:BSE,NSE

UNIT-II

Fundamental Analysis: Macro-Economic Analysis, Forecasting, Industry Analysis, Sensitivity of Business Cycle, Industry Life Cycle Analysis.

Company Analysis: Meaning of Company Analysis, Strategy Analysis, Accounting Analysis, Financial Analysis, and Estimation of Intrinsic Value.

Technical Analysis: Meaning, Difference between Technical and Fundamental Analysis, Assumptions, Tools, Dow Theory, Testing Technical Trading Rules, Evaluation of Technical Analysis.

UNIT-III

Portfolio Theory: Merits of Diversification, Diversification and Portfolio Risk, Portfolio Return and Risk, Calculation of Portfolio Risk , Efficient Frontier for securities, Optimal Portfolio.

Portfolio Analysis: Concept of Traditional and Modern Portfolio Analysis, Markowitz Theory, Single Index Model, Beta Generation in Efficient Frontier, Interactive Risk through Covariance, Sharpe's Model.

UNIT-IV

Portfolio Selection: Concept of Portfolio Selection, Efficient Frontier and Portfolio Selection, Role of Beta and its concept, Capital Market Theory, CAPM, SML Arbitrage Pricing Theory.

Portfolio Revision: Meaning, Need, Techniques of Portfolio Revision,

Formula Plans: Rules Regarding Formula Plans, Constant Rupee Value Plan, Constant Ratio Plan, Variable Ratio Plan, Modifications, Rupee Averaging Technique.

Suggested Readings:

1. Chandra. Prasanna.(2011). Investment Analysis and Portfolio Management, 3rd Edition, Tata McGraw Hill, New Delhi.

2. Fischer. and Jordon (2009). Security Analysis and Investment Management, 6th Edition, Pearson Education.

3. Rustagi. R. P. (2009). Investment Analysis and Portfolio Management, 2nd Edition, Sultan Chand & Sons.

4. Bhalla, V.K. (2012). Investment Management: Security Analysis and Portfolio Management, 17th Edition, S.Chand& Sons.

5. Frank K. Reilly, Keith E Brown. (2009). Investment Analysis and Portfolio Management, 8th Edition, Cengage Learning.

MANAGEMENT OF BANKING OPERATIONS (AUMBAFM-03)

UNIT-I

Evolution of modern commercial banking in India: Basic concepts; Banking structure-; Banking sector reforms in India. Banking Regulation Act, 1949

Sources of bank funds: Deposit products- Types of Bank Deposits

UNIT-II

Non Performing Assets: Prudential norms for asset classification and provisioning Management of capital funds: Functions, Capital Adequacy ratio.

UNIT-III

Anti money laundering: Concept, Its need and KYC norms.

Risk Management in Banks: Basic concepts, Need/purpose, process, different types of risk sin banks- operational, Liquidity, Credit risk, capital risk, Interest rate risk and systematic risk.

UNIT-IV

Service Quality Metrics: Importance of six sigma in banks, Customer Relationship Management.

Electronic Banking: Concepts, Internet/Phone/Mobile Banking- Benefits, E-payment and settlement system: Plastic cards, EFT, NEFT, RTGS, MICR..

Suggested Readings:

1. M Y Khan,(2011). Financial Services, 6th Edition, Tata McGraw Hill.
2. Hull. John C. (2012). Banking and Financial Institutions", 2nd Edition, Prentice Hall.
3. Fabozzi, Frank J. "Foundations of Financial Markets and Institutions", (Latest Edition). Prentice Hall.
4. Varshney and Mittal. (2009). Indian Financial System, 10th Edition, Sultan Chand & Sons.
5. Mehta, R.R.S. : Fundamental of Banking; Himalaya Publishing House Co., New Delhi.
6. Nigam, B.M.L. : Banking Law and Practive, Konark Publishers, Delhi.
7. Periodicals: 1. Reserve Bank of India, RBI Bulletin. 2. Indian Institute of Finance, Finance India.

ADVERTISING AND SALES MANAGEMENT (AUMBAMK-01)

Course Objectives

To understand various components of advertising and sales management and their application in different areas of marketing

- To acquaint the students with selling concepts that are helpful in developing a sound sales and distribution policy

To enable students in organizing and managing sales force and marketing channels.

- To provide an approach to the management of advertising that is professional and thoughtful
- To make students understand the latest requirement of corporate sectors in this area.

Course Outcomes

Upon successful completion of the course, students will be able to

Understand the process of advertising communications.

Acquaint approaches and methods to develop, execute and evaluate advertising campaigns

Apply Advertising through the development and implementation of an advertising plan

Develop an insight in personal selling

Analyze the managerial aspects of sales force management

Create understanding of sales force control systems

UNIT-I

Introduction to Advertising: Nature and scope and functions of Advertising, Classification of Advertising, Advertising as an element of Marketing Mix, Advertising as a Tool of Communication.

Behavioral Dynamics: The DAGMAR Approach, Hierarchy of Effects Model, New Adopter Model, AIDA Model..

Advertising and Product Life Cycle: Ethical Aspects of Advertising – Misleading Advertising, Deceptive Advertising and Shock Advertising

UNIT-II

Advertising Media – Media Planning, Media Selection and Scheduling Measuring Advertising Effectiveness – Pre-testing and Post-testing copy

Advertising Budget – Top Down Methods: Affordable Method, Percentage of Sales Method, Competitive Parity Method

UNIT-III

Sales Management- Nature and Scope of Sales Management, Personal Selling Objectives

Sales Force Recruitment – Process and Sources; • Sales Force Selection Process

UNIT-IV

Managing Sales Training Programs – Need and Objectives.

Motivating Sales Personnel – Significance, Financial and Non-Financial Reward System.

Suggested Readings:

1. Belch, George E. and Belch, Michael A.(2011). "Advertising and Promotion", Tata McGraw Hill, 7th Edition

2. Guinn, Allen, Chris T., Semenik, Richard J.(2009) "Advertising & Integrated Brand Promotion", Thomson – South Western, 4th Edition.

3. Still, R. R. &Cundiff, E. W., Govoni, N. A. P. (2009). Sales Management. 5th Edition Pearson Education, New Delhi

4. Rosenbloom, Bert (2007) Marketing Channels: A Management View, 7th Edition ,Cengage Learning, New Delhi.

5. Jobber , David and Lancaster, Geoffery (2009), Selling and Sales Management, 7th Edition, Pearson Education, New Delhi

6. Tanner Jr., J.F., Honeycutt Jr., E.D. and Erffmeyer, R.C. (2011), Sales Management:, Pearson Education, New Delhi.

CONSUMER BEHAVIOUR (AUMBA MK-02)

COURSE OBJECTIVE: To understand the role of consumer behavior in marketing and to identify qualitative and quantitative methods of measuring consumer behavior.

COURSE OUTCOME: The student will understand the influences on customer choice and the process of human decision making in a marketing context.

UNIT-I

Introduction: Concepts: Significance – Dimensions of Consumer Behavior – Application of knowledge of Consumer Behaviour in marketing decisions.

Consumer Behavior Models: Industrial and individual consumer behaviour models - Howared-Sheth, Engel – Kollat, Webstar and wind Consumer Behaviour Models – Implications of the models on marketing decisions.

UNIT-II

Internal Influences: Psychological Influences on consumer behavior – motivation – perception – personality Learning and Attitude- Self Image and Life styles – Consumer expectation and satisfaction.

UNIT-III

External Influences on Consumer Behaviour Culture: Values and Norms, Characteristics and Effect on Consumer Behaviour, Types of sub culture, Cross cultural consumer behaviour Group Dynamics and **Reference Groups:** Consumer relevant groups, Types of Family: Functions of family, Family decision making, Family Life Cycle Social Class:

UNIT-IV

Purchase Decision Process: High and low involvement - Pre-purchase and post-purchase behavior – Online purchase decision process

Diffusion of innovations: Diffusion Process, Adoption Process, Researching Consumer Behavior; Online Consumer Behavior, Profile of Consumer Innovator.

Suggested Readings:

1. Frank R. Kardes, Consumer Behaviour and Managerial Decision Making,

2nd Edition, 2010. 2. Assel, Consumer Behavior - A Strategic Approach, Biztranza, 2008.

3. Sheth Mittal, Consumer Behavior- A Managerial Perspective, Thomson Asia (P) Ltd., 2011.

4. Abbael, Consumer Behavior: A Strategic Approach (Indian Edition 2005) Wiley 2012.

5. Hed, Hoyer. Consumer Behavior, 2008 Edition Wiley 2012.

6. Das Gupta. Consumer Behavior, 2008 Edition, Wiley 2012.

7. Shri Prakash. Theory of Consumer Behavior, Ist Edition, Vikas 2012.

8. Srabanti Mukherjee, Consumer Behavior, Cengage Learning, 2012.

RURAL MARKETING (AUMBAMK-03)

Course Objectives

• To create awareness about the applicability of the concepts, techniques and processes of marketing in rural context

• To familiarize with the special problems related to sales in rural markets

• Developing insights into the behavior of the rural consumer

• Understanding rural institutions of retailers, haats and melas (rural markets and fairs); and emerging rural retail

• Addressing these issues using insights into consumer behavior and rural institutions.

Course Outcomes

Upon successful completion of the course, students will be able to

Understand in detail the concept and problems being faced by the rural markets.

Acquaint various strategies that are specific for rural markets to flourish.

Develop an insight of role being played by corporate sector in rural marketing.

Create understanding of other concepts that are related to rural marketing like agriculture and social marketing.

UNIT-I

Rural Markets in India: Nature, Scope, characteristics and the potential of rural markets in India, Rural Marketing and its Concepts., problems in rural marketing.

Rural consumer behavior: Characteristics of Rural Consumers; Rural Market Environment and Infrastructure; Challenges of Rural Marketing;Rural V/s Urban Markets.

UNIT-II

Rural marketing mix: Rural marketing and product life cycle, Rural marketing of FMCGs, Consumer durables and financial services.

Rural Marketing Strategies: Rural Market Segmentation; Product Strategies; Pricing Strategies; Promotion Strategies; Distributor Strategies;

Corporate Sector in Rural Marketing:, Role of IT/ Digitalisation in Rural Marketing (ITC e-Chaupals,

UNIT-III

Organization and functions of Agricultural marketing in India. Classification of agricultural products with particular reference to seasonality and perish ability.

Rural Marketing structure and performance: Processing facilities for different agricultural products. Marketing of Agricultural inputs and Agricultural products.

UNIT-IV

Foundation of Social Marketing: Definition, Scope and Importance; Social Marketing Challenges; Conceptual Framework of Social Marketing; Social Markets Segmentation.

Role of Warehousing: Role of central and state governments. Institutions and organizations in agricultural marketing.Nature, scope and role of co-operative marketing in India.

Suggested Reading:

1. Kotler P and Andreasen (2008) Strategic Marketing for Non-Profit Organisations, Prentice Hall of India, PHI, New Delhi

2. Kashyap, Pradeep, Amp, Raut, Siddhartha(2005) Rural Marketing,Wiley, New Delhi

3. Krishnamacharyulu, C.S.G and Rama Krishnan Lalitha, (2006),"Rural Marketing – Text and Cases", Pearson Education, New Delhi.Reference Books

4. Balram, Dogra and Ghuman, Kharminder. (2008) Rural Marketing, Tata McGraw Hill, NewDelhi,

5. Kotler, P. Lee, N. R., Lee, N.(2008) Social Marketing: Influencing Behaviors for Good, Sage Publications.

6. Kotler, P. Roberto, N. Lee, N. (2002) "Social Marketing: Strategies for Changing Public Behavior",2ndEdition, Sage Publications .

MANAGEMENT OF INDUSTRIAL RELATIONS (AUMBAHR – 01)

UNIT-I

Industrial Relations: Concept, Theories and Evolution. The Dynamic Context of Industrial Relations: Globalization and the National Economy, Responses to Competitive Pressures.

Changes in Employment Practices: System approach to IR-Actors, Context, Web of Rules & Ideology, Trade UNIONSIM, impact of trade unions on wages The Trade unions Act, 1926 {with amendments}

UNIT-II

Labour Problems: Concept of Labour Problems in India, Discipline & Misconduct, Grievance Handling

Industrial Bodies: Tripartite and bipartite bodies, Anatomy of Industrial disputes. Conciliation, arbitration and adjudication.

UNIT-III

Collective Bargaining: Concept, meaning and objectives, Approaches, technique & Strategies to collective Bargaining, Process of Collective Bargaining in detail.

Impact of Collective Bargaining: Impact of CB in detail and workers participation in management on IR.

UNIT-IV

Industrial relations : UK & USA, Japan & Russia International Labor Organization (ILO): Objectives, Structure and Procedure for Admission as a Member. Managing Without Unions The industrial Disputes Act, 1947{with amendments}

Suggested Reading:

1) Sinha, P.R.N. et al (2011). Industrial Relations, Trade Unions, and Labour Legislation. Pearson Eduction.

2) Ackers, P. & Wilkinson, A. (2009). Understanding Work & Employment: Industrial Relations in Transition.Oxford: Oxford University Press.
3) Padhi, P.K. (2012). Labor and Industrial Laws.Prentice Hall of India.
4) Singh, B.D. (2009). Industrial Relations: Emerging Paradigms. Excel Books
5) Blain Pane, International Encyclopedia of Industrial Relations.
6) Sinha- Industrial Relation, Trade union and Labour Legislation. (Pearson Education).
7) C.N.Patil Collective Barganing University Press .
8) S.C.Srivastava Industrial Relation &Labour Laws.
9) Report of National Commission on Labour, 1969 .

LABOUR LEGISLATIONS (AUMBAHR -02)

UNIT-I

Evolution of Industrial workers: Meaning ,Its various phases, Need for Labour Legislation in India

The concept of Labour welfare: definition, Scope and Objectives, welfare work and social work .Main recommendations of second National Labour Commission, The Trade Union Act. 1926.

UNIT-II

Payment of Wages Act, 1936.The Minimum Wages Act, 1948, Contract Labour Act 1970.

UNIT-III

The Maternity Benefits Act,1961. The Payment of Bonus Act, 1965, The Employees Provident Fund and Miscellaneous Provisions act 1952.

UNIT-IV

The Workmen Compensation Act, 1923, Adjustment processes and Voluntary Retirement schemes, The ESI Act 1948, The Factories Act, 1948.

Suggested Reading:-

1) Sinha, P.R.N. et al (2011). Industrial Relations, Trade Unions, and Labour Legislation. Pearson Eduction.
2) Blyton, P. & Turnbull, P. (2009). The Dynamics of Employee Relations. Palgrave Macmillan.
3) Ackers, P. & Wilkinson, A. (2009). Understanding Work & Employment: Industrial Relations in Transition.Oxford: Oxford University Press.
4) Padhi, P.K. (2010). Labor and Industrial Laws.Prentice Hall of India.
5) Singh, B.D. (2009). Industrial Relations: Emerging Paradigms. Excel Books.
6) Sen, R. (2009). Industrial Relations: Text and Cases. Macmillan India.

INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY (AUMBAHR -03)

UNIT-I

Introduction to Industrial Psychology: Meaning, Concept, Nature, Scope &Importance, Problems of industrial psychology.
Psychological testing: Utility, Reliability, and Validity. Individual Differences & their evaluation; Occupational Information and its importance in Industrial Psychology.
Personnel Tests- Purposes & Uses of Tests for Placement, Promotion etc. Validity of Tests, types of Tests and their efficiency, Tests on the basis of intelligence personality and interests, limitation of psychological tests.

UNIT-II

Human Engineering: Introduction, Time Study, Motion study, work study, Hawthorne Study.
Fatigue : Nature, environmental condition, effecting Fatigue, fatigue reduction, monotony, boredom .
Accident Prevention : Introduction, causes of accidents, Industrial safety programmes.

UNIT-III

Organizational Stress: Causes and effects, coping with stress.
Motivation at work: Fundamentals, Financial& Non-Financial aspects.
Attitudes: Introduction, components, Methods of measuring attitudes.
Psychological and Social Issues: Job Simplification, Boredom & Monotony, Fatigue, and Telecommuting.

UNIT-IV

Job Satisfaction: factors influencing job satisfaction. How to increase job satisfaction .

Personnel Counselling: Objectives, types of Counselling , steps & Techniques of counseling.
Group dynamics: Formal & informal groups, group think and group shift.

Suggested Reading:

1) Agunis, H. (2011), Industrial Psychology , Second Edition. Pearson Education, New Delhi
2) Kohli, A.S. & Deb, T. (2010). Organizational Psychology. Oxford University Press, New Delhi.
3) Willard Harrell T. (2009). Industrial Psychology: (Oxford IBH Publishing Co.)
4) Edger Schein (2009). Organizational Psychology PHI, New Delhi
5) Industrial Psychology; E.J. McCormic and IIgen, PHI, New Delhi
6) Industrial Psychology :M.L.Blum, J.C.Nayur (CBS Publishers)

RELATIONAL DATA BASE MANAGEMENT SYSTEM (AUMBAIT -01)

UNIT-I

Overview of DBMS: Basic DBMS terminology, data independence, data Abstraction, Architecture of DBMS.
Distributed Databases: structure of distributed databases, design of distributed databases, Introduction to - data mining, data warehousing.

UNIT-II

Introduction to Data models: Entity relationship model, hierarchical model, relational model,
Object Oriented databases: object relational database, comparison of OOD & ORD, comparison of network, hierarchical and relational models.

UNIT-III

Structure of Relational model: Basic Structure of Relational Data base, Data base Scheme, Query language, storage organizations for relations.
Relational algebra: Fundamental operations, relational calculus, functional dependencies, multivalued dependencies, and normalization.

UNIT-IV

Relational query language: SQL, database integrity, security, concurrency basics, recovery basics, client/ server architecture.
Introduction to SQL, DDL, DML: Working with common database objects, Pitfalls in Relational Database Design, Decomposition.

Suggested Reading:

1) Silberschatz, A, Korth H and Sudarshan S (2012), Database System Concepts, Sixth Edition, McGraw-Hill. 2) Elmsari R. and Navathe S. (2009). Fundamentals of Database Systems, Fifth Edition, Pearson Education, Delhi.
3) Koch, G. &Loney, K. (2009). Oracle 9i The complete reference. Tata McGraw-Hill.
4) Bipin C. Desai (2005). Introduction to Database Management System.Galgotia Publication.
5) Singh Shio Kumar (2009), Database Systems: Concepts, Design and Applications, First edition, Pearson Education.
6) Rob. Peter (2010). Data base system concepts, first edition, Cengage Learning.

E-COMMERCE & IT ENABLED SERVICES (AUMBAIT -02)

UNIT-I

Internet Basics: What Special about Internet. Definition of E – Commerce, Comparison with Traditional Commerce, Framework of Electronic Commerce, The Anatomy of E-Com Applications, Plastic/ E –Money Market, Global Information Distribution Networks.

Web Based Tools for Electronic Commerce: Intranet, Composition of Intranet, Business Applications on Intranet, Extranets. Electronic Data Interchange, Components of Electronic Data Interchange, Electronic Data Interchange Communication Process.

UNIT-II

Domain Name System: Meaning, Need, Importance for e- business
Mobile commerce :Wireless Protocol, WAP, Mobile Computing Applications, Blue tooth. EBusiness models, E-Business security.
Electronic Data Interchange: EDI Applications in Business

UNIT-III

IT Act and Enabled Services : Laws Related to IT Security, Data Communication etc, IT Enabled Services - Call Centre, BPO, Tele-Marketing,

Electronic Payment System: Concept of e-Money, Electronic Payment System, Types of Electronic Payment Systems, Smart Cards, Stored Value cards and Electronic Payment Systems, B2B Electronic payments, Infrastructure Issues in EPS, Electronic Fund Transfer.

UNIT-IV

Web security : Firewall, Transaction security, Secured Socket layout, Security Threats, Network security. Security Protocols such as HTTP, SSL, Firewalls, Personal Firewalls, IDS, VPNs, Public Key Infrastructure (PKI) for Security.

e-Business Applications & Strategies: Business Models & Revenue Models over Internet, Emerging Trends in e-Business, e-Governance, Digital Commerce, Mobile Commerce, Strategies for E-Commerce, Internet based Business Models.

Suggested Books:

1) Efraim Turban, David King, Dennis Viehland, Jae Lee, (2012): Electronic Commerce – A Managerial Perspective, 4th Edition, Pearson Education.
2) Elias M. Awad (2009). Electronic Commerce- From Vision to Fulfillment, 3rd Edition.PHI Learning.
3) Dave Chaffey (2011). E-Business and E-Commerce Management- Strategy, Implementation and Practice, 3rd Edition, Pearson Education.
4) Bharat Bhaskar (2009). Electronic Commerce- Framework, Technologies and Applications, 3rd Edition, Tata McGraw Hill
5) Efraim Turban, David King, Dennis Viehland, Jae Lee, (2009): Electronic Commerce – A Managerial Perspective, 4th Edition, Pearson Education.

SYSTEM ANALYSIS & DESIGN AND SOFTWARE ENGINEERING (AUMBAIT -03)

UNIT-I

Systems Concept: Characteristics of a System; Elements of System; Types of Systems; Decision Support System; System Design.

System Development Life Cycle: Meaning, Investigation, Analysis, Design, Implementation, Post Implementation Review and Maintenance.

UNIT-II

Systems Planning and Investigation: Basis for Planning in Systems Analysis - Dimensions of Planning, Initial Investigation, Needs Identification.

Determining the User's Information Requirements: Feasibility Study, Feasibility Considerations, Steps in Feasibility Analysis - Feasibility Report.

UNIT-III

Tools of Structured Analysis: Data Flow Diagram (DFD), Entity Relationship Diagrams, Data Dictionary.

Process Modeling: Structured English, Decision Tree & Decision Table, Architectural Design, Object Oriented Analysis (OOA) and Object Oriented Design (OOD).

UNIT-IV

Software Architecture: Architectural View Model, Framework, Development, Erosion and Software Architecture Recovery.

Basics of Information Security: Types of Attacks, Viruses, Virus Control, Hackers, Overview of Risks associated with Internet, Risk Management, Disaster Recovery Plan, Cryptography and authentication.

Suggested Readings:

1) Tanenbaum, A. S. (2009). Computer Networks. Pearson Education
2) David A Stamper (2011).System ananlysis. Addison Wesley.
3) Burke Richard J (2011).System Analysis & Design: Concepts and Practice, A Hands-On Approach, First edition, Pearson.
4) Kenneth E Kendall and Julie E Kendall – SAD (PHI Publication, 7 Ed.)
5) AnkitFadia -Encryption-Protecting your Data (Vikas Publication, 1st Ed.).

INTERNATIONAL MARKETING (AUMBAIB – 01)

UNIT-I

Overview of World Business and Framework of International Marketing: Definition of International Marketing, International Dimensions of Marketing, Domestic v/s International Marketing, Process of Internationalization, Benefits of International Marketing. World Market Environment: Political Environment, Legal Environment- Legal Market, Gray Market, Cultural Environment.

UNIT-II

Planning for International Marketing: Marketing Research ,Marketing Information Sources, Marketing Information System, Market Analysis. Foreign Market Entry Strategies: Exporting, Licensing, Joint Ventures, Strategic Alliances, Acquisitions Franchising, Assembly Operations , Management Contracts, Turnkey Operations, Free Trade Zones

UNIT-III

International Product Policy and Planning: Product Design and Standardization, Developing

an International Product Line. Foreign Product Diversification, International Branding Decisions, International Packaging.

International Pricing Strategy: Role of Pricing, Price Standardization, Pricing Decisions, Price Distortion, Transfer Pricing, Counter Trade, Terms of Sale, Methods of Financing and Means of Payment International Channels of Distribution – Channel Members, Channel Management, Retailing in International Scenario, International Physical Distribution.

UNIT-IV

International Marketing Decisions : International Promotion Strategies- Promotion Mix, Promotion and Communication, Personal Selling, International Sales Negotiations.

International Advertising: Patterns of Global Advertising, Global Advertising Regulations , Advertising Media, Standardized International Advertising, International Organizational Control.

SUGGESTED READINGS

1) Cateora, Philip R. and Graham John L. (2008). International Marketing. 11th Edition, Tata McGraw- Hill, New Delhi .
2) Czinkota, Michael R., and Ronkainen, Ilkka A. (2007)). International Marketing, 8th Edition, Cengage Learning, New Delhi.
3) Hollensen, S. (2010), Global Marketing , 4th Edition, Pearson Education.
4) Onkvisit, Sak and Shaw Johan J. (2009) International Marketing- Strategy and Theory, Fifth Edition, Taylor and Francis
5) Keegan, Warren J. (2009). Global Marketing, 4th Edition, Pearson Education, New Delhi..
6) Joshi, R M (2005) , International Marketing, Oxford University Press.

INTERNATIONAL BUSINESS ENVIRONMENT AND FOREIGN EXCHANGE ECONOMICS

(AUMBAIB – 02)

UNIT-I

An Overview of International Business: Introduction, Definition of International Business, Changing Environment of International Business, Globalization of Markets.

Recent Trends in Globalization: Effects and Benefits of Globalization.

UNIT-II

International Business Theories: Introduction Mercantilism, Absolute Advantage Theory Comparative Cost Theory, Hecksher-Ohlin Theory, Product Cycle Theory.

Instruments of Trade Policy: Tariffs, Subsidies, Import Quotas, Voluntary Export Restraints, Administrative Policy, Anti-dumping Policy.

UNIT-III

Foreign Exchange Market: Introduction, Exchange Rate Management, Forex Market.

Foreign Exchange Determination Systems: Basic Concepts Relating to Foreign Exchange, Various types of Exchange Rate Regimes, Factors Affecting Exchange Rates, Brief History of Indian Rupees Exchange Rates.

UNIT-IV

International Institution: UNCTAD, Its Basic Principles and Major Achievements, IMF, Role of IMF, IBRD, Features of IBRD, WTO, Role and Advantages of WTO. Regional Economic Integration: Introduction, Levels of Economic Integration, Regional Economic Integration in Europe, Regional Economic Integration in U.S.A., ASEAN, SAARC, Integration for Business.

SUGGESTED READINGS:

1. Saleem, Shaikh (2012). International Business Environment, 2nd edition, Pearson Education.
2. Tulsian, P C(2009) , "Business Laws," Tata McGraw Hill, New Delhi
3. Paul J (2010) Business Environment Text & Cases, Third Edition, Tata McGraw Hill
4. Prakash, B A (2009) ed "The Indian Economy Since1991; Economic reforms and performance" Pearson Education, New Delhi
5. Pailwar, V K (2010), "Economic Environment of Business," 2nd Edition, Prentice Hall India Learning, New Delhi
6. Khan, M. Y. and Jain P. K. (2011).International Financial Management, Text, Problems & Cases, 6th Edition, Tata McGraw Hill Company, New Delhi.
7. Maheshwari, S.N.(2009)., Financial Management – Principles & Practice, 13th Edition, Sultan Chand & Sons.
8. Bhalla V.K (2009). - International Business Environment (Anmol).

EXPORT MANAGEMENT AND DOCUMENTATION (AUMBAIB – 03)

UNIT-I

Introduction to Export Management: Introduction, Definition of Export, Benefits arising from Export, Export Prospect for Small Firms, Importance of Exports to India, Process of Export Marketing, Sources of Export Information, Important Publications, Important Organizations, Recent Trend in India's Export. Selection of Products and Identification of Export Markets: Choosing a Product, Methods of Identifying Export Winners, Suitability of a Product for A company, Selecting Products for Manufacturing and Export, Selection of Export Markets, Criteria for Grouping Countries.

UNIT-II

Export Marketing Channels: Concepts of Distribution Channels, International Channels Distribution, Agents in Exporting.

Export Sales Contract: Methods of Locating and Selecting an Agent, Signing the agreement, Nature of Exports Sales Contract, Important Incoterms, Settlement of Disputes, Terms of Payment in Export.

UNIT-III

Export Finance: Various sources of Export Financing, Preshipment Finance, Postshipment Finance, Special Financial Facilities, Export Import Bank of India, E.C.G.C. Export Pricing: Various modes of export Pricing, Its determinants, Mechanism of Price Fixation, Benefits to India Exports.

UNIT-IV

Formalities of Registration : Naming the Enterprise, form of Ownership, Opening a Bank Account, General Registrations, Registrations with RBI, Registration with Licensing Authorities.

Defining Export Documentation: Main Commercial Documents, Additional Commercial Documents, and Statutory Documents for Export's Country, Statutory Documents for Imports Country and Documents for Claiming Export Benefits.

SUGGESTED READINGS

1) Cherunilam, F -International Trade and Export Management (Himalaya, 2007)
2) Kotabe – Global Marketing Management, 5ed (Wiley)
3) Varshney R.L, Bhattacharya B-International Marketing Management (Sultan Chand & Sons, 9th Ed.) 4)Govt. of India - Hand Book of Export Import Policy 2002-2007 (Ministry of Commerce, India)
5)Keegan J Warren – Global Marketing Management (Pearson, 7th Ed.)

Semester-3

ENTREPRENEURSHIP DEVELOPMENT (AUMBA-301)

UNIT-I

Entrepreneurship: Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, stages in entrepreneurial process.
Entrepreneurial Growth: Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneur; Manager Vs. Entrepreneur.

UNIT-II

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative **Performance, Feasibility Analysis:** Economic, Marketing, Financial and Technical.
Project Planning: Evaluation, Monitoring and Control segmentation. Creative Problem Solving

UNIT-III

International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestics' entrepreneurship, Stages of economic development.
Institutional support for new ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small scale Industries, Govt. Policies for SSIs.

UNIT-IV

Family and Non Family Entrepreneur: Role of Professionals, Professionalism vs family entrepreneurs, Role of Woman entrepreneur.
Venture Capital: Venture capital, Nature and Overview, Venture capital process, locating venture capitalists.

Suggested Readings:

1. Kuratko, D.F. &Hodgetts, R.M. (2011). Entrepreneurship: Theory, Process and Practice. Thomson Press
2. Charantimath, P. (2009). Entrepreneurship Development: Small Business Enterprises. Pearson.
3. Bridge Setal (2009). Understanding Enterprise: Entrepreneurship and Small Business (Palgrave,
4. Holt (2009) .Entrepreneurship : New Venture Creation, Prentice-Hall
5. Hunger J D and Wheelen T L (2009). Strategic Management ,Addison-Wesley
6. Dollinger M J (2009). Entrepreneurship ,Prentice-Hall

INTERNATIONAL FINANCE& TAX PLANNING (AUMBA-302)

Course Objectives:

The aim of this course is to familiarize the student with latest provisions of International Financial Management, tax laws and related judicial pronouncements having implications for various aspects of corporate planning with a view to derive legitimate tax benefits permissible under the law. The knowledge acquired may find a useful application in taking different financial/managerial decisions after taking into consideration the impact of tax laws.

Course Learning Outcomes:

Understanding the implications of tax benefits and incentives for corporate decisions in various situations.

Understanding International Finance and Taxation

Gain proper knowledge about exchange rates, stock market, derivate markets and GST.

UNIT-I

Global Financial Environment: Overview, International Monetary System: Exchange Rate, IMF, EURO Market, Balance of Payments.

Foreign Investment Decision: Recent trends of FDI & FII in India, Flow of FDI & FII, Relation with Indian Economy.

Foreign Exchange Market in India: Nature, Structure & Limitations.

UNIT-II

Exchange Rate Determination: The Exchange Rate of Rupee, Foreign Exchange Risk Exposure: Types of Risk, Hedging.

Derivative Market in India: MCX, Structure of Derivates, Options, Difference between Future and Forwards, Swaps, Role of SEBI.

UNIT-III

Taxation: Introduction to Taxation Management -Taxation system in India. Basics of Direct and indirect taxes. An overview of Tax Audit- Tax incentives and Export promotion. Concepts relating to Tax Avoidance and Tax Evasion, Issue of Bonus Shares, Right Issue ,Dividends etc.

GST: IGST, CGST

UNIT-IV

Tax Planning: Effects of taxation on Investments. Role of tax Planning Manager, and factors to be considered for Tax Planning. Need of Financial Planning.

Tax Management: Filing of Returns, Penalties and Prosecutions, Advance Tax, TDS, Income Tax Rates/Slabs (Current assessment Year, Theoretically), Various Investment avenues to claim rebate from tax sections like 80c,80 D etc.

Suggested Readings:

1) Apte, P.G (2011). International Financial Management (Tata Mcgraw–Hill).

2) Sharan (2010) International Financial Management (Prentice–Hall)

3) Shapiro – Multinational Financial Management (Prentice–Hall)

4) Bhalla, V.K.(2009) : Financial Management and Policy, 2nd ed., New Delhi, Anmol,

5) AhujaGirish, Gupta Ravi, (2010). Systematic Approach to Income Tax, Service Tax and VAT, Bharat Law House Pvt. Ltd., New Delhi

6) Singhania V.K., Singhania Monica (2006) "Student's Guide to Income Tax", Taxman Publications, Delhi.

SUPPLY CHAIN MANAGEMENT (AUMBA-303)

UNIT-I

Introduction*:* Basic Concept & Philosophy of Supply Chain Management*;* Essential features, Various flows (cash, value and information), Key Issues in SCM, benefits and case examples.

UNIT-II

Logistics Management: Logistics as part of SCM, Logistics costs, different models, logistics subsystem, inbound and outbound logistics, bullwhip effect in logistics, Distribution and warehousing management.

Purchasing & Vendor management: Centralized and Decentralized purchasing, functions of purchase department and purchase policies.Use of mathematical model for vendor rating/evaluation, single vendor concept, management of stores, accounting for materials.

UNIT-III

Inventory Management: Concept, various costs associated with inventory, various EOQ models, buffer stock (tradeoff between stock out/working capital cost), lead time reduction, re-order point/ re-order level fixation, exercises –numerical problem solving , ABC, SDE/ VED Analysis, Just-In-Time & Kanban System of Inventory management.

UNIT-IV

Recent Issues in SCM : Role of Computer/IT in Supply Chain Management, CRM Vs SCM, Benchmarking concept, Features and Implementation, Outsourcing-basic concept, Value Addition in SCM-concept of demand chain management.

SUGGESTED READINGS

1.Mohanty:Supply chain Management(Theory & Practice),Biztantra
2.Sanders: Supply chain Management(A global Perspective),Wiley India
3. Raghuram G. (I.I.M.A.) - Logistics and Supply Chain Management (Macmillan, 1st Ed.)
4. Krishnan Dr. Gopal - Material Management, (Pearson,New Delhi, 5th Ed.)
5. Agarwal D.K. - A Text Book of Logistics and Supply chain management (Macmillan, 1st Ed.).
6. Sahay B.S. - Supply Chain Management (Macmillan, 1st Ed.)
7. Chopra Sunil and Peter Meindl - Supply chain management (Pearson, 3rd Ed

PRINCIPLES OF INSURANCE AND BANKING (AUMBAFM-04)

Course Objectives

To impart knowledge about the principles and working of different insurance policies.
To make students understand about the basic concepts related to insurance which are generally not known.
To introduce about the banking laws, operations and the trends that are prevalent in the banking industry.

Course Outcomes

At the end of the course students are able to:

Have knowledge about various types of insurance and its basic principles.

Understand about various insurance related documents and other attachments associated with insurance.

Extrapolate the types of operations and its management in banking business.

Get familiar about recent trends in banking in India.

UNIT-I

Life Insurance Products: Introduction, Principles, Various Life Insurance Policies of DifferentInsurance Companies; Further Classification of Life Insurance Policies.

General Insurance: Types, Policies, principles.

Annuity Policy: Introduction; Basis of Annuity Income; Classification of Annuities; Uses ofAnnuity; Limitation of Annuity.

Insurance Documents: Introduction; Documents; Prospectus; Proposal Form; First PremiumReceipt; Policy Document; Endorsement; Renewal Notice; Bonus Notice.

UNIT-II

Computation of Premium: Introduction; Age Factor; Factors of Calculating the Premium; Extra Premium;Extra Premium; Mode of Premium Payable.

Pension plans & GroupInsurance: Introduction of Pension Plans; Type of Pension Plans; Group Insurance; Types ofGroup Insurance.

Social & Rural Insurance: Introduction; Social Insurance; Legal Provisions; Rural Insurance.

UNIT-III

Riders, Options and Guarantees: Introduction; Riders; Disability; accident; Living; Benefits;Conditions; Policy Options; Policy Guarantee.

Computation of Benefits: Introduction, Bonus, Guaranteed Additions, Surrender Value,Guaranteed Surrender Value, Paid Up Value, Examples.

Claims: Introduction; Maturity Claim; Death Claim, Nomination & Assignment.

UNIT-IV

Evolution of Banking Law: Main provisions of Banking Regulation Act, 1949; and RBI Act,1934 and Negotiable Instruments Act, 1881.

Banking Operations: Acceptance of Deposits, Lending of Funds- E Banking/Online banking-Electronic Funds transfer systems, Clearing House operations.

Underwriting Procedure, NPA and Capital Adequacy in Indian Banks.

Recent Trends in Banking: CBS, CRM, Treasury Management and Investment Banking.

Suggested Readings:

1. N.M. Mishra: Principles & Practice of Insurance, S. Chand and Co.,Ltd., New Delhi.

2. Shashidharan K. Kutty: Managing Life Insurance, Prentice-hall Of India Pvt Ltd

3. James L Athearn: Risk and Insurance, Prentice Hall Of India Pvt Ltd

4. Lester William Zartman: Life Insurance,General Books Publications

5. Louis S. Shuntich: Life Insurance Handbook, Marketplace Books Publications

6. Vaughan:Fundamentals of Risk and Insurance,Wiley India

STRATEGIC FINANCIAL MANAGEMENT (AUMBAFM-05)

UNIT-I

Financial Policy and Strategic Planning: Components of financial strategy; Objectives and goals; Strategic planning process. Portfolio Tools, Mean-Variance Analysis and Capital asset pricing model, Factor models and Arbitrage Pricing Theory.

UNIT-II

Investments Decisions under Risk and Uncertainty: Techniques of investment decision- risk adjusted discount rate, certainty equivalent factor, statistical method, sensitivity analysis and simulation method; Corporate strategy and high technology investments.

UNIT-III

Financial analysis and planning, Financial models, Forecasting Financial Statements, Cross sectional analysis of financial statement information, Control, governance and financial architecture. Corporate Valuation and Value Based Management

UNIT-IV

Expansion and Financial Restructuring: Mergers and amalgamations – corporate re structuring, Buy-back of shares, LBO, Sell-off, Spin-off, Demerger and reverse merger, reasons for merger, legal procedure for merger, benefits and cost of merger; Determination of swap ratios; Evaluation of merger proposal; Corporate and distress restructuring.

Suggested Readings:

1. Allen, D: An Introduction to Strategic Financial Management, CIMA/KoganPage, London.
2. MeenaGoel:Strategic Financial Management,Biztantra Publication
3. Chandra, Prasanna: Financial Management, Tata McGraw Hill, Delhi.
4. Copeland, T., Koller, T and Murrin, J: Valuation: Measuring and Managingthe value of Companies, John Wiley, International Edition, New York.
5. Copeland, T.E. and Weston, J.F: Financial Theory and Corporate Policy,Addison-Wesley
6. Hampton, Jone: Financial Decision Making, PHI, New Delhi.
7. Kaplan, Robert S., and Cooper, Robin: Cost & effect: using integrated cost systems to drive profitability and performance, Harvard Business Press.
8.Grinblatt, Mark and Titman, Sheridan: Financial Markets and Corporate Strategy, Tata McGraw Hill.
9. Foster, George: Financial Statement Analysis, Pearson Education.
10. Brealey, Richard A. and Myers, Stewart C.: Principles of corporate finance, Tata McGraw Hill.

MANAGEMENT OF FINANCIAL SERVICE(AUMBAFM-06)

Course Objectives

- To provide a broader understanding of the issues facing the financial system, having particular reference to Indian financial system and its constituents.

- To discuss the different components of the contemporary financial systems viz., financial institution, financial markets and financial instruments.

Course Outcomes

Upon successful completion of the course, the students will be able to

Widen the learning horizons w.r.t. crucial components of the financial system; and,

Sensitize w.r.t. governance and administration issues concerning financial system, focusing on Indian financial system.

UNIT-I

Financial Services: Meaning, types and their importance. Securities Trading - Online Vs OfflineTrading, Demat and Remat.Depository - Introduction, Concept, depository participants,functioningofdepository systems, process of switching over to depository systems, benefits,depository systems in India, SEBI regulation.

UNIT-II

Mutual funds and AMCs: Concept, origin and growth of mutual funds, Constitution &management of MFs - Sponsors, Trustees, AMCs, and custodians.Classification of mutual fund schemes, advantages and disadvantages in mutual fund schemes, NAV and pricing of mutual fundunits.

Insurance Services: Introduction, Principles of insurance, Types of Insurance.LifeInsurance Products- Traditional and ULIPs.

Credit rating: the concept and objective of credit rating, various credit rating agencies in Indiaand International credit rating agencies, factors affecting creditrating& procedural aspects.

UNIT-III

Leasing: Concept and development of leasing, business,difference between leasing & hirepurchase, types of leasing business, advantages to lessor and lessee.

Merchant Banking: Origin and development of merchant banking in India scope, organizationalaspects and importance of merchant bankers. Latest guidelines of SEBI w.r.t Merchant bankers.

Venture capital: concepts and characteristics of venture capital, venture capitalin India,guidelines for venture capital.

UNIT-IV

Call money market, Treasury bill market, Commercial Bill market, Market forCPs and CDs,Discount market and market for financial guarantees.

Factoring: Development of factoring types & importance, procedural aspects infactoring,financial aspects, prospects of factoring in India.

Plastic Money: Concept and different forms of plastic money - credit and debitcards, pros andcons. Credit process followed by credit card organizations. Factors affecting utilization ofplastic money in India.

Suggested Readings:

1. Shanmugham:Financialservices,Wiley India

2. E.Gordon& K. Natarajan Financial Markets & Services Himalaya

3. LalitK.Bansal Merchant banking & Financial Services Unistar Books

4. S Gurusamy Financial services & system Thomson

5.Nalini P T Financial Instruments and services PHI

6. M Y Khan Financial Services Tata McGraw-Hill

7. L M Bhole Financial Institutions & Markets Tata McGraw-Hill

8. Lalit K. Bansal Merchant Banking & Financial Services Unistar Books

MARKETING OF SERVICES (AUMBAMK-04)

UNIT-I

Introduction: Difference between Product and Services Marketing, Characteristics of Services Classification of Services, Paradigms in Services Marketing, Importance of Customer
Relationship Management : Specific for Service Industry.

Service Marketing System: Service Quality, Understanding Customer Expectations and Zone of Tolerance, Segmentation and Zone of Tolerance, Targeting and Positioning of Services.

UNIT-II

Services Marketing Mix: Augmented Marketing Mix, Developing the Service Product/ Intangible Product, Service Product Planning, Service Pricing Strategy, Services Promotions, Services Distributions.
Physical Evidence: Role of Communication in Service Marketing, People and Internal Communication, Process of Operations and Delivery of Services, Role of Technology in Services Marketing.

UNIT-III

Marketing of Financial Services: Deciding the Service Quality, Understanding the Customer Expectations, Segmenting, Targeting and Positioning of Financial Services, Devising Financial Services, Marketing Mix Strategies with Special Reference to Credit Cards, Home Loans, Insurance and Banking, Marketing of Telecom/ Insurance Services.

UNIT-IV

Services in Global Perspective: International Marketing of Services Recent Trends, Principal Driving Force in Global Marketing of Services, Key Decisions in Global Marketing, Services Strategy and Organizing for Global Marketing.

Suggested Readings:
1. Baron S and Harrisk - Services Marketing: Text and Cases (Palgrave, 2nd Ed.)
2. Love lock Christopher - Services Marketing: People, Technology and Strategy (Pearson Education, 5th Ed.)
3.Gronrooves: Service Management and Marketing,Wiley India
3. Zeithaml - Services Marketing (Tata McGraw Hill, 3rd Ed.)
4. Woodruff Helen - Service Marketing (Macmillian, 1st Ed.)
5. Payne Adrian - The Essence of Service Marketing (Prentice Hall of India)
6. Rama MohanaRao - Services Marketing. (Person Education, 1st Ed.)
7. GovindApte - Services Marketing (Oxford University Press)

RETAIL MANAGEMENT (AUMBAMK 05)

Course Objectives: To introduce the student to the field of retailing management and enable them to understand the problems and issues faced by retailers and develop winning strategies for retailing business.

Course Learning Outcomes:

1. Understanding the nature and importance of retail management

2. Understanding various kinds of retail formats

3. Developing marketing competencies in international retailing.

UNIT-I

Overview of Retailing Environment and Management: Retailing, Definition and Concept, Functions of Retailing, Driving Forces for Retailing, Building and Sustaining Relationships, Strategic Planning, Structural Change, Type of Retail Outlets, Market Structure, Retail Planning, Development and Control. The Customer and Retail Business: Knowing your Customers, Focusing on the Consumer, Mapping Out Society, Learning, Attitude. Motivation and Perception.

UNIT-II

Situational Analysis: Retail Institutions by Ownership. Retail Institutions by Store-based Strategy-Mix, Web, Nonstore-based and other Forms of Non Traditional Retailing. Targeting Customers and Gathering Information. Communicating with Customers. Promotional Strategies used in retailing. Choosing a Store Location: Trading Area Analysis, Site Selection,. Store Design and Layout, The Store and its Image, The External Store, Internal Store, Display, Visual Merchandising and Atmospherics.

UNIT-III

Managing Retail Business: Retail Organization and HRM, Retail Organisation and Operations Management, Financial Dimensions, Managing Retail Services. Service Characteristics, Branding, Perceptions of Service Quality.

UNIT-IV

Delivering the Product: Retail Information Systems, Merchandise Management Retail Pricing, Development and Implementing Plans, People in Retailing.

International Retailing: Internationalization and Globalization, Shopping at World Stores, Going International, The Internalization Process, Culture, Business and International Management.

Suggested Readings:

1.James R. Ogden:Integrated Retail Management,Biztantra Publication

2. Newman A.J. and Cullen P - Retailing : Environment and Operations (Vikas, 1st Ed.)

3. Berman B and Evans J.R - Retail Management (Pearson Education, 9th Ed.)

4. Michael Levi M and Weitz BW - Retailing Management (Tata McGraw Hill, 5th Ed.)

5. Dunne Patrick M., Lusch Robert F. and Griffith David A - Retailing (Cengage Learning, 4th Ed.)

6. Cox Roger and Brittain Paul - Retailing: An Introduction (Pearson Education, 5th Ed.)

7. Newman and Cullen - Retailing (Cengage Learning, 1st Ed.)

8. Vedmani G. Gibson-Retail Management- Functional Principles & Practice (Jaico Publications,

SALES AND DISTRIBUTION MANAGEMENT (AUMBAMK-06)

UNIT-I

Introduction: Selling as a Part of Marketing, Sales Management Process, Role of Sales Manager, Concept of Personal Selling, Sales Management and Salesmanship, The Ones of Personal Selling, Process of Personal Selling, Qualities of a Successful Salesman.
Goals in Sales Management: Goal Setting Process in Sales Management, Analyzing Market Demand and Sales Potential, Techniques of Sales Forecasting, Preparation of Sales Budget, Formulating Selling Strategies, Designing Sales Territories and Sales Quota.

UNIT-II

Sales Force Management: Organising the Sales Force, Designing the Structure and Size of Sales Force, Recruitment and Selection of Sales Force, Leading and Motivating the Sales Force, Training and Compensating the Sales Force, Sales Contests, Evaluation and Analysis.

UNIT-III

Introduction to Distribution Management: Concept of Distribution Channel, Importance of a Channel, Types of Channels, Primary Distributors, Specialized Distributors and Participants, Distributors: Policies and Strategies.

UNIT-IV

Channel Management: Forces of Distributing Systems, Distributors Selection and Appointment, Channel Conflicts and their Resolutions, Training the Distributors Sales Team.

Suggested Readings

1. Donaldson B - Sales Management : Theory and Practice (Palgrave)
2. Cron: Sales Management,Wiley India
3. Jobber David and Lancaster Geoff - Selling and Sales Management (Pearson Education)
4. Spiro - Sales Force Management (Tata McGraw Hill, 11th Ed.)
5. Still Richard R, Cundiff Edward W. and Govoni Norman A.P - Sales Management: Decisions, Strategies and Cases (Pearson Education, 5th Ed.)
6. Rosenbloom– Marketing Channels (Cengage Learning, 7th Ed.)
7. Johnson and Marshall - Sales Force Management (Tata McGraw Hill, 8th Ed.)
8. Coughlan A.T., Stern Louis W., EL-Ansary A.I. and Anderson E - Marketing Channels (Prentice Hall of India, 6th Ed.)

HUMAN RESOURCE PLANNING AND DEVELOPMENT (AUMBAHR-04)

UNIT-I

Micro level manpower planning and labour market analysis; Organisational human resource planning; Career Management and career planning; Performance planning; Potentials appraisal and career development Meaning, Scope, Dimensions & Dynamics of HRD; Approaches of HRD, HRM & HRD, Challenges of HRD, HRD Systems, HRD Strategies, HRD Model, Techniques of Assessment.

UNIT-II

HRD needs: Organizational Analysis; Task analysis and individual analysis.
HRD strategies: Individual development; team development; designing training programmes, on the job, off-the job; Training methodology; role of trainer; MDPs; Out bound training; Training evaluation.

UNIT-III

Competency mapping; Job redesigning; Job enlargement; Job enrichment; Job rotation; Suggestion schemes; Career Planning; Career strategy, Career Development, Employee Counselling, Employee Powerment.

UNIT-IV

Quality of Worklife; Quality Circles; Kaizen; Strategic Human Resource Development; Problems and Prospects of HRD in Indian Organization; HRD experiments and cases – In India and other countries.

Suggested Readings:

1. Desimone; R.L. Werner, JM & Harris, D.M. : Human Resource Development, Thomson.
2. Mishra:Human Resource Planning and Development,Dreamtech press
3. Rajsekharan, N.P.: Competency Web, Universities Press.
4. Rao, T.V.: Reading in HRD, Oxford & IBH.
5. Pareek, UdailRao, T.V: Designing and Managing Human Resource Systems, Oxford & IBH.
6. Arthur, M. : Career Theory Handbook, Englewood Cliffs, Prentice Hall Inc., 1991
7. Belkaoui, A. R. and Belkaoui, J.M. : Human Resource Valuation: A Guide to Strategies and Techniques, Greenwood, Quorum Books, 1995.
8. Dale, B. : Total Quality and Human Resources: An Executivew Guide, Oxford, Blackwell, 1992.
9. Greenhaus, J.H. : Career Management, New York, Dryden, 1987.
10. Kavanagh, M. J. etc. : Human Resource Information System: Development and Applications, Boston, PWS-Kent, 1993.

TEAM BUILDING & LEADERSHIP (HR-05)

Course Outcome

It is designed to help any team leader, from a design and put together a winning team to achieve what ever goals it has set. It include vital information such as design and purpose of teams in various real life scenarios, the psychological aspect of the team membership and team building, shaping realistic goals and assessing resources to develop your team, and team building exercises to help you motivate and inspire your team to achieve maximum success.

Course Objectives

1.Describe the concept of a teambuilding and leadership.

2. Identify the different types of teams and develop different strategies for leading them

3.Identify the different types of teams and values of a leader.

4.How to develop a groups .

5.Traits of leadership and theories.

6.leadership skills and Building High Performance Teams.

UNIT-I

Leadership – Meaning, Concepts and Myths about Leadership, Components of Leadership-Leader, Follower sand situation. Assessing Leadership & Measuring Its effects.

UNIT-III

Focus on the Leader – Power and Influence; Leadership and Values. Leadership Traits; Leadership Behaviour; Contingency Theories of Leadership; Leadership and Change.

UNIT-III

Groups – Nature, Group Size, Stages of Group Development, Group Roles, Group Norms, Group Cohesion. **Teams** – Effective Team Characteristics and Team Building, Ginnetts Team Effectiveness Leadership Model.

UNIT-IV

Leadership Skills – Basic Leadership Skills, Building Technical Competency, Advanced Leadership Skills, Team Building for Work Teams, Building High Performance Teams.

Suggested Readings :

\

1. Hughes, Ginnett, Curphy - Leadership, Enhancing The Lessons of Experience (Tata McGraw

Hill, 5th Ed.)

2. Dubrin:Leadership research Findings Practice and Skills,Biztantra publications

3. Yukl G - Leadership in Organisations (Pearson, 6th Ed.)

4. West Michael - Effective Team Work (Excel Books, 1st Ed.)

5. Sadler Philip - Leadership (Crest Publishing House)

TRAINING AND DEVELOPMENT FOR PERSONAL GROWTH (HR-06)

Course Objectives

The objective of the course is to develop a personality traits for internal and external organizational excellence. Training and learning supports diversity and manages change effectively.

Course Outcomes:

1.Use concepts to become self-aware of strengths and discover innate potential which is the source of personal power.

2.Learn personality determinants to overcome weakness and foster holistic development that encompasses physical, mental, social and spiritual self.

3.Understand training need assessment and its need.

4.Become an effective speaker and an active listener.

UNIT-I

Personality : Meaning & Concept, Personality Patterns, , Moulding the Personality Pattern, Persistence& Change.
Psychometric Theories –Cattele and Big Five,
Psychodynamic Theories - Carl Jung and MBTI, Transactional Analysis, Johari –Window, Personal Effectiveness.

UNIT-II

Personality determinants.
Evaluation of Personality.
Sick Personalities and Healthy Personalities.

UNIT-III

Training: Concept, Role, Need and Importance of Training, Types of Training, Understanding, Designing Training Programmes.
Learning: Process of Learning, Developing an Integrated Approach of Learning in Training Programme.

UNIT-IV

Training Need Assessment: Determination of Training Needs, Approaches to Training Needs Assessment, TNA Cycle of Events, Methods of conducting Training, Evaluation of Training Programmes.

Suggestion Readings :

1. Hurlock., Elizabeth B - Personality Development (Tata McGraw Hill, 1st Ed.)
2. B.Janakiram:Training&Development,Biztantra Publications
3. UdaiPareek - Understanding Organizational Behaviour (Oxford, 2nd Ed.)
4. SahuR..K. - Training for Development (Excel Books, 1st Ed.)
5. Tapomoy Deb - Training & Development Concepts &Application(Ane Books, 6th Ed.)
6. Friedman &Schustack - Personality: Classic Theories and Modern Research (Pearson)
7. Lynton &Pareek - Training for Development (Vistaar Publication, 2nd Ed.)
8. Hall Calvin S.et al - Theories of Personality (Wiley-India Text Books, 4th Ed

DATA COMMUNICATION & NETWORK (AUMBAIT-04)

UNIT-I

Fundamentals of Communication System; Communication Links, Communication System Formats; Character Codes, Digital Data Rates; Asynchronous and Synchronous Data, Types of signals: AM; FM; PM; PCM; PDM; TDMA; FDMA; SDMA; CDMA; ASK; FSK; PSK
Features: Error detection and correction codes; Hamming codes.

UNIT-II

LAN topologies: Workstation; Server; Cables; Types of Ethernet; Broadband and base-band; Optical Fibers; Network Interface Card.
Networks and accessories: LAN, MAN, WAN; Hub; Bridges; Switches; Routers; Gateways Cell Relay; Frame Relay; ISDN; B-ISDN

UNIT-III

OSI Model; Broadcasting; Multicasting; Point-to-point communication; IP Addressing, Concepts of Port; Socket; ATM; Tunneling; Virtual Private Network.
Network Operating systems: Unix; Linux; Windows.

UNIT-IV

Mobile Communication: Applications of Mobile Communication; Wireless Communication: Bandwidth, Transmission Impairment, Interference, Terrestrial Microwave, Broadcast Radio, Infrared & Light Waves,
Mobile Internet & WML: Mobile IP, Wireless TCP& UDP, WAP, WML

SUGGESTED READINGS:
1) James Irvine:Data Communication and Networks,Wiley India
2) Widjaja L G - Communication Networks (Tata McGraw Hill, 2000)
3) Comer - Computer Networks and Internets (Pearson Education, 4th Ed.)
4) Stallings W - Data Computer Communication (Pearson Education, 2003, 7th Ed.)
5) Olifer- Computer Networks,Wiley India
6) Tanenbaum - Computer Networks (Prentice-Hall, 2004, 4th Ed.)
7) Black - Computer Networks (Prentice-Hall, 1999, 2nd Ed.)

ENTERPRISE RESOURCE PLANNING (AUMBAIT-05)

UNIT-I

ENTERPRISE RESOURCE PLANNING:

Evolution of ERP, Definition, Elements, Problem of System islands, need for system Integration, ERP products and Market, Opportunities and problems in ERP selection and implementation, MRP and MRPII.

UNIT-II

BUSINESS PROCESS REENGINEERING:-
Conceptual foundation of Business Process Re-engineering Role of Information Technology in BPR, Process identification and mapping, Process improvement and Process Redesign. Man Management for BPR implementation.

UNIT-III

ERP MODUELS/FUNCTIONALITY:-
Functional modules of ERP system, Sales order processing, MRP, Scheduling, Forecasting, Maintenance, Distribution, Finance and HRP; Features of each of the modules; Description of data flows across each module: Overview of the supporting data bases; Technologies required for ERP, Hardware Platform, Communication and networks.

UNIT-IV

IMPLEMENTATION ISSUES:-
Pre-implementation issues, Financial justification of ERP, Evaluation of Commercial Software; During implementation issues, Education and training, Project management; Post implementation issues, Performance measurement.

INTEGRATION OF ERP WITH NET TECHNOLOGIES:
Net technologies, Evolution of E-Commerce, EDI and E-business, Internet in ERP, Internet banking and related technologies, security and privacy issues, future growth of E-business.

Suggestion Readings :

1. V.K. Garg and N.K. Venkitakrishnan, Enterprise Resource Planning: Concepts and Practices, Prentice Hall (I) 1999, New Delhi.
2. Dey :Business process re-engineering,Biztantra
3. Hammer, Micheal and JamtsChamby Reengineering the corporation, 1997.
4. Leon, Alexix Countdown 2000, Tata McGraw.
5. J. Kanter, Managing with Inforamtion, Prentice Hall (I), 1996, New Delhi.
6. Carr, K. and Johansson, H.J. Best Practices in Re-engineering. New York, McGraw Hill, 1995.

INTERNET AND WEB DESIGNING (AUMBAIT-06)

UNIT-I

Introduction to Internet, Evolution of Internet, Hardware and Software Requirements for Internet, Internet Application, Bandwidth, Types of Internet Connections(Broadband/Dial-UP/Lease Line/ISDN/DSL etc.), World Wide Web, WWW Browsers, WWW Servers.

UNIT-II

TCP/IP Connectivity - IP addressing, DNS, Domain Names Registration process, Routing with TCP/IP Basics, Routing Protocol, Static Routing, Open Shortest Path First Protocol, Exterior Gateway Protocols (EGP, Border Gateway Protocol, Multi-Routing Protocol Environments).
Internet Technology – WI-FI, 2G, 3G etc.

UNIT-III

HTML - Text formatting, Data, Tables, Table layout, Images, HTML Interactivity, URLs, HTTP, NNTP, Hyperlinks, Menus & Image Maps, HTML Form, Embedded objects in HTML, Type forms, Color and Type, Adding Graphics, Adding Graphics with the Image Element, Using images as links, Creating Image Maps, Working with Image Files, Frames.

UNIT-IV

Cascading Style Sheets, Understanding CSSI's Advantages and Limitations, Embedding of CSS In HTML, Learning How CSS Works, Introduction to XML.

Suggested Readings:

1.Kogent:HTML 5 Black book,Dreamtech press
2.DevenShah:A Complete guide to Internet and Web Programming,Dreamtech press
3. Internet Get Started: BPB Publications.
4. Loren Buhle, "Webmaster Professional Reference", New RidersPublishing.
5. Rick Darnell "HTML 4", Techmedia.
6. Tauber, "Mastering Front Page 2000" BPB.
7. James Jaworski, "Making Java Script and JSCRIPT", BPB Publications.

SYLLABUS

Masters of Business Administration

ASSESMENT BASED ON THE FOLLOWING CRITERIA

Sr.No	Assessment Criteria	Percentage To total 100 marks
1	Assignments	08
2	Attendance	05
3	Mid-Term Examination: 1st	08
4	Mid-Term Examination: 2nd	08
5	Class Test	05
6	Quizzes and Presentation	03
7	Attitude and Discussion	03
8	Sub-total (Total Marks of Assessment)	40
9	End- Term Theory Examination	60
10	Total Marks Allotted	100

Note: *End -Semester theory examination will be of sixty marks, while remaining forty marks pertains to internal assessment based on the above mentioned criteria. In theory paper, Candidates need to attempt five questions in all. Q.No.1 is compulsory with short- type answers containing twenty marks covering the whole syllabus. Further, two questions will be set from each unit where one question is compulsory (under each unit). In all, examination time will be of three hours.*

MASTER OF BUSINESS ADMINISTRATION
SYLLABUS

FIRST YEAR

SEMESTER-I

Course No.	Subject	Periods				Division of Marks				
						Theory		Practical		
		L	T	P	Credits	External	Internal	External	Internal	Total
AUMBA-101	Accounting for Managerial Decisions	3	1	-	4	60	40	-	-	100
AUMBA-102	Marketing Management	3	1	-	4	60	40	-	-	100
AUMBA-103	Management Practices and Organizational Behaviour	3	1	-	4	60	40	-	-	100
AUMBA-104	Business Environment	3	1	-	4	60	40	-	-	100
AUMBA-105	Human Resource Management	3	1	-	4	60	40	-	-	100
AUMBA-106	Computer Application in Business	1	-	2	3	60	40	25	25	150
AUMBA-107	Human Values and Professional Ethics	2	-		2	60	40	-	-	100
Total Credits		**18**	**5**	**2**	**25**					**750**

Legend: ***L-lecture, T-Tutorial, P-Practical***

SEMESTER-II

Course Code	Course Title	Periods			Credit	Division of Marks		
		L	T	P		Theory	Internal	Total
AUMBA-201	Business Statistics and Computing Skill	3	1	-	4	60	40	100
AUMBA-202	Financial Management	3	1	-	4	60	40	100
AUMBA-203	Business Research Methods	3	1	-	4	60	40	100
AUMBA-204	Managerial Economics	3	1	-	4	60	40	100
AUMBA-205	Production and Operation Management	3	1	-	4	60	40	100
AUMBA-206	Fundamental of Entrepreneurship	2	-	-	2	60	40	100
AUMBA-207	Communication and Marketing Skill	2	-	-	2	60	40	100
Total Credits		**19**	**5**	**-**	**24**			**700**

Legend: ***L-lecture, T-tutorial, P-Practical***

SECOND YEAR

SEMESTER-III

Course Code	Course Title	Periods			Credit	Division of Marks		
		L	T	P		Theory	Internal	Total
AUMBA-301	Strategic Management	3	1	-	4	60	40	100
AUMBA-302	Business Law	3	1	-	4	60	40	100
AUMBA-303	Operation Research	3	1	-	4	60	40	100
	Specialization Group– (major)	3	1	-	4	60	40	100
	Specialization Group–(major)	3	1	-	4	60	40	100
	Specialization Group – (minor)	3	1	-	4	60	40	100
AUMBA-304	Summer Training Report (i) Seminar presentation 40 (ii) Project report 40 (iii) Viva-Voice 20		3		3		100	100

SEMESTER-IV

Course Code	Course Title	Periods			Credit	Division of Marks		
		L	T	P		Theory	Internal	Total
AUMBA-401	International Finance and Tax Planning	3	1	-	4	60	40	100
AUMBA-402	Management Information System	3	1	-	4	60	40	100
AUMBA-403	Supply Chain Management	3	1	-	4	60	40	100
	Specialization Group– (major)	3	1	-	4	60	40	100
	Specialization Group–(major)	3	1	-	4	60	40	100
	Specialization Group – (minor)	3	1	-	4	60	40	100
AUMBA-404	Research Project i. Seminar presentation 40 ii. Project report 40 iii. Viva-Voice 20		3	2	5		100	100

Each student will have to choose research project based on his major specialization in consultation with his allotted project guide.

SPECIALIZATIONS

FINANCE

3rd Semester

(i) Advanced Financial Management (AUMBAFM-01) (Major)
(ii) Security Analysis and Investment Management (AUMBAFM-02) (Major)
(iii) Management of Banking Operations (AUMBAFM-03) (Minor)

4th Semester

(i) Principles of Insurance and Banking (AUMBAFM-04) (Major)
(ii) Strategic Financial Management (AUMBAFM-05) (Major)
(iii) Management of Financial Services (AUMBAFM-06) (Minor)

MARKETING

3rd Semester

(i) Advertising and Sales Management (AUMBAMK-01) (Major)
(ii) Consumer Behaviour (AUMBAMK-02) (Major)
(iii) Rural Marketing (AUMBAMK-03) (Minor)

4th Semester

(i) Marketing of Service (AUMBAMK-04) (Major)
(ii) Retail Management (AUMBAMK-05) (Major)
(iii) Sales & Distribution Management (AUMBAMK-06) (Minor)

HUMAN RESOURCE MANAGEMENT (HRM)

3rd Semester

(i) Management of Industrial Relations (AUMBAHR-01) (Major)
(ii) labor Legislation (AUMBAHR-02) (Major)
(iii) Industrial/Organizational Psychology (AUMBAHR-03) (Minor)

4th Semester

(i) Human Resource Planning and Development (AUMBAHR-04) (Major)
(ii) Team Building & Leadership (AUMBAHR-05) (Major)
(iii) Personal Growth and Training & Development (AUMBAHR-06) (Minor)

INFORMATION TECHNOLOGY (IT)

3rd Semester

(i) Relational Database Management System (AUMBAIT-01) (Major)
(ii) E-commerce and IT enabled Services (AUMBAIT-02) (Major)
(iii) System Analysis & Design & Software Engineering(AUMBAIT-03) (Minor)

4th Semester

(i) Data Communication & Networks (AUMBAIT-04) (Major)
(ii) Enterprise Resource Planning (ERP) (AUMBAIT-05) (Major)
(iii) Internet & Web Designing (AUMBAIT-06) (Minor)

INTERNATIONAL BUSINESS (IB)

3rd Semester

(i) International Marketing (AUMBAIB-01) (Major)
(ii) International Business Environment and Foreign Exchange Economics (AUMBAIB-02) (Major)
(iii) Export Management And Documentation (AUMBAIB-03) (minor)

4th Semester

(i) International Logistic Management (AUMBAIB-04) (Major)
(ii) International Financial Management (AUMBAIB-05) (Major)
(iii) International business ethics and social responsibility (AUMBAIB-06) (Minor)

The Master of Business Administration (MBA) is a two-year full-time programme. The course structure of the programme is given here under.

At the end of second semester, all students will have to undergo summer training of 6 - 8 weeks with an industrial, business or service organization by taking up a project study. The condition of successfully completing the programmers' shall not be deemed to have been satisfied unless a student's undergoes summer training under the supervision of the department in the organizations as approved by the Department/Faculty from tune to time. Each student will be required to submit a project report to the Department for the work undertaken during this period within one month of the commencement of the third semester for the purpose of evaluation in the third semester.

ACCOUNTING FOR MANAGERIAL DECISIONS (AUMBA-101)

UNIT-I

Accounting and its functions: Concepts and Conventions in Accounting .Accounting Cycle. Double Entry System. Rules regarding Journal Entries; Recording of Journal Entries; Ledger Posting; Subsidiary Books, Cash Book, Trial Balance;

Preparation of Final Accounts: Manufacturing Account**,** Trading Account; Profit& Loss Account; Balance Sheet.

UNIT-II

Management Accounting: Nature; Scope; Objectives; Functions of Management Accounting; Relationship between Financial and Management Accounting; Tools and Techniques of Management Accounting; Limitations; Meaning of Financial Statement; Importance and Limitations of Financial Statement; Meaning and Objectives of Financial Statement Analysis; Limitation of Financial Analysis.

Ratio Analysis: Meaning, Interpretation, Significance, Limitations of Ratio Analysis; Classification of Ratio.

UNIT-III

Fund Flow Analysis: Meaning and Concept of Funds; Meaning of Fund Flow; Meaning of Fund Flow Statement; Significance; Limitations; Procedure of Preparing Fund Flow Statement.

Cash Flow Analysis: Meaning; Classification of Cash Flow; Comparison between Fund Flow Statement and Cash Flow Statement; Preparation of Cash Flow Statement (as per AS-3)

UNIT-IV

Price Level Accounting: Meaning; Methods or Techniques of Price Level Accounting; Advantages; Disadvantages.

Social Accounting: Concept of Social Cost Benefit Analysis; Meaning of Social Accounting; Need; Social Accounting Approaches.

Human Resource Accounting: Meaning; Need; Methods of Human Resource Accounting; Objections Against Human Resource Accounting; HRA in India.

Suggested Readings:

1. Horngren, Datar, Foster, Rajan, Iitner (2011). Cost Accounting- A Managerial Emphasis, 13th Edition, Pearson Education.

2. M.Y.Khan and P.K.Jain (2010) Management Accounting, Edition 5. Tata McGraw Hill.

3. Maheshwari, S.N (2009). Accounting for Management, 2nd Edition., Sultan Chand & Sons.

4. Glautier, M.W.E. And Underdown B. (2010). Accounting Theory and Practice, Financial Times / Pearson.

5. Horngren, Sunden and Ostratton(2010): Introduction to Management Accounting, Prentice Hall.

MARKETING MANAGEMENT (AUMBA-102)

UNIT-I

Nature and scope of Marketing: Corporate orientations towards the market place. The marketing environment and Environment scanning .

Marketing Information System and Marketing Research, Understanding consumer and Industrial markets.

UNIT-II

Market Segmentation: Targeting and Positioning.

Product decisions – product mix, product life cycle, new product development, Branding and packaging decisions. Pricing methods and strategies.

UNIT-III

Promotion decisions – promotion mix, advertising, sales promotion, publicity and personal selling. Vertical marketing – Implementation and systems.

Distribution Decisions: Patterns of channels and types of intermediaries, channel design decisions, Channel conflict, types and functions of wholesalers and retailers, Emerging trends in retailing.

UNIT-IV

Direct Marketing: Meaning, Benefits and growth of direct marketing, Forms of direct marketing, Multi level marketing, Meaning, need and importance of multilevel marketing, Advantages, Criticism of multilevel marketing, Ethical issues in direct & multilevel marketing.

Organizing and Implementing: Marketing in the organization, Evaluation and control of marketing efforts New issues in marketing – Globalization, Consumerism, Green marketing, Legal issues.

Suggested Readings:-

1. Kotler,P., Keller, K.L. Koshy, A. and Jha, M., (2011). Marketing Management: A South Asian Perspective, 13th Edition, Pearson Education, New Delhi.

2. Etzel, M., Walker, B., Stanton, W. and Pandit, A (2009) Marketing Management, TataMcGrawHill, New Delhi 1. Enis, B.M. Marketing Classics : A Selection of Influential Articles. New York,McGraw Hill, 1991.

3. Kotler, Philip. Marketing Management : Analysis, Planning, Implementation andControl. New Delhi, Prentice Hall of India, 1994.

4. Ramaswamy, V S and Namakumari, S. Marketing Management :Planning,Control. New Delhi, Prentice Hall of India, 1994.

5. Ramaswamy, V.S. and Namakumari, S. Marketing Management :Planning,Control. New Delhi, MacMillan, 1990.

MANAGEMENT PRACTICIES AND ORGANISATIONAL BEHAVIOUR (AUMBA-103)

UNIT-I

Introduction of OB: Concept, Nature, Characteristics, Conceptual Foundations and Importance, Models of Organizational Behaviour.
Perception and Attribution: Concept, Nature, Process, Importance. Management and Behavioural Applications of Perception.
Personality: Concept, Nature, Types and Theories of Personality Shaping, Personality Attitude and Job Satisfaction.

UNIT-II

Learning: Concept and Theories of Learning.
Conflict: Concept, Sources, Types, Process
Group Dynamics: Definition, Stages of Group Development, Group Cohesiveness, Formal and Informal Groups, Group Processes and Decision Making, Dysfunctional Groups
Motivation: Theories of Motivation, Leadership : Styles of leadership

UNIT-III

Management: Concept, Nature, Importance; Management : Art and Science, Management Vs. Administration, Management Skills, Levels of Management. Taylor and Scientific Management, Fayol's Administrative Management, Hawthorne Experiments and Human Relations,
Introduction to Functions of Management:
Planning: Nature, Scope, Objectives and Significance, Types of Planning, Process of Planning. Organizing: Concept, Organisation Theories, Forms of Organisational Structure, Departmentation, Span of Control, Delegation of Authority, Authority & Responsibility, Organizational Design.

UNIT-IV

Staffing: Concept, System Approach, Manpower Planning, Job Design, Recruitment & Selection, Training & Development, Performance Appraisal Directing: Concept, Direction and Supervision, Job Enrichment & Morale Building
Controlling: Concept, Process, Types of Control.

Suggested Reading:

1.Robbins, S.P., Judge, T.A., Sanghi, S (2010). Organizational Behaviour, Pearson Education.
2. Stoner, R. James A.F., Edward Freeman Daniel R Gilbert Jr., Management 6TH Ed, .Prentice-Hall of India
3. Stoner, Freeman & Gilbert Jr - Management (Prentice Hall of India, 6thEdition)
4. Koontz Harold &Weihrich Heinz – Essentials of management (Tata McGraw Hill, 5th Edition 2009) 5. Robbins S.P. and Decenzo David A. - Fundamentals of Management: Essential Concepts andApplications (Pearson Education, 6th Ed).
6. Weihrich Heinz and Koontz Harold - Management: A Global and Entrepreneurial Perspective (McGraw Hill, 12thEdition 2008)

BUSINESS ENVIRONMENT (AUMBA-104)

UNIT-I

Environmental Scanning: Different Aspects of Business Environment.
Salient features of Economic Systems: Capitalist system/Market economy; Socialist system and Mixed Economy, Basic Features of Indian Economy, Government Business Relationship. Micro and Macro Environment.

UNIT-II

Economic Policy: Monetary and Fiscal Policies in India, India's Trade Policy.
Economic Reforms: Liberalization; Privatization; Globalization and its Implications for India. EXIM Policy; FEMA(Foreign Exchange Management Act).

UNIT-III

Social Responsibility of Business: Concept, rationale, dimensions models of social responsibility and barriers of social responsibility, Ethics and social responsibility of management.
The Environment Protection Act, 1986.

UNIT-IV

International Economic Environment: Emergence of Globalization, Control of Foreign Direct Investment, Benefits and Problems from MNCs, WTO-its role and functions, implications for India; Devaluation of Rupee.

Suggested Readings:
1. Saleem, Shaikh (2010). Business Environment, 2nd edition, Pearson Education.
2. S.K.Misra&Puri: Indian Economy (Its Development Experience), Himalaya Publishing House Pvt.Ltd.
3. R,uddarDatt& K.P.M. Sundaram(2010) : Indian Economy, S.Chand& Co.
4. Mungekar,Nachana&ManoharRao(2011) : Indian Economy in the New Millenium, Himalaya PublishingHouse Pvt. Ltd.
5. G.Rama Krishna & A.G. Moss V.Suguna(2009): Economic Reforms in India- Retrospect and Prospect,Himalaya Publishing House Pvt. Ltd.
6. M.R. Das: WTO Opportunities and Challenges for Indian Banking, Himalaya Publishing House Pvt. Ltd.
7. Misra&Puri: Economic Environment of Business, Himalaya Publishing House Pvt. Ltd

HUMAN RESOURCE MANAGEMENT (AUMBA-105)

UNIT-I

Introduction to Human Resource Management: Growing Importance and functions of Human Resource management Important Environmental Influences on HRM.
Personnel Management: Meaning, Approaches to Personnel Management, Challenges to Personnel Management, Responsibilities of a Personnel Managers, Demographic, Societal and Workforce Trends. Personnel Management and Professionalization.

UNIT-II

Human Resource Planning: Importance of Human Resource Planning, Contemporary Challenges in Human Resource Planning, Factors affecting HRP, HRP Process, Approaches to HRP, Evaluating Effectiveness of HRP, Methods of HRP.
Recruitment, Selection and Placement, Interview and Promotion Socializing the new employees.
Training: Meaning, Importance, Methods of Training, Evaluating Training Effectiveness Methods for developing managers, Managerial Development.

UNIT-III

Performance Appraisal and Compensation Management: Performance Appraisal: Meaning, Purpose, Essentials of effective Performance Appraisal system, Various Components of Performance Appraisal, Methods and techniques of Performance Appraisal.
Managing Compensation: Employee Remuneration: Concept, Objectives, Factors Influencing Employee Remuneration, Remuneration methods, Challenges of remuneration; Job Evaluation: Meaning, Process and Methods of Job Evaluation; Incentives: Concept, Importance and Types. Fringe Benefits – Meaning, Types and administration of Benefits.

UNIT-IV

Maintenance, Disciplining the Employees: Maintenance and disciplining the employees. Discipline meaning and importance. Employees' grievance handling mechanism and procedure. Disciplinary action dismissal and retrenchment, Various workplace safety and health issues and management of these issues.
Introduction to IHRM: Concept of IHRM, Issues in IHRM, Barriers to effective global HRM; Cultural & behavioral differences and its relevance and importance in IHRM; IHRM trends, issues and challenges .

Suggested Readings:-

1. Snell et al (2010). Human Resource Management, CengageLearning(India Edition).
2. Dessler et al (2008). Human Resource Management, Pearson Education.
3. Armstrong, M. (2009). Armstrong's Handbook of Human Resource Practice, Kogan Page
4. Lepak, D. &Gowan M. (2009). Human Resource Management, Pearson Education.
5. Edwin B. Flippo :- Principles of Personnel Management
6. Robert L. Mathis and John H. Personnel Human Resource Management (4th ed.)
7. David A. De Cenzo and Stephen P. Robbins Personnel Human Resource Management

COMPUTER APPLICATIONS IN BUSINESS (AUMBA-106)

UNIT-I

Introduction to Computers: Classification, Components of Computer System, Introduction to High level and low level languages.
Computer Hardware: CPU, Basic Logic Gates, Computer Memory and Mass Storage Devices, Computer Hierarchy, Input Technologies, Output Technologies.
Software: Application Software and System Software, Applications Basic concepts of operating systems, Artificial Intelligence Flow charts and data flow diagrams.

UNIT-II

Networking concepts: Internet and intranet, sending and reading e-mails. Practical on Internet using emails, Use of search engines Fundamentals of website design End User Computing using MS-Office 2000:
Word processing: MS-Word, word basics, formatting text and documents, working with header and footer, footnotes, endnotes, tables and sorting, graphics, mail merge and macros.

UNIT-III

Spreadsheets and their uses in business: Excel basics, Rearranging, Worksheets, Excel formatting techniques, using formulas and functions, chart features and working with graphics in Excel. Power Point: Basics, working with texts and graphics in Power Point, Creating and delivering presentations
Functional and Enterprise Systems: Data, Information and Knowledge Concepts, Decision Making Process, Physical Components of Information Systems, Overview of Security Issues in Information Technology, Emerging Trends in Information Technology.

UNIT-IV

Computer Networks and Internet: Goals and Objectives of Computer Networks, Topologies, applications, ISO-OSI Protocol, TCP/IP: Protocol; Local Area Network, Metropolitan Area Network, Wide Area Network, E-Mail, search engines and protocols; FTP, HTTP, Telnet, Lynx.
The Internet, Intranet and Extranets: Operation of the Internet, Services provided by Internet, World Wide Web. Creating Web Pages using HTML, Intranets and Extranets.

Suggested Readings:

1. ITL Education Solutions (2009). Introduction to Information Technology, Pearson Education.
2. Turban, Rainer and Potter (2009). Introduction to information technology, 2nd Edition, John Wiley and Sons.
3. Joseph A. Brady and Ellen F Monk (2007).Problem Solving Cases in Microsoft and Excel, Fourth Annual Edition, Thomson Learning.
4. Saini A. K.andPradeep Kumar (2007).Computer Applications in Management, Anmol Publications.
5. Deepak Bharihoke, (2009). Fundamentals of Information Technology, 3rd Edition, Excel Books.
6. V.Raja Raman,(2009). Fundamentals of Computers,PHI,New Delhi
7. Leon &leon :Introduction to Computers,Vikas Publishing house,NewDelhi

HUMAN VALUES AND PROFESIONAL & ETHICS (AUMBA-107)

UNIT-I

Concept of Values; Types of Values; Human Values in Management; Relevance of Values in Modern Management; Values for Managers. Leadership and Human Values; Inter-personal Relations and Human Values; Stress Management and Human Values; Team Building and Values.
Business Ethics: The Changing Environment and Stakeholder Management, Relevance of Ethics and Values in Business, Spiritual Values. Modern Business Ethics and Dilemmas.

UNIT-II

Value Education: understanding value education, self-exploration as the process of value education, continuous happiness and prosperity-the basic human aspirations, right understanding ,relationship and physical facilities ,happiness and prosperity –current scenario.

UNIT-III

Harmony in the human being: understanding human being as the co - existence of self (I)and the body ,Discriminating between the needs of self (I) and the body , Understanding harmony in the self ,harmony of the self (II) with the body. Program to ensure Sanyam and Swasthya.

UNIT-IV

Harmony in the family and society: harmony in the family –the basic unit of human interaction, values in human to human relationship, trust –the fundamental values in the relationship, respect–as the right evaluation, understanding harmony in the society vision for the universal human order
Harmony in the nature (Existence): Understanding harmony in the nature, interconnectedness, self regulation.

Suggested Books:

1. Weiss, Joseph W (2009). Business Ethics: Concepts & Cases, Cengage Learning.
2. Colin Fisher and Alan Lovell (2009). Business ethics and values: Individual, Corporate and International Perspectives, Prentice Hall.
3. Gaur R. R, R Sangal, G P Bagaria (2011). Human values and professional ethics (excel books)
4. Fernando A.C., (2009). Business Ethics: An Indian Perspective, Prentice Publications
5. Nagarazan R.S. (2008). Professional ethics and Human values New Age International

SEMESTER-II

BUSINESS STATISTICS AND COMPUTING SKILLS (AUMBA-201)

UNIT-I

Classification of data and construction of Frequency Distribution: Graphic Presentation of Data, Meaning & Types.
Introduction of Descriptive Statistics: Measures of Central Tendency; Measures of DispersionRange, Quartile Deviation, Mean Deviation, and Standard Deviation, Skewness& Kurtosis. Index Numbers: Definition and Methods of Construction of Index Numbers; Problems in Construction, Importance of Index Numbers in Managerial Decision Making.

UNIT-II

Theory of Probability: Basic concepts, Additive and Multiplicative Rule, Idea of Conditional Probability, Concept of Random Variable and its mathematical expectation.
Theoretical Distributions: Binomial, Poisson and Normal Distribution.

UNIT-III

Statistical Inference: Concept of Sampling Distribution, Parameter & Statistics, Standard Error. Testing of Hypothesis: Large Sample Tests, Small Sample Test (t Test-single sample mean and difference of means tests; F test-Variance Ratio test; Z test-single proportion, difference of proportions single sample mean and Difference of Means; (chi square) test-Independence of Attributes, Goodness of Fit and Test of Homogeneity.

UNIT-IV

Correlation Analysis: Rank Method and Karl Pearson's Coefficient of Correlation and Properties of Correlation.
Regression Analysis: Simple Linear Regression Model, Specification of the Model, Assumptions, Least Square Estimates of Parameters and their properties, Coefficient of Determination and Interpretation of Coefficients.
Time Series Analysis: Components, Measurement of Trend by Least Squares Method, Straight Line and Importance of Time Series.

Suggested Readings:

1. Richard Levin and DS Rubin (2011) Statistics for Management, 7th edition, Pearson Education.
2. Gupta, S.P. & Gupta M.P. (2012) Business Statistics, 16th edition, Sultan Chand and Sons.
3. Sharma, J.K. (2009). Operations Research: Theory and Applications, 4th ed. Macmillan. 4. J. K. Sharma: Business Statistics, Pearson Publication, New Delhi.
5. Amir D Aczel&Sounderpandian (2010): Complete Business Statistics, Tata McGraw Hill Publishing Company Ltd.
6. Levin &Kapoor (2009) : Statistics For Management, Prentice Hall
7. U.K. Srivastava, Shenoy&Sharma(2009): Quantitative Techniques for Management, New Age International, New Delhi. 8. P.N. Arora& S. Arora(2011): Statistics for Management, S. Chand &Co., New Delhi.

FINANCIAL MANAGEMENT (AUMBA-202)

UNIT-I

Introduction to Financial Management: Meaning, Scope, Finance Function, Financial Goals, Limitations.
Sources of Finance: Types- Advantages and Limitations of Equity Shares, Preference Shares, Debentures, Term-Loans, Right Issue, Venture Capital, Private Equity GDR, ADR.
Cost of Capital: Meaning; Calculation of Cost of Debt Capital; Equity Capital; Preference Capital; Retained Earnings; Weighted Average Cost of Capital.

UNIT-II

Capital Structure: Meaning, Determinants, Assumptions, Net Income and Operating Income Approach, Traditional Position, M-M Position, EBIT and EPS Analysis.
Leverage Analysis: Meaning, Types, Estimation of Financial, Operating and Combined Leverage, Relation of Financial Leverage with Risk and Return.
Management of Working Capital: Meaning of WC; Need of WC Management; Determinants of WC, Operating Cycle.

UNIT-III

Cash Management: Meaning; Facets of Cash Management; Motives for Holding Cash; Optimal Cash Balance; Short-Term and Long-Term Cash Forecasting.
Receivable Management: Meaning; Credit Policy Variable; Credit Evaluation; Credit Decisions; Control of Account Receivable.
Inventory Management: Meaning; Need to hold Inventory; Objective of Inventory Management; Inventory Investment Analysis; Inventory Control System.

UNIT-IV

Capital Budgeting: Meaning; Basic Principles of Costs and Benefits; Investment Criteria; Pay back Method; Accounting Rate of Return Method; Net Present Value Method; Benefit -Cost Ratio; Internal Rate of Return; Capital Rationing; Introduction to Basic Techniques of Risk Analysis in Capital Budgeting.
Dividend Decisions: Meaning and Types of Dividend; Issues in Dividend Policy; Traditional Model; Walter Model; Gordon Model; Miller and Modigliani Model.

Suggested Readings:

1. Khan, M. Y. and Jain P. K. (2011). Financial Management, Text, Problems & Cases, 5th Edition, Tata McGraw Hill Company, New Delhi.
2. Maheshwari, S.N.(2009). Financial Management – Principles & Practice, 13th Edition, Sultan Chand & Sons.
3. Prasanna, Chandra (2011) Financial Management: Theory and Practice, 7th Edition, Tata McGraw Hill.
4. Bhalla. V. K.(2009). Financial Management and Policy: Text and Cases, 9th Edition, Anmol Publications Pvt. Ltd.
5. I.M. Pandey (2010): Financial Management, Vikas Publishing House
6. James C. Van(2009): Financial Management, Pearson Education Horne Policy Asia
7. Brealy and Myres: Principles of Corporate Finance, Tata McGraw Hill

BUSINESS RESEARCH METHODS (AUMBA-203)

UNIT-I

Introduction to Research: Definition, Scope, significance Limitations, and Types. Definition and Applications of Business Research; Types of Research , Objectives of Research
Research Process: Steps in the Research Process; Reviewing of Literature; Formulating A Research Problem,.

UNIT-II

Research Designs: Exploratory, Descriptive and Experimental Research Design.
Data Collection: Secondary Data, Primary Data and Methods of Collection. Scaling Techniques, Attitude Measurement Techniques; Motivational Research Techniques.

UNIT-III

Sample Design: Sampling, Concepts, Principles; Types of Sampling – Probability, Non Probability, Mixed Sampling Designs, Sample Size Determination.
Statistical technique: Selecting an Appropriate Statistical technique; Field Work and Tabulation, coding, Editing. Interpretation of Data and Report Writing.

UNIT-IV

Hypothesis: Functions, Characteristics, Types of Hypotheses, Testing of Hypothesis, Constructing the Hypothesis .
Techniques for Data Analysis –ANOVA, Discriminant Analysis, Factor Analysis, Conjoint Analysis, Multidimensional Scaling and Clustering Methods.

Suggested Readings:-

1) Ranjit Kumar (2009) Resea
rch Methodology, 2nd edition, Pearson Education.
2) NareshMalhotra and S Dash (2009) Marketing Research, 5th edition, Pearson Prentice Hall.
3) Robert Stine and D Foster (2010) Statistics for Business, 1st edition, Pearson Education.
4) Richard Levin and DS Rubin (2009) Statistics for Management, 7th edition, Pearson Education.
5) C.R.Kothari (2014) ,Research Methodology
6) S.L.Gupta ,Marketing Research, Excel Books.
7) Luck,David J and Ronald S.Rubir (2009). Marketing Research ,Prentice Hall India Ltd.

MANAGERIAL ECONOMICS (AUMBA-204)

UNIT-I

Introduction to Managerial Economics: Nature, Scope and Importance of Managerial Economics. Relationship of Managerial Economics with Decision Making.Distinction between Micro and Macroeconomics.

UNIT-II

Demand Concepts and Analysis: Individual Demand, Market Demand, Kinds of Demand, Determinants of Demand, Demand Functions, Functions, Demand Schedule and Law of Demand.
Elasticity of Demand: Concept, Types, Measurement and importance.
Demand Forecasting: Sources of Data-Expert Opinions, Surveys and Market Experiments; Time Series Analysis-Trend Projection; Barometric Forecasting-Leading Indicators, Composite and diffusion Indices.

UNIT-III

Production Function: Concept and types, Returns to Factor and Returns to Scale, Law of Variable Proportions.
Cost concepts and Analysis: Concept of Cost, Short run and Lung-run Cost Curves, Relationships among various costs, Break-even Analysis.
Revenue Curves: Concept and Types.
Pricing in various markets: Perfect Competition, Monopoly, Monopolistic, Competition Oligopoly.

UNIT-IV

National Income: Conceptual Framework, Measures of National Income, Methods of Measurement, Limitations of National Income.
Inflation: Meaning, Types, Theories, Causes, Effects and Control.
Balance of Payments Monetary and Fiscal Policies, Investment Multiplier, Credit Multiplier.

Suggested Readings:

1. Truett Lila J., Truett, Dale B. and Truett J. Lila (2009). Managerial Economics: Analysis, Problems, Cases, 8th Editon, John Wiley & Sons.
2. Atmanand (2009). Managerial Economics, 2nd Edition, Excel Books.
3. Christopher R Thomas & S Charles Maurice (2008). Managerial Economics, 9th edition, McGraw Hill Co.
4. Petersen, H. C., Cris, L W and Jain, S.K. (2008). Managerial Economics, 1st edition, Pearson Education.
5. William Samuelson and Stephen G. Mark, Managerial Economics, John Wiley & Sons.
6. Managerial Economics Analysis: Problem Cases, 8th Edition, Truett&Truett, Wiley
7. R.L. Varshney& K. L. Maheshwari(2009). Managerial Economics, S. Chand & Sons, New Delhi

PRODUCTION AND OPERATIONS MANAGEMENT (AUMBA-205)

UNIT-I

Operations Management: Concepts, Functions.
Product Design & Development: Product Design and its Characteristics, Product Development Process (Technical), Product Development Techniques.
Process Selection: Project, Job, Batch, Mass & Process types of Production Systems, ProductProcess Mix.

UNIT-II

Facility Location: importance, Factors in Location Analysis, Location Analysis Techniques.
Facility Layout: Objectives, Advantages, Basic Types of Layouts.
Capacity Planning: Concepts, Factors Affective Capacity, Planning, Capacity Planning Decisions.
Production Planning & Control (PPC): Concepts, Objectives, Functions
Work Study: Productivity, Method Study, Work Measurement.

UNIT-III

Materials Management: Concepts, Objectives.
Introduction to modem Productivity techniques: Just in time, Kanban System, Total quality Management & six sigma.
Functions Purchasing Management: Objectives, Functions, Methods, Procedure.

UNIT-IV

Stores Management: Types of Stores; Functions
Inventory Management: Concepts, Classification, Objectives, Factors Affecting Inventory Control Policy, Inventory Costs, Basic EOQ Model, Re-order Level, ABC Analysis.
Maintenance Management: Concepts; Objectives; Functions; Types of Maintenance.

Suggested Readings:

1. Mahadevan B. (2010).Production Operations Management: Theory and Practice,2nd Edition, Pearson Education.
2. Chase, R.B, et. Al (2010). Operations Management for Competitive Advantage, Tata McGraw Hill, New Delhi
3. Stevenson W. J (2009). Operations Management, 9th Edition, Tata McGraw Hill, New Delhi
4. Nair (2009) . Production & Operation Management, Tata McGraw Hill
5. Adam &Ebert(2009). Production & Operation Management, Prentice Hall India
6. Krajewski&Ritzman: Operations Management, Pearson Education Asia
7. SN Chary: Production & Operations Management, Tata McGraw Hill

FUNDAMENTAL OF ENTREPRENEURSHIP (AUMBA-206)

UNIT-I

Entrepreneurship: Definition of Entrepreneur, Internal and External Factors, Functions of an Entrepreneur, Entrepreneurial motivation and Barriers, Classification of Entrepreneurship, Theory of Entrepreneurship, Concept of Entrepreneurship, stages in entrepreneurial process.
Entrepreneurial Growth: Economic, Non-Economic Factors; EDP Programmes; Entrepreneurial Training; Traits/Qualities of an Entrepreneur; Manager Vs. Entrepreneur.

UNIT-II

Creativity and Entrepreneurial Plan: Idea Generation, Screening and Project Identification, Creative **Performance, Feasibility Analysis:** Economic, Marketing, Financial and Technical.
Project Planning: Evaluation, Monitoring and Control segmentation. Creative Problem Solving

UNIT-III

International Entrepreneurship Opportunities: The nature of international entrepreneurship, Importance of international business to the firm, International versus domestics' entrepreneurship, Stages of economic development.
Institutional support for new ventures: Supporting Organizations; Incentives and facilities; Financial Institutions and Small scale Industries, Govt. Policies for SSIs.

UNIT-IV

Family and Non Family Entrepreneur: Role of Professionals, Professionalism vs family entrepreneurs, Role of Woman entrepreneur.
Venture Capital: Venture capital, Nature and Overview, Venture capital process, locating venture capitalists.

Suggested Readings:

1. Kuratko, D.F. &Hodgetts, R.M. (2011). Entrepreneurship: Theory, Process and Practice. Thomson Press
2. Charantimath, P. (2009). Entrepreneurship Development: Small Business Enterprises. Pearson.
3. Bridge Setal (2009). Understanding Enterprise: Entrepreneurship and Small Business (Palgrave,
4. Holt (2009) .Entrepreneurship : New Venture Creation, Prentice-Hall
5. Hunger J D and Wheelen T L (2009). Strategic Management ,Addison-Wesley
6. Dollinger M J (2009). Entrepreneurship ,Prentice-Hall

COMMUNICATION AND MARKETING SKILLS (AUMBA-207)

UNIT-I

Introduction of Communication: Role of communication, defining and classifying communication, purpose of communication, process of communication, importance of communication in management, communication structure in organization, barriers & gateway in communication, 7 C's of communication.
Employment Communication: Writing CVs, Group discussions, interview, types of interview, candidates preparation, Interviewers preparation; Impact of Technological Advancement on Business Communication; Communication networks, Intranet, Internet, e mails, SMS, teleconferencing, videoconferencing.

UNIT-II

Oral Communication: What is oral Communication, principles of successful oral communication, two sides of effective oral communication, effective listening, non–verbal communication, Body language, Paralanguage.
Written Communication: Purpose of writing, clarity in writing, principles of effective writing, writing technique, electronic writing process.

UNIT-III

Business letters: Introduction to business letters, Types of business letter, Layout of business letter, writing memos, what is a report purpose, kinds and objectives of reports, writing reports.
Case method of Learning: Understanding the case method of learning, different types of cases, overcoming the difficulties of the case Method, reading a case properly (previewing, skimming, reading, scanning), case analysis approaches .

UNIT-IV

Presentation Skills: What is a presentation: elements of presentation, designing a presentation, Advanced visual support for business presentation, types of visual aid.
Group Communication: Meetings, Notice, Planning meetings, objectives, participants, timing, venue of meetings, leading meetings, Minutes of Meeting, Media management, the press release, press conference, media interviews, Seminars, workshop, conferences, Business etiquettes.

Suggested Readings:

1. Lesikar et al (2011). Business Communication: Making Connections in a Digital World. Tata McGraw Hill Publishing Company Ltd. New Delhi.
2. Boove, C.L., Thill, J.V. &Chaturvedi, M. (2011). Business Communication Today, Pearson.
3. M. K. Sehgal& V. Khetrapal(2010) - Business Communication (Excel Books).
4. RajendraPal(2009) - Business Communication (Sultanchand& Sons Publication).
5. P.D. Chaturvedi(2009). Busines Communication (Pearson Education, 2nd Edition
6. Lesikar RV & Pettit Jr. JD .Basic Business Communication : Theory & Application (Tata Mc Grow Hill, 10th Edition).
7. TaylerShinley(2011) . Communication for Business (Pearson Education, 4th Edition.

SEMESTER-III

STRATEGIC MANAGEMENT (AUMBA-301)

UNIT-I

Understanding strategy and Strategic Management: Strategic management process. Strategic decision making, Levels of strategy.
Defining strategic intent: Vision, Mission Goals and Objectives. Characteristics of a good mission statement.
External environment analysis: Strategically relevant components of external environment. Industry analysis – Porter's five forces model, Strategic group mapping, industry, key success factors .External Factor Evaluation matrix. **Environmental scanning techniques:** ETOP and SWOT analysis etc.

UNIT-II

Internal environment analysis: Resource based view of an organization, Value chain analysis, Competitive advantage and Core competency. Internal Factor Evaluation Matrix.
Business level Strategies: Porter's framework of competitive strategies: Cost leadership, Differentiation and Focused strategies.
Corporate level strategies: Growth strategies – horizontal and vertical integration; strategic out sourcing, related and un-related diversification, international entry options, harvesting and retrenchment strategies.

UNIT-III

Portfolio Strategies: BCG Model, GE Business Planning Matrix, Shell's Directional Policy Matrix, Product Life Cycle matrix.
Growth of the Firm: Internal Development, Mergers & Acquisitions, and Strategic Alliances. Restructuring Strategies regarding growth of firm. Corporate Restructuring: Types, Synergy, Location and Timing tactics.

UNIT-IV

Strategy Implementation: Strategy-structure fit, developing and modifying organizational structure. Leadership and organization culture Strategy.

Evaluation and Control: Nature of strategy evaluation, Strategy evaluation frame work, the balanced Score Card, Benchmarking.

Suggested Readings:

1. Lasserre, Philippe (2009). Global Strategic Management, Palgrave MacMillan.
2. John D Daniels, Lee H Radebaugh Daniel P Sullivan ,PrashantSalwan (2010). International Business Environments and Operations, Pearson Education
3. Tamer Cavusgil, Gary Knight (2011). International Business: Strategy, Management and the New Realities, 1st Edition, Pearson Education.
4. Kark Rajneesh (2008). Competing with the Best: Strategic Management of Indian Companies in a Globalizing Arena Penguin Books.
5. AzharKazmi (2009). Business Policy and Strategic Management. Tata McGraw Hill, New Delhi
6. Jauch&Glueek(2009) : Business Policy and Strategic Management.

BUSINESS LAWS (AUMBA-302)

UNIT-I

Contract Act, 1872: Definition of a Contract and its essentials, Formation of a valid Contract - Offer and Acceptance, Consideration, Capacity to Contract, Free consent, Damages for breach of a contract, Quasi contracts, Contract of Indemnity and Guarantee, Bailment and Pledge, Agency.

UNIT-II

Partnership Act, 1932: Definition of Partnership and its essentials.

Rights and Duties of Partners : Types of Partners, Minor as a partner, Doctrine of Implied Authority, Registration of Firms, Dissolution of firms.

Sales of Good Act, 1930: Meaning and its essentials, Cavet emptor.

UNIT-III

Negotiable Instrument Act, 1881: Definition and characteristics, Kinds of negotiable instruments, Promissory Note, Bill of Exchange and Cheques, Crossing of Cheques, Bouncing of Cheques. Companies Act, 1956: Nature and Definition of a Company, Registration and Incorporation, Memorandum of Association, Articles of Association, Prospectus. Winding up of Company.

UNIT-IV

Consumer Protection Act, 1956: Aims and Objects of the Act, Redressal Machinery under the act, Procedure for complaints under the act, Remedies, Appeals, Enforcement of orders and Penalties. The Information Technology Act, 2000.

Suggested Readings –

1. Gulshan J.J. - (2009) .Business Law Including Company Law (New Age International Publisher, 13thEdition)
2. Maheshwari, S.N. and Maheshwari, S.K. (2011). A Manual of Business Laws, 3rd ed. Himalaya Publishing House.
3. Tulsian, P C(2009) , “Business Laws,” Tata McGraw Hill, New Delhi
4. Kuchhal M.C. - Business Law (Vikas Publication, 4th Edition)
5. Avtar Singh - Principles of Mercantile Law (Eastern Book Company, 7th Edition).
6. All acts pertaining to Business Law provided by Indian Governance.

OPERATIONS RESEARCH (AUMBA-303)

UNIT-I

Operations Research: Introduction to OR: Definition, Characteristics, Scope and Necessity of OR, OR Models: Principles and Types.

Decision making: Decision making environment, Decision making under certainty, Decision making under uncertainty, Decision making under risk, Decision Tree Analysis.

UNIT-II

Linear Programming : Problem Formulation, Graphical Method, Simplex Method, Duality Project Management: PERT, CPM, Phases of a Project, Network Arrow Diagrams; Slack; Critical Path, Float, Crashing the Network.

UNIT-III

Transportation Models: Transshipment Problem, Assignment Models, Competitive Strategies.

Theory of Games: Duopoly Two Person Zero Sum Game, Pure and Mixed Strategies, Criteria of choosing strategies and simple numerical problems based on these.

UNIT-IV

Inventory Management: Definition of Inventory, Costs associated with Inventory Elementary, Models of Inventory. **Waiting Lines:** Applications of waiting lines, queue disciplines, derivations of Average length, number of units in the queue, Average waiting time for single service station.

Replacement Theory: Replacement Models and Problems.

Suggested Readings:

1. Sharma. J. K.(2009). Operations Research: Theory and Applications, 3rd Edition, Macmillan India Ltd.
2. Choudhury, S, (2010). Project Management, 1st Edition, Tata McGraw Hill Publishing Company.
3. J.K. Sharma(2011): Quantitative Techniques for Managerial Decisions, 1st Macmillan.
4. N.D. Vohra(2009): Quantitative Techniques in Management, 2nd Tata McGraw Hill.
5. V.K. Kapoor: Operations Research, 7th Sultan Chand .
6. Tulsian and Pandey: Quantitative Techniques, 1st Pearson Edn.
7. Hiller and Lieberman: Introduction to Operations Research, 7th Tata McGraw Hill.

ADVANCED FINANCIAL MANAGEMENT (AUMBAFM-01)

UNIT-I

Application of Linear Programming: Goal Programming; Regression analysis and Simulation.

Technique in Financial Decisions Making Areas: Corporate Debt Capacity Management Decisions; Business Failure and Reorganization— Application of Multiple Discriminant analysis;

UNIT-II

Decision Tree Analysis. Capital Expenditure Decision Under Conditions of Risk and Uncertainly.

UNIT-III

Cost-Volume-Profit Analysis under conditions of Uncertainly; Sequencing of Decisions; Replacement Decisions; Mergers and Acquisitions; Takeover code;

UNIT-IV

Dividend Valuation Model; Determination of the Exchange ratio; Legal and Proceduralaspects of Merger Decision; Estimation and Projection of Working Capital Decisions,

Suggested Readings:

1. Bierman, Harold. Lease Vs.: Buy Decision. Englewood Cliffs, New Jersey, Prentice Hall Ins.
2. Fogler, H and Ganpathy : Financial Econometrics Englewood Cliffs, New Jersey, Prentice Hall Inc.,1982.
3. Ievy, H. and Sarnat H. Capital Investment and Financial Decision, Englewood Cliffs New Jersey, Prentice Hall Inc., 1982.
4. Van Home, James C. : Financial Management and Policy, Englewood Cliffs, New Jersey. Prentice Hall of India, 1990
5. Sapirio, Edverd, Financial Decision Analysis.

SECURITY ANALYSIS AND PORTFOLIO MANAGEMENT (AUMBAFM-02)

UNIT-I

Introduction to Investment Management: Concept and objectives of investment, Difference between Investment and Speculation, Investment and Gambling, Meaning of Investment Management, Investment Management Process, Investment Alternatives, Features of Investment Avenues.

Risk and Return: Concept of Risk, Components of Investment Risk, Measurement of Risk through Standard Deviation, Regression Equation, Covariance, Concept of Return, Relationship between Risk and Return.

Introduction to Indian Stock Market :BSE,NSE

UNIT-II

Fundamental Analysis: Macro-Economic Analysis, Forecasting, Industry Analysis, Sensitivity of Business Cycle, Industry Life Cycle Analysis.

Company Analysis: Meaning of Company Analysis, Strategy Analysis, Accounting Analysis, Financial Analysis, and Estimation of Intrinsic Value.

Technical Analysis: Meaning, Difference between Technical and Fundamental Analysis, Assumptions, Tools, Dow Theory, Testing Technical Trading Rules, Evaluation of Technical Analysis.

UNIT-III

Portfolio Theory: Merits of Diversification: Diversification and Portfolio Risk, Portfolio Return and Risk, Calculation of Portfolio Risk, Efficient Frontier for two securities, Efficient Frontier for securities, Optimal Portfolio.

Portfolio Analysis: Concept of Traditional and Modern Portfolio Analysis, Markowitz Theory, Single Index Model, Beta Generation in Efficient Frontier, Interactive Risk through Covariance, Sharpe's Model.

UNIT-IV

Portfolio Selection: Concept of Portfolio Selection, Efficient Frontier and Portfolio Selection, Role of Beta and its concept, Capital Market Theory, CAPM, SML Arbitrage Pricing Theory.

Portfolio Revision: Meaning, Need, Techniques of Portfolio Revision, Formula Plans, Rules Regarding Formula Plans, Constant Rupee Value Plan, Constant Ratio Plan, Variable Ratio Plan, Modifications, Rupee Averaging Technique.

Suggested Readings:

1. Chandra. Prasanna.(2011). Investment Analysis and Portfolio Management, 3rd Edition, Tata McGraw Hill, New Delhi.
2. Fischer. and Jordon (2009). Security Analysis and Investment Management, 6th Edition, Pearson Education.
3. Rustagi. R. P. (2009). Investment Analysis and Portfolio Management, 2nd Edition, Sultan Chand & Sons.
4. Bhalla, V.K. (2012). Investment Management: Security Analysis and Portfolio Management, 17th Edition, S.Chand& Sons.
5. Frank K. Reilly, Keith E Brown. (2009). Investment Analysis and Portfolio Management, 8th Edition, Cengage Learning.

MANAGEMENT OF BANKING OPERATIONS (AUMBAFM-03)

UNIT-I

Evolution of modern commercial banking in India: Basic concepts; Banking structure- banking consolidation; Banking sector reforms in India. Banking Regulation Act, 1949:Role of banking in Economic Development, Role of RBI.

Sources of bank funds: Deposit products- Types of Bank Deposits, The Fee based services, Letter of credit, Bank Guarantees, Subsidiary Services, Off Balance Sheet activities, Bank assurance.

UNIT-II

Non Performing Assets: Prudential norms for asset classification and provisioning Management of capital funds: Functions, Capital Adequacy ratio - The New Basel Accord-Implication for Banks. New Forms of Banking: Wholesale and Retail Banking, Universal and Narrow banking, Corporate Banking, Off shore Banking and Multi National banking.

UNIT-III

Anti money laundering: Concept, Its need and KYC norms.

Risk Management in Banks: Basic concepts, Need/purpose, process, different types of risk sin banks- operational, Liquidity, Credit risk, capital risk, Interest rate risk and systematic risk.Asset- Liability Management.

UNIT-IV

Service Quality Metrics: Core factors, Role and process of capability of Managing services, Importance of six sigma in banks, Customer Relationship Management.

Electronic Banking: Concepts, Internet/Phone/Mobile Banking- Benefits, concerns, E-payment and settlement system: Plastic cards, EFT, NEFT, RTGS, MICR, Cheque Truncation and ATM. Social Banking, Priority sector lending, Genesis of Microfinance.

Suggested Readings:

1. M Y Khan,(2011). Financial Services, 6th Edition, Tata McGraw Hill.
2. Hull. John C. (2012). Banking and Financial Institutions", 2nd Edition, Prentice Hall.
3. Fabozzi, Frank J. "Foundations of Financial Markets and Institutions", (Latest Edition). Prentice Hall.
4. Varshney and Mittal. (2009). Indian Financial System, 10th Edition, Sultan Chand & Sons.
5. Mehta, R.R.S. : Fundamental of Banking; Himalaya Publishing House Co., New Delhi.
6. Nigam, B.M.L. : Banking Law and Practive, Konark Publishers, Delhi.
7. Periodicals: 1. Reserve Bank of India, RBI Bulletin. 2. Indian Institute of Finance, Finance India.

ADVERTISING AND SALES MANAGEMENT (AUMBAMK-01)

UNIT-I

Introduction to Advertising: Nature and scope and functions of Advertising, Classification of Advertising, Advertising as an element of Marketing Mix, Advertising as a Tool of Communication, Setting Advertising Objectives .

Behavioral Dynamics: The DAGMAR Approach, Hierarchy of Effects Model, New Adopter Model, AIDA Model; Developing Segmentation and Positioning Strategies for Advertising – Segmenting on the Basis of Usage Patterns and Commitment Level, Segmenting Business Markets, Formulating Positioning Strategy, Benefit Positioning, User Positioning and Competitive Positioning .

Advertising and Product Life Cycle: Ethical Aspects of Advertising – Misleading Advertising, Deceptive Advertising and Shock Advertising; Economic Effects and Legal Aspects of Advertising.

UNIT-II

Managing an Advertising Program Message Structure : Appeals, Copy, Layout
Advertising Media – Media Planning, Media Selection and Scheduling Measuring Advertising Effectiveness – Pre-testing and Post-testing copy
Advertising Budget – Top Down Methods: Affordable Method, Percentage of Sales Method, Competitive Parity Method; Build-up Approach: Objective and Task Method; Advertising Agencies – Types, Role and Functions; Social and Cultural Consequences of Advertising – Advertising and Stereotyping.

UNIT-III

Sales Management- Nature and Scope of Sales Management, Personal Selling Objectives Sales Force Organization – Nature and Types.
Sales Force Recruitment – Process and Sources; • Sales Force Selection Process

UNIT-IV

Managing Sales Training Programs – Need and Objectives.
Motivating Sales Personnel – Significance, Financial and Non-Financial Reward System, Sales Meetings and Sales Contests; Designing Sales Territories and Sales Quotas International Global Advertising

Suggested Readings:

1. Belch, George E. and Belch, Michael A.(2011). "Advertising and Promotion", Tata McGraw Hill, 7th Edition
2. Guinn, Allen, Chris T., Semenik, Richard J.(2009) "Advertising & Integrated Brand Promotion", Thomson – South Western, 4th Edition.
3. Still, R. R. &Cundiff, E. W., Govoni, N. A. P. (2009). Sales Management. 5th Edition Pearson Education, New Delhi
4. Rosenbloom, Bert (2007) Marketing Channels: A Management View, 7th Edition ,Cengage Learning, New Delhi.
5. Jobber , David and Lancaster, Geoffery (2009), Selling and Sales Management, 7th Edition, Pearson Education, New Delhi
6. Tanner Jr., J.F., Honeycutt Jr., E.D. and Erffmeyer, R.C. (2011), Sales Management:, Pearson Education, New Delhi.

CONSUMER BEHAVIOUR (AUMBAMK-02)

UNIT-I

Introduction to Consumer Behavior: Consumer Behavior: Scope, importance and interdisciplinary nature Consumer **Research Process:** Qualitative and Quantitative research.

Evolution of Consumer Behavior: Introduction to Consumer Decision Making Models: Howard-Sheth, Engel Kollat-Blackwell and Nicosia Models of consumer decision-making.

UNIT-II

Individual Determinants of Consumer Behavior: Consumer Perception: Concept and Elements of Perception, Consumer Imagery, Perceived Risk Consumer Learning: Behavioural and Cognitive Learning Theories Consumer Attitude: Functions of Attitude and Sources of Attitude Development, Attitude formation Theories (Tricomponent, Multi attribute and Cognitive Dissonance), Attitude Change Strategies, Designing persuasive communications

UNIT-III

External Influences on Consumer Behaviour Culture: Values and Norms, Characteristics and Effect on Consumer Behaviour, Types of sub culture, Cross cultural consumer behaviour Group Dynamics and Reference Groups: Consumer relevant groups, Types of Family: Functions of family, Family decision making, Family Life Cycle Social Class: Categories, Measurement and Applications of Social Class.

UNIT-IV

Consumer Decision Making Process: Personal Influence and Opinion Leadership: Process of Opinion Leadership, Profile of Opinion Leader, Opinion leadership and Firm's Promotional Strategy.

Diffusion of innovations: Diffusion Process, Adoption Process, Researching Consumer Behavior; Online Consumer Behavior, Profile of Consumer Innovator.

Suggested Readings:

1) Schiffman L.G. and Kanuk L.L. (2011), Consumer Behaviour, 9th Edition, Pearson Education, New Delhi.
2) Hawkins, D. I. & Best R. J. and Coney, K.A. and Mookerjee, A, (2009) Consumer Behaviour-Building Marketing Strategy. Tata McGraw Hill, New Delhi.
3) Solomon, Michael R. (2012), Consumer Behaviour: Buying, Having and Being, PHI Learning Pvt. Ltd., New Delhi
4) Assel Henry, (2009), Consumer Behaviour, Cengage Learning, New Delhi.
5) Majumdar,R.(2010), Consumer Behaviour: Insights from the Indian Market, PHI Learning Pvt. Ltd., New Delhi
6) Loudon, David L. and Della Bitta, J. (2008) Consumer Behaviour, 4th Edition, Tata McGraw Hill, New Delhi.

RURAL MARKETING (AUMBAMK-03)

UNIT-I

Rural Markets in India: Nature, Scope, characteristics and the potential of rural markets in India, Rural Marketing and its Concepts.
Rural Markets in India: Characteristics of Rural Consumers; Rural Market Environment and Infrastructure; Challenges of Rural Marketing; Rural V/s Urban Markets.

UNIT-II

Rural consumer behavior ;Rural marketing mix , Rural marketing and product life cycle ,Rural marketing of FMCG's , Consumer durables and financial services.
Rural Marketing Strategies: Rural Market Segmentation; Product Strategies; Pricing Strategies; Promotion Strategies; Distributor Strategies; Role of IT in Rural Marketing (e-Chaupals etc.)

UNIT-III

Organization and functions of Agricultural marketing in India. Classification of agricultural products with particular reference to seasonality and perish ability.
Rural Marketing structure and performance: Processing facilities for different agricultural products. Marketing of Agricultural inputs and Agriculturalproducts .

UNIT-IV

Foundation of Social Marketing: Definition, Scope and Importance; Social Marketing Challenges; Conceptual Framework of Social Marketing; Social Markets Segmentation.
Role of Warehousing: Role of central and state governments. Institutions and organizations in agricultural marketing.Nature, scope and role of co-operative marketing in India.

Suggested Reading:

1. Kotler P and Andreasen (2008) Strategic Marketing for Non-Profit Organisations, Prentice Hall of India, PHI, New Delhi
2. Kashyap, Pradeep, Amp, Raut, Siddhartha(2005) Rural Marketing,Wiley, New Delhi
3. Krishnamacharyulu, C.S.G and Rama Krishnan Lalitha, (2006),"Rural Marketing – Text and Cases", Pearson Education, New Delhi.Reference Books
4. Balram, Dogra and Ghuman, Kharminder. (2008) Rural Marketing, Tata McGraw Hill, NewDelhi,
5. Kotler, P. Lee, N. R., Lee, N.(2008) Social Marketing: Influencing Behaviors for Good, Sage Publications.
6. Kotler, P. Roberto, N. Lee, N. (2002) "Social Marketing: Strategies for Changing Public Behavior",2ndEdition, Sage Publications .

MANAGEMENT OF INDUSTRIAL RELATIONS (AUMBAHR – 01)

UNIT-I

Industrial Relations: Concept, Theories and Evolution. The Dynamic Context of Industrial Relations: Globalization and the National Economy, Responses to Competitive Pressures.

Changes in Employment Practices: System approach to IR-Actors, Context, Web of Rules & Ideology, Trade UNIONSIM, impact of trade unions on wages The Trade unions Act, 1926 {with amendments}

UNIT-II

Labour Problems: Concept of Labour Problems in India, Discipline & Misconduct, Grievance Handling

Industrial Bodies: Tripartite and bipartite bodies, Anatomy of Industrial disputes. Conciliation, arbitration and adjudication.

UNIT-III

Collective Bargaining: Concept, meaning and objectives, Approaches, technique & Strategies to collective Bargaining, Process of Collective Bargaining in detail.

Impact of Collective Bargaining: Impact of CB in detail and workers participation in management on IR.

UNIT-IV

Industrial relations : UK & USA, Japan & Russia International Labor Organization (ILO): Objectives, Structure and Procedure for Admission as a Member. Managing Without Unions The industrial Disputes Act, 1947{with amendments}

Suggested Reading:

1) Sinha, P.R.N. et al (2011). Industrial Relations, Trade Unions, and Labour Legislation. Pearson Eduction.
2) Ackers, P. & Wilkinson, A. (2009). Understanding Work & Employment: Industrial Relations in Transition.Oxford: Oxford University Press.
3) Padhi, P.K. (2012). Labor and Industrial Laws.Prentice Hall of India.
4) Singh, B.D. (2009). Industrial Relations: Emerging Paradigms. Excel Books
5) Blain Pane, International Encyclopedia of Industrial Relations.
6) Sinha- Industrial Relation, Trade union and Labour Legislation. (Pearson Education).
7) C.N.Patil Collective Barganing University Press .
8) S.C.Srivastava Industrial Relation &Labour Laws.
9) Report of National Commission on Labour, 1969 .

LABOUR LEGISLATIONS (AUMBAHR -02)

UNIT-I

Evolution of Industrial workers: Meaning ,Its various phases, Need for Labour Legislation in India

The concept of Labour welfare: definition, Scope and Objectives, welfare work and social work .Main recommendations of second National Labour Commission, The Trade Union Act. 1926.

UNIT-II

Payment of Wages Act, 1936.The Minimum Wages Act, 1948, Contract Labour Act 1970.

UNIT-III

The Maternity Benefits Act,1961. The Payment of Bonus Act, 1965, The Employees Provident Fund and Miscellaneous Provisions act 1952.

UNIT-IV

The Workmen Compensation Act, 1923, Adjustment processes and Voluntary Retirement schemes, The ESI Act 1948, The Factories Act, 1948.

Suggested Reading:-

1) Sinha, P.R.N. et al (2011). Industrial Relations, Trade Unions, and Labour Legislation. Pearson Eduction.
2) Blyton, P. & Turnbull, P. (2009). The Dynamics of Employee Relations. Palgrave Macmillan.
3) Ackers, P. & Wilkinson, A. (2009). Understanding Work & Employment: Industrial Relations in Transition.Oxford: Oxford University Press.
4) Padhi, P.K. (2010). Labor and Industrial Laws.Prentice Hall of India.
5) Singh, B.D. (2009). Industrial Relations: Emerging Paradigms. Excel Books.
6) Sen, R. (2009). Industrial Relations: Text and Cases. Macmillan India.

INDUSTRIAL/ORGANIZATIONAL PSYCHOLOGY (AUMBAHR -03)

UNIT-I

Introduction to Industrial Psychology: Meaning, Concept, Nature, Scope &Importance, Problems of industrial psychology.
Psychological testing: Utility, Reliability, and Validity. Individual Differences & their evaluation; Occupational Information and its importance in Industrial Psychology.
Personnel Tests- Purposes & Uses of Tests for Placement, Promotion etc. Validity of Tests, types of Tests and their efficiency, Tests on the basis of intelligence personality and interests, limitation of psychological tests.

UNIT-II

Human Engineering: Introduction, Time Study, Motion study, work study, Hawthorne Study.
Fatigue : Nature, environmental condition, effecting Fatigue, fatigue reduction, monotony, boredom .
Accident Prevention : Introduction, causes of accidents, Industrial safety programmes.

UNIT-III

Organizational Stress: Causes and effects, coping with stress.
Motivation at work: Fundamentals, Financial& Non-Financial aspects.
Attitudes: Introduction, components, Methods of measuring attitudes.
Psychological and Social Issues: Job Simplification, Boredom & Monotony, Fatigue, and Telecommuting.

UNIT-IV

Job Satisfaction: factors influencing job satisfaction. How to increase job satisfaction .
Personnel Counselling: Objectives, types of Counselling , steps & Techniques of counseling.
Group dynamics: Formal & informal groups, group think and group shift.

Suggested Reading:

1) Agunis, H. (2011), Industrial Psychology , Second Edition. Pearson Education, New Delhi
2) Kohli, A.S. & Deb, T. (2010). Organizational Psychology. Oxford University Press, New Delhi.
3) Willard Harrell T. (2009). Industrial Psychology: (Oxford IBH Publishing Co.)
4) Edger Schein (2009). Organizational Psychology PHI, New Delhi
5) Industrial Psychology; E.J. McCormic and IIgen, PHI, New Delhi
6) Industrial Psychology :M.L.Blum, J.C.Nayur (CBS Publishers)

RELATIONAL DATA BASE MANAGEMENT SYSTEM (AUMBAIT -01)

UNIT-I

Overview of DBMS: Basic DBMS terminology, data independence, data Abstraction, Architecture of DBMS.
Distributed Databases: structure of distributed databases, design of distributed databases, Introduction to - data mining, data warehousing.

UNIT-II

Introduction to Data models: Entity relationship model, hierarchical model, relational model,
Object Oriented databases: object relational database, comparison of OOD & ORD, comparison of network, hierarchical and relational models.

UNIT-III

Structure of Relational model: Basic Structure of Relational Data base, Data base Scheme, Query language, storage organizations for relations.
Relational algebra: Fundamental operations, relational calculus, functional dependencies, multivalued dependencies, and normalization.

UNIT-IV

Relational query language: SQL, database integrity, security, concurrency basics, recovery basics, client/ server architecture.
Introduction to SQL, DDL, DML: Working with common database objects, Pitfalls in Relational Database Design, Decomposition.

Suggested Reading:

1) Silberschatz, A, Korth H and Sudarshan S (2012), Database System Concepts, Sixth Edition, McGraw-Hill.
2) Elmsari R. and Navathe S. (2009). Fundamentals of Database Systems, Fifth Edition, Pearson Education, Delhi.
3) Koch, G. &Loney, K. (2009). Oracle 9i The complete reference. Tata McGraw-Hill.
4) Bipin C. Desai (2005). Introduction to Database Management System.Galgotia Publication.
5) Singh Shio Kumar (2009), Database Systems: Concepts, Design and Applications, First edition, Pearson Education.
6) Rob. Peter (2010). Data base system concepts, first edition, Cengage Learning.

E-COMMERCE & IT ENABLED SERVICES (AUMBAIT -02)

UNIT-I

Internet Basics: What Special about Internet. Definition of E – Commerce, Comparison with Traditional Commerce, Framework of Electronic Commerce, The Anatomy of E-Com Applications, Plastic/ E –Money Market, Global Information Distribution Networks.

Web Based Tools for Electronic Commerce: Intranet, Composition of Intranet, Business Applications on Intranet, Extranets. Electronic Data Interchange, Components of Electronic Data Interchange, Electronic Data Interchange Communication Process.

UNIT-II

Domain Name System: Meaning, Need, Importance for e- business
Mobile commerce :Wireless Protocol, WAP, Mobile Computing Applications, Blue tooth. EBusiness models, E-Business security.
Electronic Data Interchange: EDI Applications in Business

UNIT-III

IT Act and Enabled Services : Laws Related to IT Security, Data Communication etc, IT Enabled Services - Call Centre, BPO, Tele-Marketing,

Electronic Payment System: Concept of e-Money, Electronic Payment System, Types of Electronic Payment Systems, Smart Cards, Stored Value cards and Electronic Payment Systems, B2B Electronic payments, Infrastructure Issues in EPS, Electronic Fund Transfer.

UNIT-IV

Web security : Firewall, Transaction security, Secured Socket layout, Security Threats, Network security. Security Protocols such as HTTP, SSL, Firewalls, Personal Firewalls, IDS, VPNs, Public Key Infrastructure (PKI) for Security.

e-Business Applications & Strategies: Business Models & Revenue Models over Internet, Emerging Trends in e-Business, e-Governance, Digital Commerce, Mobile Commerce, Strategies for E-Commerce, Internet based Business Models.

Suggested Books:

1) Efraim Turban, David King, Dennis Viehland, Jae Lee, (2012): Electronic Commerce – A Managerial Perspective, 4th Edition, Pearson Education.
2) Elias M. Awad (2009). Electronic Commerce- From Vision to Fulfillment, 3rd Edition.PHI Learning.
3) Dave Chaffey (2011). E-Business and E-Commerce Management- Strategy, Implementation and Practice, 3rd Edition, Pearson Education.
4) Bharat Bhaskar (2009). Electronic Commerce- Framework, Technologies and Applications, 3rd Edition, Tata McGraw Hill
5) Efraim Turban, David King, Dennis Viehland, Jae Lee, (2009): Electronic Commerce – A Managerial Perspective, 4th Edition, Pearson Education.
6) Elias M. Awad (2009). Electronic Commerce- From Vision to Fulfillment, 3rd Edition.PHI Learning.

SYSTEM ANALYSIS & DESIGN AND SOFTWARE ENGINEERING (AUMBAIT -03)

UNIT-I

Systems Concept: Characteristics of a System; Elements of System; Types of Systems; Decision Support System; System Design.

System Development Life Cycle: Meaning, Investigation, Analysis, Design, Implementation, Post Implementation Review and Maintenance.

UNIT-II

Systems Planning and Investigation: Basis for Planning in Systems Analysis - Dimensions of Planning, Initial Investigation, Needs Identification.

Determining the User's Information Requirements: Feasibility Study, Feasibility Considerations, Steps in Feasibility Analysis - Feasibility Report.

UNIT-III

Tools of Structured Analysis: Data Flow Diagram (DFD), Entity Relationship Diagrams, Data Dictionary.

Process Modeling: Structured English, Decision Tree & Decision Table, Architectural Design, Object Oriented Analysis (OOA) and Object Oriented Design (OOD).

UNIT-IV

Software Architecture: Architectural View Model, Framework, Development , Erosion and Software Architecture Recovery.

Basics of Information Security: Types of Attacks, Viruses, Virus Control, Hackers, Overview of Risks associated with Internet, Intrusion Detection, Risk Management, Disaster Recovery Plan, Cryptography and authentication.

Suggested Readings:

1) Tanenbaum, A. S. (2009). Computer Networks. Pearson Education
2) David A Stamper (2011).System ananlysis. Addison Wesley.
3) Burke Richard J (2011).System Analysis & Design: Concepts and Practice, A Hands-On Approach, First edition, Pearson.
4) Kenneth E Kendall and Julie E Kendall – SAD (PHI Publication, 7 Ed.)
5) AnkitFadia -Encryption-Protecting your Data (Vikas Publication, 1st Ed.).

INTERNATIONAL MARKETING (AUMBAIB – 01)

UNIT-I

Overview of World Business and Framework of International Marketing: Definition of International Marketing, International Dimensions of Marketing, Domestic v/s International Marketing, Process of Internationalization, Benefits of International Marketing. World Market Environment: Political Environment, Legal Environment- Legal Market, Gray Market, Cultural Environment.

UNIT-II

Planning for International Marketing: Marketing Research ,Marketing Information Sources, Marketing Information System, Market Analysis. Foreign Market Entry Strategies: Exporting, Licensing, Joint Ventures, Strategic Alliances, Acquisitions Franchising, Assembly Operations , Management Contracts, Turnkey Operations, Free Trade Zones

UNIT-III

International Product Policy and Planning: Product Design and Standardization, Developing

an International Product Line. Foreign Product Diversification, International Branding Decisions, International Packaging.

International Pricing Strategy: Role of Pricing, Price Standardization, Pricing Decisions, Price Distortion, Transfer Pricing, Counter Trade, Terms of Sale, Methods of Financing and Means of Payment International Channels of Distribution – Channel Members, Channel Management, Retailing in International Scenario, International Physical Distribution.

UNIT-IV

International Marketing Decisions : International Promotion Strategies- Promotion Mix, Promotion and Communication, Personal Selling, International Sales Negotiations.

International Advertising: Patterns of Global Advertising, Global Advertising Regulations , Advertising Media, Standardized International Advertising, International Organizational Control.

SUGGESTED READINGS

1) Cateora, Philip R. and Graham John L. (2008). International Marketing. 11th Edition, Tata McGraw- Hill, New Delhi .

2) Czinkota, Michael R., and Ronkainen, Ilkka A. (2007)). International Marketing, 8th Edition, Cengage Learning, New Delhi.

3) Hollensen, S. (2010), Global Marketing , 4th Edition, Pearson Education.

4) Onkvisit, Sak and Shaw Johan J. (2009) International Marketing- Strategy and Theory, Fifth Edition, Taylor and Francis

5) Keegan, Warren J. (2009). Global Marketing, 4th Edition, Pearson Education, New Delhi..

6) Joshi, R M (2005) , International Marketing, Oxford University Press.

INTERNATIONAL BUSINESS ENVIRONMENT AND FOREIGN EXCHANGE ECONOMICS

(AUMBAIB – 02)

UNIT-I

An Overview of International Business: Introduction, Definition of International Business, Changing Environment of International Business, Globalization of Markets.

Recent Trends in Globalization: Effects and Benefits of Globalization.

UNIT-II

International Business Theories: Introduction Mercantilism, Absolute Advantage Theory Comparative Cost Theory, Hecksher-Ohlin Theory, Product Cycle Theory.

Instruments of Trade Policy: Tariffs, Subsidies, Import Quotas, Voluntary Export Restraints, Administrative Policy, Anti-dumping Policy.

UNIT-III

Foreign Exchange Market: Introduction, Exchange Rate Management, Forex Market.

Foreign Exchange Determination Systems: Basic Concepts Relating to Foreign Exchange, Various types of Exchange Rate Regimes, Factors Affecting Exchange Rates, Brief History of Indian Rupees Exchange Rates.

UNIT-IV

International Institution: UNCTAD, Its Basic Principles and Major Achievements, IMF, Role of IMF, IBRD, Features of IBRD, WTO, Role and Advantages of WTO. Regional Economic Integration: Introduction, Levels of Economic Integration, Regional Economic Integration in Europe, Regional Economic Integration in U.S.A., ASEAN, SAARC, Integration for Business.

SUGGESTED READINGS:

1. Saleem, Shaikh (2012). International Business Environment, 2nd edition, Pearson Education.
2. Tulsian, P C(2009) , "Business Laws," Tata McGraw Hill, New Delhi
3. Paul J (2010) Business Environment Text & Cases, Third Edition, Tata McGraw Hill
4. Prakash, B A (2009) ed "The Indian Economy Since1991; Economic reforms and performance" Pearson Education, New Delhi
5. Pailwar, V K (2010), "Economic Environment of Business," 2nd Edition, Prentice Hall India Learning, New Delhi
6. Khan, M. Y. and Jain P. K. (2011).International Financial Management, Text, Problems & Cases, 6th Edition, Tata McGraw Hill Company, New Delhi.
7. Maheshwari, S.N.(2009)., Financial Management – Principles & Practice, 13th Edition, Sultan Chand & Sons.
8. Bhalla V.K (2009). - International Business Environment (Anmol).

EXPORT MANAGEMENT AND DOCUMENTATION (AUMBAIB – 03)

UNIT-I

Introduction to Export Management: Introduction, Definition of Export, Benefits arising from Export, Export Prospect for Small Firms, Importance of Exports to India, Process of Export Marketing, Sources of Export Information, Important Publications, Important Organizations, Recent Trend in India's Export. Selection of Products and Identification of Export Markets: Choosing a Product, Methods of Identifying Export Winners, Suitability of a Product for A company, Selecting Products for Manufacturing and Export, Selection of Export Markets, Criteria for Grouping Countries.

UNIT-II

Export Marketing Channels: Concepts of Distribution Channels, International Channels Distribution, Agents in Exporting.

Export Sales Contract: Methods of Locating and Selecting an Agent, Signing the agreement, Nature of Exports Sales Contract, Important Incoterms, Settlement of Disputes, Terms of Payment in Export.

UNIT-III

Export Finance: Various sources of Export Financing, Preshipment Finance, Postshipment Finance, Special Financial Facilities, Export Import Bank of India, E.C.G.C. Export Pricing: Various modes of export Pricing, Its determinants, Mechanism of Price Fixation, Benefits to India Exports.

UNIT-IV

Formalities of Registration : Naming the Enterprise, form of Ownership, Opening a Bank Account, General Registrations, Registrations with RBI, Registration with Licensing Authorities.

Defining Export Documentation: Main Commercial Documents, Additional Commercial Documents, and Statutory Documents for Export's Country, Statutory Documents for Imports Country and Documents for Claiming Export Benefits.

SUGGESTED READINGS

1) Cherunilam, F -International Trade and Export Management (Himalaya, 2007)
2) Kotabe – Global Marketing Management, 5ed (Wiley)
3) Varshney R.L, Bhattacharya B-International Marketing Management (Sultan Chand & Sons, 9th Ed.)
4)Govt. of India - Hand Book of Export Import Policy 2002-2007 (Ministry of Commerce, India)
5)Keegan J Warren – Global Marketing Management (Pearson, 7th Ed.)

SEMESTER- IV

INTERNATIONAL FINANCE& TAX PLANNING (AUMBA-401)

UNIT-I

Global Financial Environment: Overview, International Monetary System: Exchange Rate, IMF, EURO Market, Balance of Payments.

Foreign Investment Decision: Recent trends of FDI & FII in India, Flow of FDI & FII, Relation with Indian Economy.

Foreign Exchange Market in India: Nature, Structure & Limitations.

UNIT-II

Exchange Rate Determination: The Exchange Rate of Rupee, Foreign Exchange Risk Exposure: Types of Risk, Hedging.

Derivative Market in India: MCX, Structure of Derivates, Options, Difference between Future and Forwards, Swaps, Role of SEBI.

UNIT-III

Taxation: Introduction to Taxation Management -Taxation system in India. Basics of Direct and indirect taxes.An overview of Tax Audit- Tax incentives and Export promotion. Concepts relating to Tax Avoidance and Tax Evasion, Issue of Bonus Shares, Right Issue ,Dividends etc.

GST: IGST, CGST

UNIT-IV

Tax Planning: Effects of taxation on Investments.Role of tax Planning Manager, and factors to be considered for Tax Planning. Need of Financial Planning.

Tax Management: Filing of Returns, Penalties and Prosecutions, Advance Tax, TDS, Income Tax Rates/Slabs (Current assessment Year, Theoretically), Various Investment avenues to claim rebate from tax sections like 80c,80 D etc.

Suggested Readings:

1) Apte, P.G (2011). International Financial Management (Tata Mcgraw–Hill).
2) Sharan (2010) International Financial Management (Prentice–Hall)
3) Shapiro – Multinational Financial Management (Prentice–Hall)
4) Bhalla, V.K.(2009) : Financial Management and Policy, 2nd ed., New Delhi, Anmol,
5) AhujaGirish, Gupta Ravi, (2010). Systematic Approach to Income Tax, Service Tax and VAT, Bharat Law House Pvt. Ltd., New Delhi
6) Singhania V.K., Singhania Monica (2006) “Student’s Guide to Income Tax”, Taxman Publications, Delhi.

MANAGEMENT INFORMATION SYSTEMS (AUMBA-402)

UNIT-I

MIS need and concepts: factors influencing MIS and characteristics of MIS. Data and Information.Technology of MIS.Structure of MIS. Decision Making and role of MIS. Data communication. Basic H/W required, Channel features and concept of Distributed Data bases.

Telecommunications and networks: An overview of telecommunications; Networks and distributed processing, internet, intranet and extranet.

UNIT-II

Planning for MIS; System Development Methodologies;Conceptual and detailed designs of MIS.System implementation Strategies and process; System Evaluation and Maintenance.

UNIT-III

Introduction to Data Base and Access: Viewing and editing data; Sorting and indexing Printing reports and Labels, Managing Multipletables.Forms, Queries, Reports.

Managing International Information Systems: Organizing International Information Systems; Managing Global Systems; Technology Issues and Opportunities.

UNIT-IV

Enhancing Decision Making for Digital Firm*:*Decision Making and Decision Support System (DSS), Group decision support system (GDSS), Executive support in the enterprise, management opportunities challenges and solutions.

Enterprise application and business process integration*:* Enterprise systems, Supply chain Management systems, customer relationship management system, enterprise integration trends.

Suggested Readings:

1. Rahul De:MIS Management Information systems,Wiley India
2. Jerome Kantler : Management Information System, Prentice Hall of India Pvt. Ltd.New Delhi,1984.
2. Laondon&Laodon: Management Information System, Prentice Hall of India Pvt.Ltd.,New Delhi, 1999.
3.Shubhalakshmi Joshi: Management Information System,Biztantra
4. Davis and Oslon: Management Information System, Tata McGraw Hill Publications,New Delhi, 2nd edition, 1984.
5. Murdick& Ross: Information Systems for Modern Management, Prentice Hall of IndiaPvt. Ltd., New Delhi, 3rd edition, 1984.
6. London, Kenneth C. and London, Lane P., “Management Information Systems”, PHI.

SUPPLY CHAIN MANAGEMENT (AUMBA-403)

UNIT-I

Introduction*:* Basic Concept & Philosophy of Supply Chain Management*;* Essential features, Various flows (cash, value and information), Key Issues in SCM, benefits and case examples.

UNIT-II

Logistics Management: Logistics as part of SCM, Logistics costs, different models, logistics subsystem, inbound and outbound logistics, bullwhip effect in logistics, Distribution and warehousing management.
Purchasing & Vendor management: Centralized and Decentralized purchasing, functions of purchase department and purchase policies.Use of mathematical model for vendor rating/evaluation, single vendor concept, management of stores, accounting for materials.

UNIT-III

Inventory Management: Concept, various costs associated with inventory, various EOQ models, buffer stock (tradeoff between stock out/working capital cost), lead time reduction, re-order point/ re-order level fixation, exercises –numerical problem solving , ABC, SDE/ VED Analysis, Just-In-Time & Kanban System of Inventory management.

UNIT-IV

Recent Issues in SCM : Role of Computer/IT in Supply Chain Management, CRM Vs SCM, Benchmarking concept, Features and Implementation, Outsourcing-basic concept, Value Addition in SCM-concept of demand chain management.

SUGGESTED READINGS

1.Mohanty:Supply chain Management(Theory & Practice),Biztantra
2.Sanders: Supply chain Management(A global Perspective),Wiley India
3. Raghuram G. (I.I.M.A.) - Logistics and Supply Chain Management (Macmillan, 1st Ed.)
4. Krishnan Dr. Gopal - Material Management, (Pearson,New Delhi, 5th Ed.)
5. Agarwal D.K. - A Text Book of Logistics and Supply chain management (Macmillan, 1st Ed.).
6. Sahay B.S. - Supply Chain Management (Macmillan, 1st Ed.)
7. Chopra Sunil and Peter Meindl - Supply chain management (Pearson, 3rd Ed

PRINCIPLES OF INSURANCE AND BANKING (AUMBAFM-04)

UNIT-I

Life Insurance Products: Introduction, Principles, Various Life Insurance Policies of Different of Insurance Companies; Further Classification of Life Insurance Policies.
General Insurance: Types, Policies, principles.
Annuity Policy: Introduction; Basis of Annuity Income; Classification of Annuities; Uses of Annuity; Limitation of Annuity.

UNIT-II

Special Policy Combination & the Best Policy Insurance in pension plans & Group Insurance: Introduction of Pension Plans; Type of Pension Plans; Group Insurance; Types of Group Insurance.
Social & Rural Insurance: Introduction; Social Insurance; Legal Provisions; Rural Insurance.

UNIT-III

Insurance Documents: Introduction; Documents; Prospectus; Proposal Form; First Premium Receipt; Policy Document; Endorsement; Renewal Notice; Bonus Notice.
Riders, Options and Guarantees: Introduction; Riders; Disability; accident; Living; Benefits; Conditions; Policy Options; Policy Guarantee. Underwriting Procedure, NPA and Capital Adequacy in Indian Banks.
Evolution of Banking Law: Main provisions of Banking Regulation Act, 1949; and RBI Act, 1934 and Negotiable Instruments Act, 1881.

UNIT-IV

Computation of Premium: Introduction; Age Factor; Factors of Calculating the Premium; Extra Premium; Extra Premium; Mode of Premium Payable.
Computation of Benefits: Introduction, Bonus, Guaranteed Additions, Surrender Value, Guaranteed Surrender Value, Paid Up Value, Examples.
Claims: Introduction; Maturity Claim; Death Claim, Nomination & Assignment.

Suggested Readings:

1. N.M. Mishra: Principles & Practice of Insurance, S. Chand and Co.,Ltd., New Delhi.
2. Shashidharan K. Kutty: Managing Life Insurance, Prentice-hall Of India Pvt Ltd
3. James L Athearn: Risk and Insurance, Prentice Hall Of India Pvt Ltd
4. Lester William Zartman: Life Insurance,General Books Publications
5. Louis S. Shuntich: Life Insurance Handbook, Marketplace Books Publications
6. Vaughan:Fundamentals of Risk and Insurance,Wiley India

STRATEGIC FINANCIAL MANAGEMENT (AUMBAFM-05)

UNIT-I

Financial Policy and Strategic Planning: Components of financial strategy; Objectives and goals; Strategic planning process. Portfolio Tools, Mean-Variance Analysis and Capital asset pricing model, Factor models and Arbitrage Pricing Theory.

UNIT-II

Investments Decisions under Risk and Uncertainty: Techniques of investment decision- risk adjusted discount rate, certainty equivalent factor, statistical method, sensitivity analysis and simulation method; Corporate strategy and high technology investments.

UNIT-III

Financial analysis and planning, Financial models, Forecasting Financial Statements, Cross sectional analysis of financial statement information, Control, governance and financial architecture. Corporate Valuation and Value Based Management

UNIT-IV

Expansion and Financial Restructuring: Mergers and amalgamations – corporate re structuring, Buy-back of shares, LBO, Sell-off, Spin-off, Demerger and reverse merger, reasons for merger, legal procedure for merger, benefits and cost of merger; Determination of swap ratios; Evaluation of merger proposal; Corporate and distress restructuring.

Suggested Readings:

1. Allen, D: An Introduction to Strategic Financial Management, CIMA/KoganPage, London.
2. MeenaGoel:Strategic Financial Management,Biztantra Publication
3. Chandra, Prasanna: Financial Management, Tata McGraw Hill, Delhi.
4. Copeland, T., Koller, T and Murrin, J: Valuation: Measuring and Managingthe value of Companies, John Wiley, International Edition, New York.
5. Copeland, T.E. and Weston, J.F: Financial Theory and Corporate Policy,Addison-Wesley
6. Hampton, Jone: Financial Decision Making, PHI, New Delhi.
7. Kaplan, Robert S., and Cooper, Robin: Cost & effect: using integrated cost systems to drive profitability and performance, Harvard Business Press.
8.Grinblatt, Mark and Titman, Sheridan: Financial Markets and Corporate Strategy, Tata McGraw Hill.
9. Foster, George: Financial Statement Analysis, Pearson Education.
10. Brealey, Richard A. and Myers, Stewart C.: Principles of corporate finance, Tata McGraw Hill.

MANAGEMENT OF FINANCIAL SERVICES (AUMBAFM-06)

UNIT-I

Financial Services: Meaning, types and their importance. Securities Trading - Online Vs Offline Trading, Demat and Remat .Depository - Introduction, Concept, depository participants, functioning of depository systems, process of switching over to depository systems, benefits, depository systems in India, SEBI regulation.

UNIT-II

Mutual funds and AMCs: concept, origin and growth of mutual funds, Constitution & management of MFs - Sponsors, Trustees, AMCs, and custodians. Classification of mutual fund schemes, advantages and disadvantages in mutual fund schemes, NAV and pricing of mutual fund units. state of mutual funds in India.
Insurance Services Introduction, Principles of insurance, Types of Insurance. Life Insurance Products-Traditional and ULIPs.
Credit rating: the concept and objective of credit rating, various credit rating agencies in India and International credit rating agencies, factors affecting creditrating& procedural aspects.

UNIT-III

Leasing: Concept and development of leasing, business, difference between leasing & hire purchase, types of leasing business, advantages to lessor and lessee.
Merchant Banking: Origin and development of merchant banking in India scope, organizational aspects and importance of merchant bankers. Latest guidelines of SEBI w.r.t Merchant bankers.
Venture capital: concepts and characteristics of venture capital, venture capital in India, guidelines for venture capital.

UNIT-IV

Call money market, Treasury bill market, Commercial Bill market, Market for CPs and CDs, Discount market and market for financial guarantees.
Factoring: Development of factoring types & importance, procedural aspects in factoring, financial aspects, prospects of factoring in India.
Plastic Money: Concept and different forms of plastic money - credit and debit cards, pros and cons. Credit process followed by credit card organizations. Factors affecting utilization of plastic money in India.

Suggested Readings:

1.Shanmugham:Financialservices,Wiley India
2. E.Gordon& K. Natarajan Financial Markets & Services Himalaya
3. LalitK.Bansal Merchant banking & Financial Services Unistar Books
4. S Gurusamy Financial services & system Thomson
5.Nalini P T Financial Instruments and services PHI
6. M Y Khan Financial Services Tata McGraw-Hill
7. L M Bhole Financial Institutions & Markets Tata McGraw-Hill
8. Lalit K. Bansal Merchant Banking & Financial Services Unistar Books

MARKETING OF SERVICES (AUMBAMK-04)

UNIT-I

Introduction: Difference between Product and Services Marketing, Characteristics of Services Classification of Services, Paradigms in Services Marketing, Importance of Customer
Relationship Management : Specific for Service Industry.
Service Marketing System: Service Quality, Understanding Customer Expectations and Zone of Tolerance, Segmentation and Zone of Tolerance, Targeting and Positioning of Services.

UNIT-II

Services Marketing Mix: Augmented Marketing Mix, Developing the Service Product/ Intangible Product, Service Product Planning, Service Pricing Strategy, Services Promotions, Services Distributions.
Physical Evidence: Role of Communication in Service Marketing, People and Internal Communication, Process of Operations and Delivery of Services, Role of Technology in Services Marketing.

UNIT-III

Marketing of Financial Services: Deciding the Service Quality, Understanding the Customer Expectations, Segmenting, Targeting and Positioning of Financial Services, Devising Financial Services, Marketing Mix Strategies with Special Reference to Credit Cards, Home Loans, Insurance and Banking, Marketing of Telecom/ Insurance Services.

UNIT-IV

Services in Global Perspective: International Marketing of Services Recent Trends, Principal Driving Force in Global Marketing of Services, Key Decisions in Global Marketing, Services Strategy and Organizing for Global Marketing.

Suggested Readings:

1. Baron S and Harrisk - Services Marketing: Text and Cases (Palgrave, 2nd Ed.)
2. Love lock Christopher - Services Marketing: People, Technology and Strategy (Pearson Education, 5th Ed.)
3.Gronrooves: Service Management and Marketing,Wiley India
3. Zeithaml - Services Marketing (Tata McGraw Hill, 3rd Ed.)
4. Woodruff Helen - Service Marketing (Macmillian, 1st Ed.)
5. Payne Adrian - The Essence of Service Marketing (Prentice Hall of India)
6. Rama MohanaRao - Services Marketing. (Person Education, 1st Ed.)
7. GovindApte - Services Marketing (Oxford University Press)

RETAIL MANAGEMENT (AUMBAMK 05)

UNIT-I

Overview of Retailing Environment and Management: Retailing, Definition and Concept, Functions of Retailing Driving Forces for Retailing, Building and Sustaining Relationships, Strategic Planning, Structural Change, Type of Retail Outlets, Market Structure, Retail Planning, Development and Control. The Customer and Retail Business: Knowing your Customers, Focusing on the Consumer, Mapping Out Society, Learning, Attitude. Motivation and Perception.

UNIT-II

Situational Analysis: Retail Institutions by Ownership. Retail Institutions by Store-based Strategy-Mix, Web, Nonstore-based and other Forms of Non Traditional Retailing. Targeting Customers and Gathering Information. Communicating with Customers. Promotional Strategies used in retailing. Choosing a Store Location: Trading Area Analysis, Site Selection,. Store Design and Layout, The Store and its Image, The External Store, Internal Store, Display, Visual Merchandising and Atmospherics.

UNIT-III

Managing Retail Business: Retail Organization and HRM, Retail Organisation and Operations Management, Financial Dimensions, Managing Retail Services. Service Characteristics, Branding, Perceptions of Service Quality.

UNIT-IV

Delivering the Product: Retail Information Systems, Merchandise Management Retail Pricing, Development and Implementing Plans, People in Retailing.
International Retailing: Internationalization and Globalization, Shopping at World Stores, Going International, The Internalization Process, Culture, Business and International Management.

Suggested Readings:

1.James R. Ogden:Integrated Retail Management,Biztantra Publication
2. Newman A.J. and Cullen P - Retailing : Environment and Operations (Vikas, 1st Ed.)
3. Berman B and Evans J.R - Retail Management (Pearson Education, 9th Ed.)
4. Michael Levi M and Weitz BW - Retailing Management (Tata McGraw Hill, 5th Ed.)
5. Dunne Patrick M., Lusch Robert F. and Griffith David A - Retailing (Cengage Learning, 4th Ed.)
6. Cox Roger and Brittain Paul - Retailing: An Introduction (Pearson Education, 5th Ed.)
7. Newman and Cullen - Retailing (Cengage Learning, 1st Ed.)
8. Vedmani G. Gibson-Retail Management- Functional Principles & Practice (Jaico Publications, 1st

SALES AND DISTRIBUTION MANAGEMENT (AUMBAMK-06)

UNIT-I

Introduction: Selling as a Part of Marketing, Sales Management Process, Role of Sales Manager, Concept of Personal Selling, Sales Management and Salesmanship, The Ones of Personal Selling, Process of Personal Selling, Qualities of a Successful Salesman.

Goals in Sales Management: Goal Setting Process in Sales Management, Analyzing Market Demand and Sales Potential, Techniques of Sales Forecasting, Preparation of Sales Budget, Formulating Selling Strategies, Designing Sales Territories and Sales Quota.

UNIT-II

Sales Force Management: Organising the Sales Force, Designing the Structure and Size of Sales Force, Recruitment and Selection of Sales Force, Leading and Motivating the Sales Force, Training and Compensating the Sales Force, Sales Contests, Evaluation and Analysis.

UNIT-III

Introduction to Distribution Management: Concept of Distribution Channel, Importance of a Channel, Types of Channels, Primary Distributors, Specialized Distributors and Participants, Distributors: Policies and Strategies.

UNIT-IV

Channel Management: Forces of Distributing Systems, Distributors Selection and Appointment, Channel Conflicts and their Resolutions, Training the Distributors Sales Team.

Suggested Readings

1. Donaldson B - Sales Management : Theory and Practice (Palgrave)
2. Cron: Sales Management,Wiley India
3. Jobber David and Lancaster Geoff - Selling and Sales Management (Pearson Education)
4. Spiro - Sales Force Management (Tata McGraw Hill, 11th Ed.)
5. Still Richard R, Cundiff Edward W. and Govoni Norman A.P - Sales Management: Decisions, Strategies and Cases (Pearson Education, 5th Ed.)
6. Rosenbloom– Marketing Channels (Cengage Learning, 7th Ed.)
7. Johnson and Marshall - Sales Force Management (Tata McGraw Hill, 8th Ed.)
8. Coughlan A.T., Stern Louis W., EL-Ansary A.I. and Anderson E - Marketing Channels (Prentice Hall of India, 6th Ed.)

HUMAN RESOURCE PLANNING AND DEVELOPMENT (AUMBAHR-04)

UNIT-I

Micro level manpower planning and labour market analysis; Organisational human resource planning; Career Management and career planning; Performance planning; Potentials appraisal and career development Meaning, Scope, Dimensions & Dynamics of HRD; Approaches of HRD, HRM & HRD, Challenges of HRD, HRD Systems, HRD Strategies, HRD Model, Techniques of Assessment.

UNIT-II

HRD needs: Organizational Analysis; Task analysis and individual analysis.
HRD strategies: Individual development; team development; designing training programmes, on the job, off-the job; Training methodology; role of trainer; MDPs; Out bound training; Training evaluation.

UNIT-III

Competency mapping; Job redesigning; Job enlargement; Job enrichment; Job rotation; Suggestion schemes; Career Planning; Career strategy, Career Development, Employee Counselling, Employee Powerment.

UNIT-IV

Quality of Worklife; Quality Circles; Kaizen; Strategic Human Resource Development; Problems and Prospects of HRD in Indian Organization; HRD experiments and cases – In India and other countries.

Suggested Readings:

1. Desimone; R.L. Werner, JM & Harris, D.M. : Human Resource Development, Thomson.
2. Mishra:Human Resource Planning and Development,Dreamtech press
3. Rajsekharan, N.P.: Competency Web, Universities Press.
4. Rao, T.V.: Reading in HRD, Oxford & IBH.
5. Pareek, UdailRao, T.V: Designing and Managing Human Resource Systems, Oxford & IBH.
6. Arthur, M. : Career Theory Handbook, Englewood Cliffs, Prentice Hall Inc., 1991
7. Belkaoui, A. R. and Belkaoui, J.M. : Human Resource Valuation: A Guide to Strategies and Techniques, Greenwood, Quorum Books, 1995.
8. Dale, B. : Total Quality and Human Resources: An Executivew Guide, Oxford, Blackwell, 1992.
9. Greenhaus, J.H. : Career Management, New York, Dryden, 1987.
10. Kavanagh, M. J. etc. : Human Resource Information System: Development and Applications, Boston, PWS-Kent, 1993.

TEAM BUILDING & LEADERSHIP (AUMBAHR-05)

UNIT-I

Leadership – Meaning, Concepts and Myths about Leadership, Components of Leadership- Leader, Followers and situation. Assessing Leadership & Measuring Its effects.

UNIT-III

Focus on the Leader – Power and Influence; Leadership and Values. Leadership Traits; Leadership Behaviour; Contingency Theories of Leadership; Leadership and Change.

UNIT-III

Groups,Teams and Their Leadership. Groups – Nature, Group Size, Stages of Group Development, Group Roles, Group Norms, Group Cohesion.Teams – Effective Team Characteristics and Team Building, Ginnetts Team Effectiveness Leadership Model.

UNIT-IV

Leadership Skills – Basic Leadership Skills, Building Technical Competency, Advanced Leadership Skills, Team Building for Work Teams, Building High Performance Teams.

Suggested Readings :

1. Hughes, Ginnett, Curphy - Leadership, Enhancing The Lessons of Experience (Tata McGraw Hill, 5th Ed.)
2. Dubrin:Leadership research Findings Practice and Skills,Biztantra publications
3. Yukl G - Leadership in Organisations (Pearson, 6th Ed.)
4. West Michael - Effective Team Work (Excel Books, 1st Ed.)
5. Sadler Philip - Leadership (Crest Publishing House)

PERSONAL GROWTH AND TRAINING & DEVELOPMENT (AUMBAHR-06)

UNIT-I

Personality: Meaning & Concept, Personality Patterns, Symbols of Self, Moulding the Personality Pattern, Persistence & Change.
Personality & Personal Effectiveness: Psychometric Theories –Cattele and Big Five, Psychodynamic Theories - Carl Jung and MBTI, Transactional Analysis, Johari –Window, Personal Effectiveness.

UNIT-II

Personality Determinants: An overview of Personality determinants.
Evaluation of Personality: Sick Personalities and Healthy Personalities.

UNIT-III

Training : Concept, Role, Need and Importance of Training, Types of Training, Understanding Process of Learning, Developing an Integrated Approach of Learning in Training Programme.

UNIT-IV

Training Need Assessment: Determination of Training Needs, Approaches to Training Needs Assessment, TNA Cycle of Events. Designing Training Programmes, Methods of conducting Training, Evaluation of Training Programmes.

Suggestion Readings :

1. Hurlock., Elizabeth B - Personality Development (Tata McGraw Hill, 1st Ed.)
2. B.Janakiram:Training&Development,Biztantra Publications
3. UdaiPareek - Understanding Organizational Behaviour (Oxford, 2nd Ed.)
4. SahuR..K. - Training for Development (Excel Books, 1st Ed.)
5. Tapomoy Deb - Training & Development Concepts &Application(Ane Books, 6th Ed.)
6. Friedman &Schustack - Personality: Classic Theories and Modern Research (Pearson)
7. Lynton &Pareek - Training for Development (Vistaar Publication, 2nd Ed.)
8. Hall Calvin S.et al - Theories of Personality (Wiley-India Text Books, 4th Ed

DATA COMMUNICATION & NETWORK (AUMBAIT-04)

UNIT-I

Fundamentals of Communication System; Communication Links, Communication System Formats; Character Codes, Digital Data Rates; Asynchronous and Synchronous Data, Types of signals: AM; FM; PM; PCM; PDM; TDMA; FDMA; SDMA; CDMA; ASK; FSK; PSK
Features: Error detection and correction codes; Hamming codes.

UNIT-II

LAN topologies: Workstation; Server; Cables; Types of Ethernet; Broadband and base-band; Optical Fibers; Network Interface Card.
Networks and accessories: LAN, MAN, WAN; Hub; Bridges; Switches; Routers; Gateways Cell Relay; Frame Relay; ISDN; B-ISDN

UNIT-III

OSI Model; Broadcasting; Multicasting; Point-to-point communication; IP Addressing, Concepts of Port; Socket; ATM; Tunneling; Virtual Private Network.
Network Operating systems: Unix; Linux; Windows.

UNIT-IV

Mobile Communication: Applications of Mobile Communication; Wireless Communication: Bandwidth, Transmission Impairment, Interference, Terrestrial Microwave, Broadcast Radio, Infrared & Light Waves,
Mobile Internet & WML: Mobile IP, Wireless TCP& UDP, WAP, WML

SUGGESTED READINGS:

1) James Irvine:Data Communication and Networks,Wiley India
2) Widjaja L G - Communication Networks (Tata McGraw Hill, 2000)
3) Comer - Computer Networks and Internets (Pearson Education, 4th Ed.)
4) Stallings W - Data Computer Communication (Pearson Education, 2003, 7th Ed.)
5) Olifer- Computer Networks,Wiley India
6) Tanenbaum - Computer Networks (Prentice-Hall, 2004, 4th Ed.)
7) Black - Computer Networks (Prentice-Hall, 1999, 2nd Ed.)

ENTERPRISE RESOURCE PLANNING (AUMBAIT-05)

UNIT-I

ENTERPRISE RESOURCE PLANNING:
Evolution of ERP, Definition, Elements, Problem of System islands, need for system Integration, ERP products and Market, Opportunities and problems in ERP selection and implementation, MRP and MRPII.

UNIT-II

BUSINESS PROCESS REENGINEERING:-
Conceptual foundation of Business Process Re-engineering Role of Information Technology in BPR, Process identification and mapping, Process improvement and Process Redesign. Man Management for BPR implementation.

UNIT-III

ERP MODUELS/FUNCTIONALITY:-
Functional modules of ERP system, Sales order processing, MRP, Scheduling, Forecasting, Maintenance, Distribution, Finance and HRP; Features of each of the modules; Description of data flows across each module: Overview of the supporting data bases; Technologies required for ERP, Hardware Platform, Communication and networks.

UNIT-IV

IMPLEMENTATION ISSUES:-
Pre-implementation issues, Financial justification of ERP, Evaluation of Commercial Software; During implementation issues, Education and training, Project management; Post implementation issues, Performance measurement.

INTEGRATION OF ERP WITH NET TECHNOLOGIES:
Net technologies, Evolution of E-Commerce, EDI and E-business, Internet in ERP, Internet banking and related technologies, security and privacy issues, future growth of E-business.

Suggestion Readings :

1. V.K. Garg and N.K. Venkitakrishnan, Enterprise Resource Planning: Concepts and Practices, Prentice Hall (I) 1999, New Delhi.
2. Dey :Business process re-engineering,Biztantra
3. Hammer, Micheal and JamtsChamby Reengineering the corporation, 1997.
4. Leon, Alexix Countdown 2000, Tata McGraw.
5. J. Kanter, Managing with Inforamtion, Prentice Hall (I), 1996, New Delhi.
6. Carr, K. and Johansson, H.J. Best Practices in Re-engineering. New York, McGraw Hill, 1995.

INTERNET AND WEB DESIGNING (AUMBAIT-06)

UNIT-I

Introduction to Internet, Evolution of Internet, Hardware and Software Requirements for Internet, Internet Application, Bandwidth, Types of Internet Connections(Broadband/Dial- UP/Lease Line/ISDN/DSL etc.), Internet Features (Electronic Mail, Newsgroups, FTP Archive, Real Time Activity, Video, Audio, Search Engine), World Wide Web, WWW Browsers, WWW Servers.

UNIT-II

TCP/IP Connectivity - IP addressing, DNS, Domain Names Registration process, Routing with TCP/IP Basics, Routing Protocol, Static Routing, Open Shortest Path First Protocol, Exterior Gateway Protocols (EGP, Border Gateway Protocol, Multi-Routing Protocol Environments).
Internet Technology – WI-FI, 2G, 3G etc.

UNIT-III

HTML - Text formatting, Data, Tables, Table layout, Images, HTML Interactivity, URLs, HTTP, NNTP, Hyperlinks, Menus & Image Maps, HTML Form, Embedded objects in HTML, Web Typography, Approaching Web Typography, Graphics and Type, Families and Faces, Type forms, Color and Type, Adding Graphics, Adding Graphics with the Image Element, Using images as links, Creating Image Maps, Working with Image Files, Layout Technology, Standard HTML Formatting, Tables, Frames,

UNIT-IV

Cascading Style Sheets, Understanding CSSI's Advantages and Limitations, Embedding of CSS In HTML, Learning How CSSI Works, Introduction to XML.

Suggested Readings:

1.Kogent:HTML 5 Black book,Dreamtech press
2.DevenShah:A Complete guide to Internet and Web Programming,Dreamtech press
3. Internet Get Started: BPB Publications.
4. Loren Buhle, "Webmaster Professional Reference", New RidersPublishing.
5. Rick Darnell "HTML 4", Techmedia.
6. Tauber, "Mastering Front Page 2000" BPB.
7. James Jaworski, "Making Java Script and JSCRIPT", BPB Publications.

INTERNATIONAL LOGISTIC MANAGEMENT (AUMBAIB – 04)

UNIT-I

Introduction to Logistic System: Concepts of Logistics, Scope and Objectives of Logistics, System Elements, Importance of Logistics, Relevance of Logistics to Expert Management, Logistics Excellence.

Logistics Management: Logistics as part of SCM, Logistics costs, different models, logistics sub-system, inbound and outbound logistics, bullwhip effect in logistics, Distribution and warehousing management.

UNIT-II

Structure of Shipping Industry and World Seaborne Trade: Different type of Ships, Shipping Routes, Operating Ships-Linear and Tramp, Organization of Shipping Company. Volume and value of World Trade, World Tonnage, Flags of Convenience, Conference System, Chartering.

UNIT-III

Freight Structure and Role of Intermediaries: Principles of Freight Rates, Linear Freight Structure, Tramp Freight Structure, Shipping Agents, Freight Brokers, Freight Forwarders Stevedores.

Purchasing & Vendor Management: Centralized and Decentralized purchasing, functions of purchase department and purchase policies. Use of mathematical model for vendor rating / evaluation, single vendor concept, management of stores, accounting for materials

UNIT-IV

Indian Shipping and Containerization: Ports in India, Developments in India Shipping, Ports Infrastructure Development, Shipping Association, Shipment of Govt. Controlled Cargo. Concept of Containerization, Classification of Constraints in Containerization, I.C.D's.

International Air Transport: Concept of Air Transport, Advantages of Air Transport, Constraints, Air Cargo, Tariff Structure, I.A.T.A.

SUGGESTED READING:

1. Rushton, A., Croucher, P. and Peter Baker, (2006). Handbook of Logistics and Distribution Management, 3rd Edition, Kogan Page Pub..
2. Christopher Martin. (2005). Logistics & Supply Chain Management Creating Valueadding Networks, 3rd Edition, Pearson Education.
3. Chopra Sunil and Peter Meindl (2009). Supply Chain Management, 4th Edition, Pearson Education. 4
. Ballou, R. H. (2004). Business Logistic Management, 5th Edition, Prentice Hall, New Delhi.
5. Bowersox, D. J., David, J & Cooper (2010). Supply Chain Logistics Management, McGraw Hill
6. Agarwal D.K.(2009) - A Text Book of Logistics and Supply chain management (Macmillan, 3rd Ed.).

INTERNATIONAL FINANCIAL MANAGEMENT (AUMBAIB – 05)

UNIT-I

International Finance: concept & role of international finance manager in multinational corporations. **Different types of risks:** country risk analysis.

International financial environment: international transactions & financial market, trade & capital flow, inflation, exchange control & currency devaluation, ex-proprietary action etc.

UNIT-II

Role of FDI &FII : Foreign direct investment & foreign institutional investment foreign collaboration trends since liberalization.

Financial operations of multinational corporation: sources & investment: short, medium & long term national currency financing foreign currency financing, regional & national development finance, private investment companies. Multilateral financial institution: WB/IMF, ADB. Export & import financing: role of commercial banks. Basic instruments, private non-bank sources of finance.

UNIT-III

Financial innovation & risk sharing: introduction, futures markets in growing world, financial future trading, role of financial futures, swap markets, basic swap structure, interest rate, fixed rates currency, currency coupon types.

International stock exchanges: New York, London, Luxemburg, third world and Asian stock exchanges: working and their influences, the securities market, bond market, foreign portfolio investment.

UNIT-IV

New developments in international finance: country funds, ADR, GDR, EURO issues, ECBs, their process of issue, benefits, limitations & specific guidelines issued by Foreign Investment Promotion Board (FIPB).International financial investment strategies and regulations for Indian Companies.

Foreign Exchange Management Act, 1999: Need, Scope, FERA,Various Provisions.

Suggested Readings:

1) Khan, M. Y. and Jain P. K. (2012). Financial Management, Text, Problems & Cases, 5th Edition, Tata McGraw Hill Company, New Delhi.
2) Maheshwari, S.N.(2010)., International Financial Management – Principles & Practice, 13th Edition, Sultan Chand & Sons..
3) Van Horne, James, C (2009). Principles of Financial Management, Pearson.
4) Prasanna, Chandra (2011) Financial Management: Theory and Practice, 7th Edition, Tata McGraw Hill.
5) Van Horn, JC(2010), Financial Management and Policy, Prentice Hall, New Delhi
6) PG Godbole(2010), Mergers, Acquisitions and Corporate Restructuring, Vikas Publishers, New Delhi.

INTERNATIONAL BUSINESS ETHICS AND SOCIAL RESPONSIBILITY (AUMBAIB – 06)

UNIT-I

Fundamental principles of ethics: Ethics in international business, Normative and relative ethics, concept and choice, Legal compliances. Sarham Oxley Act (SOX), Home and host country's regulations and compulsions of international agencies.

UNIT-II

Corporate governance: Corporate governance beyond legal compliance. Human dignity, Meeting stake holders, expectations, competitiveness and fair trade practices, Employee wellness. International Importance of integrity, avoidance of corrupt, practices, Importance of doing business on merit.

UNIT-III

Social Responsibility: Meaning, Wider concept of social responsibility, Balance between profit and social / moral obligations and survival. Ethics and human rights.

Global Environment: Balanced global environment Kyoto Protocol concern of global warming, judicious use of natural resources, Maintenance of ecological balance, Sustainable development, Cost benefit analysis of corporate social responsibility and good corporate citizenship.

UNIT-IV

Role of International trade: Role of international trade and business organizations Concept of Ombudsman. Cases- Analysis of failure of leading corporate and top auditing firms due to lapses in ethics and social responsibilities.

Legal and Ethical Issues in International Trade.

Suggested Reading:

1) Weiss, Joseph W (2011). Business Ethics: Concepts & Cases, Cengage Learning.
2) Colin Fisher and Alan Lovell (2010). Business ethics and values: Individual, Corporate and International Perspectives, Prentice Hall.
3) Hartman , Laura P. and Joe DesJardins (2009). Business Ethics: Decision-Making For Personal Integrity And Social Responsibility, McGraw-Hill/Irwin
4) Hartman, Laura P and AbhaChatterjee (2009). Perspectives in Business Ethics, Tata McGraw Hill .

Study & Evaluation Scheme

Of

PGDCA

[Applicable w.e.f. Academic Year 2019-20]

ABHILASHI UNIVERSITY

Chailchowk (Chachyot), Distt. Mandi (H.P.)
Website:www.abhilashiuniversity.in

Study & Evaluation Scheme Programme: PGDCA

SEMESTER-I

Sr.No.	Course Code	Subject	Teaching Scheme				Evaluation Scheme		
			L	T	P/D	Credits	Internal Assessment	External Assessment	Total
1	AUPGDCA - 101	Fundamentals of Programming using C	3	1	0	4	40	60	100
2	AUPGDCA – 102	PC Software	3	1	0	4	40	60	100
3	AUPGDCA - 103	Operating System	3	1	0	4	40	60	100
4	AUPGDCA - 104	Computer Organization and Architecture	3	1	0	4	40	60	100
LABS									
1	AUPGDCA – 101(L)	Fundamentals of Programming using C	0	0	2	1	30	20	50
2	AUPGDCA – 102(L)	PC Software	0	0	2	1	30	20	50
TOTAL			**12**	**4**	**4**	**18**			

SEMESTER-II

Sr.No.	Course Code	Subject	Teaching Scheme				Evaluation Scheme		
			L	T	P/D	Credits	Internal Assessment	External Assessment	Total
1	AUPGDCA - 201	Data and File Structure	3	1	0	4	40	60	100
2	AUPGDCA – 202	System Analysis and Design	3	1	0	4	40	60	100
3	AUPGDCA - 203	Object Oriented Programming & C++	3	1	0	4	40	60	100
4	AUPGDCA - 204	Database Management System	3	1	0	4	40	60	100
LABS									
1	AUPGDCA – 203(L)	DFS using C++	0	0	2	1	30	20	50
2	AUPGDCA – 204(L)	Database Management System	0	0	2	1	30	20	50
3		Project Work					100	100	200
TOTAL			**12**	**4**	**4**	**18**			

SEMESTER - I

FUNDAMENTALS OF PROGRAMMING USING C (AUPGDCA - 101)

Credits- 4 (L-3, T-1)

Objective: To understand the topics on the programming language C. Also understand the various concepts about C language functions, pointers, structure etc.

Course Outcomes:

- Students will be able to programming skills for solving problems
- To implement coding standards using C

Course Content:

SECTION–A

Programming Tools: Problem analysis, Program constructs (sequential, decision, loops), Algorithm, Flowchart, Pseudo code, Decision table, Modular programming, Top Down and Bottom up approaches, Concept of High Level Languages, Low Level Languages, Assembly Languages, Compiler, Interpreter, Type of errors.

SECTION–B

Overview of C: General structure of C Program. Data types, Operators and expressions: Constants and Variables, Data types, Declaring Variables, Storage Classes, Different types of expressions and their Evaluation, Conditional Expression, Assignment statement, Enumerated data type, Redefining/Creating data types, Library functions, Type casting. Input/Output: Unformatted and formatted I/O Functions (Character and strings I/O, *Scanf ( ), Printf ( ).*

SECTION–C

Control Statements: Decision making using *if, if-else, elseif* and *switch* statements, Looping using *for, while* and *do-while* statements, Transferring Program controlling *break* and *continue* statements, Programming examples to illustrate the use of these control statements.
Pointers: Definition, Need of pointers, declaring Pointers, Accessing Values via Pointers, Pointer arithmetic, Types of pointers.

SECTION–D

Functions: Defining a function, Local variables, *return* statement, invoking a Function, specifying and passing arguments to a function, Functions returning non Integer, External, static and register variable, block structure, initialization and recursion.
Structures: Declaring a structure type, Declaring Variables of structure type, Initializing Structures, Accessing Elements of structures, arrays of structures, nested structures, Pointers to structures.

Text Books:

1. Mullis Cooper: Spirit of C: Jacob Publications
2. Yashwant Kanetkar: Let us C: BPB

Refrence Books:

1. Kerninghan B.W. & Ritchie D. M.: The C Programming Language: PHI
2. Yashwant Kanetkar: Pointers in C: BPB
3. Gotterfied B.: Programming in C: Tata McGraw Hill

PC SOFTWARE (AUPGDCA - 102)

Credits- 4 (L-3, T-1)

Objective: To understand the operating system concept. To get to know about a various types of operating system. To get the basic knowledge about MS – Office.

Course Outcomes:

- To see working of different operating systems
- To implement MS-Office PC Suite

Course Content:

SECTION–A

Operating System Concept: Duties, Responsibilities and functions of an Operating system, General understanding of different Operating System Environment (Single user system, Multi user system, Graphical user interface system, character based system).

SECTION–B

Disk Operating System: Concept of Files and Directories, Internal commands, External commands, Batch Files, Filters, Redirection, Macros, Wild Card character Booting Process, Configuration Files (Config.Sys), General Understanding Of Facilities, Features Of Windows Explorer, Control Panel Setting, Accessories, Recycle Bin.

SECTION–C

Computer Virus: Prevention, Detection, Cure.
Word Processing Concepts: Definition, Benefits, Facilities & Features in general.
MS - Office 97: Word processing using MS-WORD, File handling, Editing, Formatting, spell checking, Mail merge & Table handling & Insertion, importing, exporting & object linking embedding, printing operation.

SECTION–D

MS-Excel 97: Spreadsheets, Entering data & selecting cells, editing worksheet data, formatting worksheet, creating Formulae, function & charts /graphs, multi operation, data base management.
MS Power Point: Creating & saving presentation templates & view (slide view, notes view, outline view, slide show) Formatting text, slides & graphs, animations, slides transition, multi operation.

Text Books:

1. A.L.STEVENS: Teach Yourself Windows.
2. JONATHAN KAMIN: DOS-7.
3. R.K.TAXALLI: Intro to software package, Galgotia publication.
4. RAJIV MATTUS: dos quick reference, Galgotia.
5. RAJIV MATTUS: Learning window 98 step by step BPB publication
6. LONNIE .E. MOSELEY& DAVID M.BOODEY: Mastering office 97

OPERATING SYSTEM (AUPGDCA - 103)

Credits- 4 (L-3, T-1)

Objective: To understand the operating system concept. To get to know about different characteristics of operating system.

Course Outcomes:

- To identify the role of different components of operating system
- To implement various strategies for task management in operating system
- To explain various implementation issues in operating system

Course Content:

SECTION–A

Introduction: Definition Of The Operating System, Functions Of An Operating System, Different Types Of Systems - Simple Batch System, Multi-Programmed Batched System, Time Sharing System, Personal Computer Systems, Parallel Systems, Distributed Systems, Real Time Systems.

SECTION–B

Process Management: Process- Process Concept, Process Scheduling, Operation On Processes, Cooperating Processes, Threads, Inter-Process Communication, CPU Scheduling–scheduling criteria, scheduling algorithms – FCFS, SJF, priority scheduling, round robin scheduling, multilevel queue scheduling, multilevel feedback queue scheduling, multiple processor scheduling, real time scheduling.

Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.

SECTION–C

Memory Management: Logical & physical address space, Swapping, Continuous Allocation (single partition, multiple partition), internal, external fragmentation, Paging, Segmentation, Segmentation With Paging, Virtual Memory, Demand Paging, Performance Of Demand Paging, Page Replacement, Page Replacement Algorithms– FIFO, optimal, LRU, LRU approximation algorithms, counting algorithms, Thrashing, Demand Segmentation.

SECTION–D

File System Implementation: File System Structure, Allocation Methods contiguous allocation, linked allocation, indexed allocation.

Secondary Storage Structure: Disk Structure, Disk Scheduling, FCFS, SSTF, SCAN, C-SCAN, Look Scheduling, Selection of A Scheduling Algorithm, Disk Management-disk formatting, boot block, bad blocks.

Text Books:

1. Silberschatz, Galvin “Operating System Concepts”, Addison Wesley Publishing Company, 1989.

Reference Books:

1. William Stallings, “Operating Systems”, Macmillan Publishing Company.
2. Deitel H.M., “An Introduction To Operating System”, Addison Wesley Publishing Company, 1984.
3. Tanenbaum, A.S., “Modern Operating System”, Prentice Hall of India Pvt. Ltd. 1995.

COMPUTER ORGANISATION AND ARCHITECTURE (AUPGDCA - 104)
Credits- 4 (L-3, T-1)

Objective: To understand the basic computer organization and design. Also the concept of input-output and memory management.

Course Outcomes:
- To learn about the evolution of computers
- To implement architectural design of computer

Course Content:

SECTION–A

Basics: Organization & Architecture, Structure & Function, A brief history, mechanical & electromechanical ancestors, First, Second, Third & later generations, Von - Neumann Machine, Block diagrams of computer system.
Register transfers & micro-operations: Register Transfer Language, Register transfer, Bus & memory transfers, Arithmetic loops, Logic loops, Shift loops, Arithmetic, logic, shift unit.

SECTION–B

Basic computer organization & design: Instruction codes, Computer registers, Computer Instructions, Timing & Control, Instruction cycle, memory reference instruction, I-O interrupt, Design of basic computer, Design of accumulator logic.
Micro-programmed Control: Control Memory, Address sequencing, Design of control unit.

SECTION–C

Central Processing Unit: General Register Organization, Stack organization, Instruction formats (zero, one, two, three), Address Instructions, Addressing Modes (direct, indirect, Immediate, relative, indexed), Data transfer & manipulation, Program control.
Computer Arithmetic: Addition & Subtraction, Multiplication algorithms, Division Algorithms, Floating point arithmetic operations.

SECTION–D

IO Organization: Peripheral devices, I/O interfaces, asynchronous data transfer, Modes of Data transfer, Priority Interrupts, DMA, I-O processors, Serial Communication.
Memory Organization: Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory, Memory management hardware.
RISC: Instruction execution characteristics, Use of large register files, Computer based Register optimization, Reduced instruction set architecture, RISC pipeline.

Text Books:
1. Morris M. Mano: Computer System & Architecture: PHI.
2. Stallings & Williams: Computer Organization & Architecture: Maxwell Macmillan.
Reference Books:
1. V.Rajaraman & Radhakrishnan: Introduction to Digital Computer Design: PHI
2. P.Pal Chowdhary: Computer Organization & Design: PHI

FUNDAMENTALS OF PROGRAMMING USING C (AUPGDCA – 101 (L))

Credits- 1(P-2)

PRACTICAL LIST

1. Write a program to swap the values of two numbers.
2. Write a program to find out whether the number is even or odd.
3. Write a program to find the largest number among three numbers.
4. Write a program to find the factorial of a number.
5. Write a program to find the factorial of a number using recursion.
6. Write a program to find Fibonacci series.
7. Write a program to count number of digits in an integer.
8. Write a program to sum the digits of a number and reverse the number.
9. Write a program to check whether a number is prime or not.
10. Write a program to calculate average of numbers using arrays.

PC SOFTWARE (AUPGDCA – 102 (L))
Credits- 1(P-2)

PRACTICAL LIST

1. Introduction to MS – Word, word processing etc.
2. Introduction to Document previewing.
3. Introduction to Formatting of document via find and replace.
4. Introduction to Mail Merge.
5. Converting a word document into various formats.
6. Use of presentation tools.
7. Introduction to MS – Excel, spreadsheets etc.
8. Inserting and deleting of data.
9. Introduction to mathematical operations.

SEMESTER – II

DATA AND FILE STRUCTURE (AUPGDCA - 201)

Credits- 4 (L-3, T-1)

Objective: To understand the concepts of arrays, linked list, stacks, queues and tree structures.

Course Outcomes:

- To find solutions to various problems using different data structures
- To create computer based solutions to various real - world problems

Course Content:

SECTION–A

Preliminaries: Concept & notation, common operation on data structures, algorithm complexity, time-space tradeoff between algorithm, physical & logical representation of different data structures.
Arrays: Arrays defined, representing arrays in memory, Various operation (traversal, insertion, deletion), Multidimensional arrays, Sparse arrays.

SECTION–B

Linked List: Definition, type (linear, circular, doubly linked, inverted), representing linked lists in memory, advantages of using linked list over arrays, various operations on Linked list (traversal, insertion, deletion).

SECTION–C

Stacks: Definition & concepts of stack structure, Implementation of stacks, Operation on stacks (push & pop), Application of stacks (converting arithmetic expression from infix notation to polish and their subsequent evaluation), quick sort technique to sort an array, recursion.
Queue: Definition & concept of queues, implementation of queue, operation on queues (insert & delete), Type of queues (circular queue, priority queue).

SECTION–D

Trees Structures: Tree, Binary Trees, Tree Traversal Algorithms (Pre-Order, In-Order, Post-Order), Threaded Trees, Trees in various Sorting & Searching Algorithms & their Complexity (Heap Sort, Binary Search Trees).
Sorting & Searching: Selection sort, Bubble sort, Merge sort, Radix sort, Quick sort, Sequential search, Linear search and their complexity.

Text Books:

1. Jean Paul Tremblay & Paul G. Sorenson: An Introduction to Data Structures with Applications: Tata McGraw Hill.
2. Aaron M. Tenenbaum, Yedidyah Langsam, Moshe J. Augenstein: Data Structures using C: PHI

Refrence Books:

1. Robert L. Kruse: Data Structures & Program Design: PHI
2. Aho, Hopcroft & Ullman: Data Structures and Algorithms: Addison Wesley.

SYSTEM ANALYSIS AND DESIGN (AUPGDCA - 202)

Credits- 4 (L-3, T-1)

Objective: To understand the basic development techniques to build software. To study the different phases of software development life cycle model (SDLC).

Course Outcomes:

- To apply design and development principles in the construction of software systems of varying complexity.
- To apply current tools and techniques for computing practice
- To explain system controls and quality assurance techniques

Course Content:

SECTION–A

Introduction: Overview of system analysis and design, Business systems concepts, systems development life cycle, project selection, feasibility analysis, design, implementation, testing and evaluation.

SECTION–B

Project Selection: Source of project requests, managing project review and selection, preliminary investigation.
Feasibility Study: Technical and economic feasibilities, cost and benefit analysis.

SECTION–C

System requirement specification and analysis: Fact finding techniques, Data flow diagrams, data dictionaries, process organisation and interactions, Decision analysis, decision trees and tables.
Detailed Design: Modularisation, Module Specification, File Design, System Development Involving Data Basis.

SECTION–D

Systems control and Quality Assurance: Design objectives, reliability and maintenance, software design and documentation tools, topdown, bottomup and variants. Units and integration testing, testing practices and plans. System controls, Audit trails. System Administration and Training, conversion and Operating Plans. Hardware and software selection, Hardware acquisition, memory, processes, peripherals, bench-marking, vendor selection, software selection, operating systems, languages processes, performance and acceptance criteria.

Reference Books:

1. James, A.S.: Analysis and Design of Information Systems, McGraw Hill, 1986.
2. Ludeberg, M., Gulkoh1, G. & Hilsson, A.: Information Systems Development: A Systematic Approach, Prentice Hall Intern. 1981.
3. Lesson, M.: Systems Analysis and Design, Science research Associates, 1985.
4. Semprive, P.C.: System Analysis: Definition, Process and Design, 1982.

OBJECT ORIENTED PROGRAMMING & C++ (AUPGDCA - 203)
Credits- 4 (L-3, T-1)

Objective: To understand the object oriented programming using C++. To learn the concepts of loops, structures, functions, objects and classes.

Course Outcomes:

- To understand Object Oriented approach
- To learn programming real – world examples
- To implement C++ programming

Course Content:

SECTION–A

Object oriented programming: Need for OOP, the project oriented approach, characterstics of OOP language-objects, classes, Inheritance, Reusability, Polymorphism, overloading advantage of OOP, the relationship between C and C++.
Programming Basic: Basic program construction, output using cout, preprocessor directive, comments, integer variables, character variables, input with cin type float manipulator, type conversion, arithmetic operators, relational operators.

SECTION–B

Loops and decision: loop- for, while, do, decision-if, if- else, switch, conditional operator, logical operator-AND, OR, NOT, other control statements-break, continue, goto.
Structures and functions: structures, Accessing structure members, structure within a structure, Enumerated Data type, simple functions, passing arguments to functions, Returning values from functions, reference arguments, overloaded functions, variable and storage class.

SECTION–C

Objects and classes: A simple class, classes and objects, specifying a class, using a class, C++ objects as physical objects, C++ objects as data types. Constructors, objects as function arguments, returning objects from functions.
Arrays: Array fundamental-defining array, array elements, Accessing array elements, Initializing arrays, multidimensional arrays, passing arrays to functions, array of objects, strings-string variables, Avoiding Buffer overflow, string constants, array of strings string as class members.

SECTION–D

Operator overloading: Overloading unary operators-the operator keyboard, operator arguments, operator return values nameless temporary objects, limitation of increment operators, overloading Binary operators, data conversion, Pitfalls of operator overloading and conversion.
Inheritance: Derived class and base class, specifying the derived class, accessing base class, members, derived class constructors, overriding member functions, class hierarchies, public and private Inheritance, levels of inheritance, multiple inheritance.

Text Book:

1. Robert Lafore, “Object oriented programming in Turbo C++.” Galgotia Publications.

DATABASE MANAGEMENT SYSTEMS (AUPGDCA - 204)
Credits- 4 (L-3, T-1)

Objective: To learn about the database and database management system (DBMS). To understand the concept of relational model and structured query language (SQL)

Course Outcomes:
- To formulate using SQL solution to queries
- To apply the concept of transaction management in DBMS
- To explain various views and join operations in DBMS using SQL

Course Content:

SECTION–A

Introduction: Basic Concepts, Data Modeling for a Database, Records and Files, Abstraction and Data Integration, The Three-Level Architecture Proposal for DBMS, Components of a DBMS, Advantages and Disadvantages of a DBMS. Data Models, Data Associations, Data Models Classification, Entity Relationship Model, Relational Data Model, Network Data Model, Hierarchical Model.

SECTION–B

The Relational Model: Relational Database, Relational Algebra, Relational Calculus. Relational Database Manipulation, SQL, Data Manipulation, Basic Data Retrieval, Condition Specification, Arithmetic and Aggregate Operators, SQL Join: Multiple Tables Queries, Set Manipulation, Categorization, Updates.

SECTION–C

Views: SQL, QUEL, Data Definition, Data Manipulation; QUEL, Condition Specification, Renaming, Arithmetic Operators, Multiple Variable Queries, Aggregation Operators in QUEL, Retrieve into Temporary Relation, Updates, Views.

SECTION–D

Relational Database Design: Relational Scheme and Relational Design, Anomalies in a Database: A Consequence of Bad Design, Universal Relation, Functional Dependency, Relational Database Design.
Concurrency Management: Serializability, Concurrency Control, Locking Scheme, Timestamp-Based Order, Optimistic Scheduling, Multiversion Techniques, Deadlock and Its Resolution. Database Security, Integrity, and Control, Security and Integrity, Threats, Defense Mechanisms, Integrity.

Text Books:
1. Desai, B., "An Introduction To Database Concepts." Galgotia Publications, New Delhi.

Refrence Books:
1. Date C.J., "An Introduction to Database Systems", Narosa Publishing House, New Delhi.
2. Elimsari And Navathe, "Fundamentals of Database Systems", Addison Wesley, New York.

DATA AND FILE STRUCTURE (AUPGDCA – 201 (L))

Credits- 1(P-2)

PRACTICAL LIST

1. Write recursive program which computes the nth Fibonacci number.
2. Write recursive program which computes the factorial of a given number.
3. Write a program to implement linear search using arrays.
4. Write a program to implement binary search using arrays.
5. Write C programs that implement stack using arrays.
6. Write C programs that implement stack using linked list.
7. Write C programs that implement Queue using array.
8. Write C programs that implement Queue using linked list.
9. Write a program to implement binary tree.
10. Write a program to implement heap sort using arrays.

DATABASE MANAGEMENT SYSTEMS (AUPGDCA – 204 (L))

Credits- 1(P-2)

PRACTICAL LIST

1. Introduction to SQL and installation of SQL Server / Oracle.
2. Data Types and Create a database.
3. Write the programs to carry out the following operation:
    - **a.** Add a record in the database.
    - **b.** Delete a record in the database.
    - **c.** Modify the record in the database.
4. List all the records of database in ascending order.
5. Use of Alter and Drop Statements.
6. Working with Views, Indexes.
7. Working with Database Security and Privileges: Grant and Revoke Commands, Commit and Rollback Commands.
8. Working with multiple table queries.
9. Working with inner joins.
10. Working with outer joins.

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

1ST PROFESSIONAL

1.1	PADARTHA VIGYAN AND AYURVED ITIHAS	2-6
1.2	SANSKRIT	7-8
1.3	KRIYA SHARIR	9-14
1.4	RACHANA SHARIR	15-18
1.5	MAULIK SIDDHANT AVUM ASHTANG HRIDAYA	19

1.1 PADARTHA VIGYAN EVUM AYURVEDA ITIHAS
(Philosophy and History of Ayurveda)

Theory- Two papers– 200 marks (100 each paper)
Total teaching hours: 150 hours

PAPER-I **Padartha Vigyanam** **100marks**

PART A **50 marks**

1.Ayurveda Nirupana

1.1 Lakshana of Ayu, composition of Ayu.
1.2 Lakshana of Ayurveda.
1.3 Lakshana and classification of Siddhanta.
1.4 Introduction to basic principles of Ayurveda and their significance.

2. Ayurveda Darshana Nirupana

2.1 Philosophical background of fundamentals of Ayurveda.
2.2 Etymological derivation of the word "Darshana". Classification and general introduction to schools of Indian Philosophy with an emphasis on: Nyaya, Vaisheshika, Sankhya and Yoga.
2.3 Ayurveda as unique and independent school of thought (philosophical individuality of Ayurveda).
2.4 Padartha: Lakshana, enumeration and classification, Bhava and Abhava padartha, Padartha according to Charaka (Karana-Padartha).

3. Dravya Vigyaniyam

3.1 **Dravya**: Lakshana, classification and enumeration.
3.2 **Panchabhuta**: Various theories regarding the creation (theories of Taittiriyopanishad, Nyaya-Vaisheshika, Sankhya-Yoga, Sankaracharya, Charaka and Susruta), Lakshana and qualities of each Bhoota.
3.3 **Kaala**: Etymological derivation, Lakshana and division / units, significance in Ayurveda.
3.4 **Dik**: Lakshana and division, significance in Ayurveda.
3.5 **Atma**:Lakshana, classification, seat, Gunas, Linga according to Charaka, the method / process of knowledge formation (*atmanah jnasya pravrittih*).
3.6 **Purusha:** as mentioned in Ayurveda - Ativahikapurusha/ Sukshmasharira/ Rashipurusha/ Chikitsapurusha/ Karmapurusha/ Shaddhatvatmakapurusha.
3.7 **Manas**: Lakshana, synonyms, qualities, objects, functions, dual nature of mind (*ubhayaatmakatvam*), as a substratum of diseases, penta-elemental nature (*panchabhutatmakatvam*).
3.8 Role of Panchamahabhuta and Triguna in Dehaprakriti and Manasaprakriti respectively.
3.9 Tamas as the tenth Dravya.
3.10 Practical study/application in Ayurveda.

PART B **50 marks**

4. Gunavigyaniyam

4.1 Etymological derivation, classification and enumeration according to Nyaya-Vaisheshika and Charaka, Artha, Gurvadiguna, Paradiguna, Adhyatmaguna.
4.2 Lakshana and classification of all the 41 gunas.
4.3 Practical / clinical application in Ayurveda.

5. Karma Vigyaniyam

5.1 Lakshana, classification in Nyaya.
5.2 Description according to Ayurveda.
5.3 Practical study/ application in Ayurveda.

6. Samanya Vigyaniyam

6.1 Lakshana, classification.
6.2 Practical study/ application with reference to Dravya, Guna and Karma.

7. Vishesha Vigyaniyam

7.1 Lakshana, classification.
7.2 Practical study/ application with reference to Dravya, Guna and Karma.
7.3 Significance of the statement "*Pravrittirubhayasya tu*".

8. Samavaya Vigyaniyam

8.1 Lakshana
8.2 Practical study /clinical application in Ayurveda.

9. Abhava Vigyaniyam

9.1 Lakshana, classification
9.2 Clinical significances in Ayurveda.

PAPER II **Padartha Vigyan and Ayurveda Itihas** **100 marks**

PART A - Pramana/ Pariksha- Vigyaniyam **75 marks**

1. Pariksha

1.1. Definition, significance, necessity and use of *Pariksha.*
1.2. Definition of *Prama, Prameya, Pramata, Pramana.*
1.3. Significance and importance of *Pramana,* Enumeration of *Pramana* according to different schools of philosophy.
1.4. Four types of methods for examination in *Ayurveda* (Chaturvidha-Parikshavidhi), *Pramana* in Ayurveda.
1.5. Subsudation of different *Pramanas* under three *Pramanas.*
1.6. Practical application of methods of examination (Parikshavidhi) in treatment (Chikitsa).

2. Aptopdesha Pariksha/ Pramana

2.1. Lakshana of Aptopadesha, Lakshana of Apta.
2.2. Lakshana of Shabda, and its types.
2.3. Shabdavritti-Abhidha, Lakshana, Vyanjana and Tatparyakhya. Shaktigrahahetu.
2.4. Vaakya: Characteristics, Vaakyarthagyanahetu- Aakanksha, Yogyata, Sannidhi.

3. Pratyaksha Pariksha/ Pramana

3.1. Lakshana of Pratyaksha, types of Pratyaksha- Nirvikalpaka- Savikalpaka with description, description of Laukika and Alaukika types and their further classification.

3.2. Indriya-prapyakaritvam, six types of Sannikarsha.

3.3. Indriyanam lakshanam, classification and enumeration of Indriya. Description of Panchapanchaka, Penta-elemental nature of Indriya by Panchamahabhuta (*Panchabhautikatwa* of Indriya) and similarity in sources (*Tulyayonitva*) of Indriya.

3.4. Trayodasha Karana, dominance of Antahkaran.

3.5. Hindrances in direct perception (*pratyaksha-anupalabdhikaaran*), enhancement of direct perception (Pratyaksha) by various instruments/ equipments, necessity of other Pramanas in addition to Pratyaksha.

3.6. Practical study/ application of Pratyaksha in physiological, diagnostic, therapeutics and research grounds.

4. Anumanapariksha/Pramana

4.1. Lakshana of Anumana. Introduction of Anumiti, Paramarsha, Vyapti, Hetu, Sadhya, Paksha, Drishtanta. Types of Anumana mentioned by Charaka and Nyayadarshana.

4.2. Characteristic and types of Vyapti.

4.3. Lakshana and types of Hetu, description of Ahetu and Hetwabhasa.

4.4. Characteristic and significance of Tarka.

4.5. Practical study/ application of Anumanapramana in physiological, diagnostic, therapeutics and research.

5. Yuktipariksha/ Pramana

5.1. Lakshana and discussion.

5.2. Importance in Ayurveda.

5.3. Practical study and utility in therapeutics and research.

6. Upamana Pramana

6.1 Lakshana.

6.2 Application in therapeutics and research.

7. Karya- Karana Siddhanta (Cause and Effect Theory)

7.1. Lakshana of Karya and Karana. Types of Karana.

7.2. Significance of Karya and Karana in Ayurveda.

7.3. Different opinions regarding the manifestation of Karya from Karana: Satkaryavada, Asatkaryavada, Parinamavada, Arambhavada, Paramanuvada, Vivartavada, Kshanabhangurvada, Swabhavavada, Pilupaka, Pitharpaka, Anekantavada, Swabhavoparamavada.

PART B - Ayurved Itihas **25 marks**

1. Etymological derivation (Vyutpatti), syntactical derivation (Niruktti) and definition of the word Itihas, necessity of knowledge of history, its significance and utility, means and method of history, historical person (Vyakti), subject (Vishaya), time period (Kaal), happening (Ghatana) and their impact on Ayurveda.

2. Introduction to the authors of classical texts during Samhitakaal and their contribution: Atreya, Dhanwantari, Kashyapa, Agnivesha, Sushruta, Bhela, Harita, Charaka,

Dridhabala, Vagbhata, Nagarjuna, Jivaka.

3. Introduction to the commentators of classical Samhitas – Bhattarahariccchandra, Jejjata, Chakrapani, Dalhana, Nishchalakara, Vijayarakshita, Gayadas, Arunadutta, Hemadri, Gangadhara, Yogindranath Sen, Haranachandra, Indu.

4. Introduction to the authors of compendiums (Granthasamgrahakaala) – Bhavmishra, Sharngadhara, Vrinda, Madhavakara, Shodhala, Govinda Das (Author of Bhaishajyaratnawali), Basavraja.

5. Introduction to the authors of Modern era –Gana Nath Sen, Yamini Bhushan Rai, Shankar Dajishastri Pade, Swami Lakshmiram, Yadavji Tikramji, Dr. P. M. Mehta, Ghanekar, Damodar Sharma Gaur, Priyavrat Sharma.

6. Globalization of Ayurveda – Expansion of Ayurveda in Misra (Egypt), Sri Lanka, Nepal other nations.

7.
   a) Developmental activities in Ayurveda in the post-independence period, development in educational trends.
   b) Establishment of different committees, their recommendations.
   c) Introduction to and activities of the following Organizations :- Department of AYUSH, Central Council of Indian Medicine, Central Council for Research in Ayurvedic Sciences, Ayurvedic Pharmacopeia commission, National Medicinal Plants Board, Traditional Knowledge Digital Library (TKDL)
   d) Introduction to the following National Institutions :
      - National Institute of Ayurved, Jaipur.
      - IPGT&RA, Gujrat Ayurved University, Jamnagar.
      - Faculty of Ayurved, BHU, Varanasi.
      - Rashtriya Ayurveda Vidyapeetha, New Delhi.
   e) Drug and Cosmetic Act.

8. Introduction to national & international popular journals of Ayurveda.

9. Introduction to activities of WHO in the promotion of Ayurved.

Reference Books:-

A). Padartha Vigyan:-

1.	Padarthavigyan	Acharya Ramraksha Pathak
2.	Ayurvediya Padartha Vigyana	Vaidya Ranjit Rai Desai
3.	Ayurved Darshana	Acharya Rajkumar Jain
4.	Padartha Vigyana	Kashikar
5.	Padartha Vigyana	Balwant Shastri
6.	Sankhyatantwa Kaumadi	GajananS hastri
7.	Psycho Pathology in Indian Medicine	Dr. S.P. Gupta
8.	Charak Evum Sushrut ke Darshanik Vishay ka Adhyayan	Prof. Jyotirmitra Acharya
9.	Ayurvediya Padartha Vigyana	Dr. Ayodhya Prasad Achal
10.	Padartha Vigyana	Dr. Vidyadhar Shukla
11.	Padartha Vigyana	Dr. Ravidutta Tripathi
12.	Ayurvediya Padartha Vigyana	Vaidya Ramkrishna Sharma Dhand
13.	Ayurvediya Padartha Vigyan Parichaya	Vaidya Banwarilal Gaur
14.	Ayurvediya Padartha Darshan	Pandit Shivhare

15.	Scientific Exposition of Ayurveda	Dr. Sudhir Kumar
16.	Relevant portions of Charakasamhita, Sushrutasamhita.	

B) History of Ayurveda:-

1. Upodghata of Kashyapasamhita Paragraph of acceptance of Indian medicine	Rajguru Hem Raj Sharma
2. Upodghata of Rasa Yogasagar	Vaidy Hariprapanna Sharma
3. Ayurveda Ka Itihas	KaviraSuram Chand
4. Ayurveda Sutra	Rajvaidya Ram Prasad Sharma
5. History of Indian Medicine (1-3 part)	Dr. GirindrNath Mukhopadhyaya
6. A Short history of Aryan Medical Science	Bhagwat Singh
7. History of Indian Medicine	J. Jolly
8. Hindu Medicine	Zimer
9. Classical Doctrine of Indian Medicine	Filiyosa
10. Indian Medicine in the classical age	AcharyaPriyavrata Sharma
11. Indian Medicine (Osteology)	Dr. Harnley
12. Ancient Indian Medicine	Dr. P. Kutumbia
13. Madhava Nidan and its Chief Commentaries (Chapters highlighting history)	Dr. G.J. Mulenbelt
14. Ayurveda Ka BrihatItihasa	Vaidya Atridev Vidyalankara
15. Ayurveda Ka VaigyanikaItihasa	Acharya Priyavrata Sharma
16. Ayurveda Ka PramanikaItihasa	Prof. Bhagwat Ram Gupta
17. History of Medicine in India	Acharya Priyavrata Sharma
18. Vedomein Ayurveda	Vaidya Ram GopalS hastri
19. Vedomein Ayurveda	Dr. Kapil Dev Dwivedi
20. Science and Philosophy of Indian Medicine	Dr. K.N. Udupa
21. History of Indian Medicine from Pre-Mauryan to Kushana Period	Dr. Jyotirmitra
22. An Appraisal of Ayurvedic Material in Buddhist literature	Dr. Jyotirmitra
23. Mahayana Granthon mein nihita Ayurvediya Samagri	Dr. RavindraNathTripathi
24. Jain Ayurveda Sahitya Ka Itihasa	Dr. Rajendra Prakash Bhatnagar
25. Ayurveda- Prabhashaka Jainacharya	Acharya Raj Kumar Jain
26. CharakaChintana	Acharya Priyavrata Sharma
27. Vagbhata Vivechana	Acharya Priyavrata Sharma
28. Atharvaveda and Ayurveda	Dr. Karambelkara
29. Ayurvedic Medicine Past and Present	Pt. Shiv Sharma
30. Ancient Scientist	Dr. O.P. Jaggi
31. Luminaries of Indian Medicine	Dr. K.R. Shrikanta Murthy
32. Ayurveda Ke Itihasa Ka Parichaya	Dr. RaviduttaTripathi
33. Ayurveda Ke Pranacharya	Ratnakara Shastri
34. Ayurveda Itihasa Parichaya	Prof. Banwari Lal Gaur

****

1.2 संस्कृतम्

THEORY - ONE PAPER - 100 marks

TEACHING HOURS - 90 hours

PART-A **50 marks**

संस्कृतव्याकरणाध्ययनम्

1- संज्ञाप्रकरणम्

2- विभक्त्यर्थाः

3- सन्धिप्रकरणम् (सन्धिविच्छेदः, सन्धिकरणम्)

4- षड्लिंगप्रकरणम् (षब्दरूपाण्येव)

5- धातुप्रकरणम् (धातुरूपाण्येव)

(भ्वादिगणीय धातूनां प०च लट्लोट्लङ्लिंट्विधिलिङ्लकारेषु रूपाणि)

6- वाच्यप्रयोगाः (कर्तरि कर्मणि भाववाच्यप्रयोगाः)

7- समासप्रकरणम्

8- प्रत्ययाः

(णिच्, क्त, क्तवतु, शतृ, शानच्, तुमुन्, तव्यत्, तृच्, क्त्वा, ल्यप्, ल्युट्, अनीयर्, मतुप्, इनि, तन्, इतच्, अण्, इञ्, इक्, त्व, ता, षन्, इम्, निच्, तः, त्र, दा, धा, तरप्, तमप्, टाप्, ङाप्)

9- अनुवादः

A) From English / Hindi / regional language to Sanskrit
B) From Sanskrit to English / Hindi / regional language
C) Identification and correction of grammatical errors in the given sentences

The sentences for translation should be selected from the under mentioned reference books-

1) Laghusiddhanta Kaumudi- Acharya Varadaraja (Commentary by Shri Dhananand Shastry)
2) Brihattrayee- (Charaka Samhita, Sushruta Samhita, Ashtanga Hridayam)
3) Anuvada Chandrika-Chakradhara Hansa Nautiyal
4) Sanskruta Ayurved Sudha- Dr. Banwari Lal Gaur
5) Rachananuvada Kaumudi- Dr. Kapildev Dwivedi
6) Bhasha Sopanam- Published by Rashtreeya Samskruta Samsthanam, New Delhi

PART- B **50 marks**

भाषाध्ययनम्

1.) आयुर्वेदार्षग्रन्थाध्ययनाÿमः—ैजमचूपेम उमजीवक वि जनकल वि ।लनतअमकं ।तीं ळतंदजीं ;नैीतनजं ैउीपजंए ैीतममतं ैजींदंउए बिंचजमत.4द्ध 25 marks

2.) वैद्यकीय—सुभाषितसाहित्यम् (अध्यायाः 1—10) 15 marks

3.) प०चतन्त्रम्—अपरीक्षितकारकम् (क्षपणक कथातः मूर्खपण्डितकथापर्यन्तम् प०चकथाः) 10 marks

---

REFERENCE BOOKS-

1.) Sushruta Samhita, Shareera Sthanam, Chapter-4
2.) Prabhashanam Work Book, Su.sam.chap.4
Published by-AYURVEDA ACADEMY® BANGALORE;
Email-ayuacademy@gmail.com
3.) Vaidyakeeya Subhashita Sahityam - Dr. Bhaskara Govinda Ghanekar
4.) Panchatantra-(Apareekshitakarakam) -Pt. Vishnu Sharma

****

1.3 KRIYA SHARIR
(PHYSIOLOGY)

Theory-Two Papers-200 Marks (100 marks each)
Teaching hours-180 hours

PAPER- I **100 marks**

PART- A **50 marks**

1. Conceptual study of fundamental principles of Ayurvediya Kriya Sharir e.g - Panchamahabhuta, Tridosha, Triguna, Loka-Purusha Samya, Samanya-Vishesha. Description of basics of Srotas.
2. Definition and synonyms of the term Sharir, definition and synonyms of term Kriya, description of Sharir Dosha and Manasa Dosha. Mutual relationship between Triguna-Tridosha & Panchmahabhuta. Difference between Shaarir and Sharir. Description of the components of Purusha and classification of Purusha, role of Shatdhatupurusha in Kriya Sharira and Chikitsa.
3. Dosha- General description of Tridosha. Inter relationship between Ritu-Dosha-Rasa-Guna. Biological rhythms of Tridosha on the basis of day-night-age-season and food intake. Role of Dosha in the formation of Prakriti of an individual and in maintaining of health. Prakrita and Vaikrita Dosha.
4. Vata Dosha: Vyutpatti (derivation), Nirukti (etymology) of the term Vata, general locations, general properties and general functions of Vata, five types of Vata (Prana, Udana, Samana, Vyana, Apana) with their specific locations, specific properties, and specific functions.
   Respiratory Physiology in Ayurveda, Physiology of speech in Ayurveda.
5. Pitta Dosha: Vyutpatti, Nirukti of the term Pitta, general locations, general properties and general functions of Pitta, five types of Pitta (Pachaka, Ranjaka, Alochaka, Bhrajaka, Sadhaka) with their specific locations, specific properties, and specific functions. Similarities and differences between Agni and Pitta.
6. Kapha Dosha: Vyutpatti, Nirukti of the term Kapha, general locations, general properties and general functions of Kapha, five types of Kapha (Bodhaka, Avalambaka, Kledaka, Tarpaka, Śleshaka) with their specific locations, specific properties, and specific functions.
7. Etiological factors responsible for Dosha Vriddhi, Dosha Kshaya and their manifestations.
8. Concept of Kriyakala.
9. Prakriti:
   a) Deha- Prakriti: Vyutpatti, Nirukti, various definitions and synonyms for the term 'Prakriti'. Intra-uterine and extra-uterine factors influencing Deha-Prakriti, classification and characteristic features of each kind of Deha-Prakriti.
   b) Manasa- Prakriti: Introduction and types of Manasa- Prakriti.
10. Ahara: Definition, classification and significance of Ahara, Ahara-vidhi-vidhana, Ashta Aharavidhi Viseshayatana, Ahara Parinamkar Bhava.

11. Aharapaka (Process of digestion): Description of Annavaha Srotas and their Mula. Role of Grahani & Pittadhara Kala.
12. Description of Avasthapaka (Madhura, Amla and Katu). Description of Nishthapaka (Vipaka) and its classification. Separation of Sara and Kitta. Absorption of Sara. Genesis of Vata-Pitta-Kapha during Aharapaka process. Definition of the term Koshtha. Classification of Koshtha and the characteristics of each type of Koshtha.
13. Agni – Definition and importance, synonyms, classification, location, properties and functions of Agni and functions of Jatharagni, Bhutagni, and Dhatvagni.

PART- B **50 marks**

Modern Physiology

a) Definition and mechanisms of maintenance of homeostasis. Cell physiology. Membrane physiology. Transportation of various substances across cell membrane.
b) Resting membrane potential and action potential.
c) Physiology of respiratory system: functional anatomy of respiratory system. Definition of ventilation, mechanism of respiration, exchange and transport of gases, neural and chemical control of respiration, artificial respiration, asphyxia, hypoxia. Introduction to Pulmonary Function Tests.
d) Physiology of Nervous System: General introduction to nervous system, neurons, mechanism of propagation of nerve impulse, physiology of CNS, PNS, ANS; physiology of sensory and motor nervous system, Functions of different parts of brain and physiology of special senses, intelligence, memory, learning and motivation. Physiology of sleep and dreams, EEG. Physiology of speech and articulation. Physiology of temperature regulation.
e) Functional anatomy of gastro-intestinal tract, mechanism of secretion and composition of different digestive juices. Functions of salivary glands, stomach, liver, pancreas, small intestine and large intestine in the process of digestion and absorption. Movements of the gut (deglutition, peristalsis, defecation) and their control. Enteric nervous system.
f) Acid-base balance, water and electrolyte balance. Study of basic components of food. Digestion and metabolism of proteins, fats and carbohydrates.
Vitamins & Minerals- sources, daily requirement, functions, manifestations of hypo and hypervitaminosis.

PAPER- II **100 marks**

PART- A **50 marks**

1. **Dhatu:**
Etymology, derivation, definition, general introduction of term Dhatu, different theories related to Dhatuposhana (Dhatuposhana Nyaya)

2. **Rasa Dhatu:**
Etymology, derivation, location, properties, functions and Praman of Rasa-dhatu. Physiology of Rasavaha Srotas, Formation of Rasa Dhatu from Aahara Rasa, circulation of Rasa (Rasa-Samvahana), role of Vyana Vayu and Samana Vayu in Rasa Samvahana. Description of functioning of Hridaya. Ashtavidha Sara (8 types

of Sara), characteristics of Tvakasara Purusha, conceptual study of mutual interdependence (Aashraya-Aashrayi Bhaava) and its relation to Rasa and Kapha. Manifestations of kshaya and Vriddhi of Rasa.

3. Rakta Dhatu:

Etymology, derivation, synonyms, location, properties, functions and Praman of Rakta Dhatu. Panchabhautikatva of Rakta Dhatu, physiology of Raktavaha Srotas, formation of Raktadhatu, Ranjana of Rasa by Ranjaka Pitta, features of Shuddha Rakta, specific functions of Rakta, characteristics of Raktasara Purusha, manifestations of Kshaya and Vriddhi of Raktadhatu, mutual interdependence of Rakta and Pitta.

4. Mamsa Dhatu :

Etymology, derivation, synonyms, location, properties and functions of Mamsa Dhatu, physiology of Mamsavaha Srotasa, formation of Mamsa Dhatu, characteristics of Mamsasara Purusha, manifestations of Kshaya and Vriddhi of Mamsa Dhatu .Concept of Peshi.

5. Meda Dhatu :

Etymology, derivation, location, properties, functions and Praman of Meda Dhatu, physiology of Medovaha Srotas, formation of Medo Dhatu, characteristics of Medasara Purusha and manifestations of Kshaya and Vriddhi of Meda.

6. Asthi Dhatu:

Etymology, derivation, synonyms, location, properties, functions of Asthi Dhatu. Number of Asthi. Physiology of Asthivaha Srotas and formation of Asthi Dhatu, characteristics of Asthisara Purusha, mutual interdependence of Vata and Asthi Dhatu, manifestations of Kshaya and Vriddhi of Asthi Dhatu.

7. Majja Dhatu :

Etymology, derivation, types, location, properties, functions and Praman of Majjaa Dhatu, physiology of Majjavaha Srotas, formation of Majja Dhatu, characteristics of Majja Sara Purusha, relation of Kapha, Pitta, Rakta and Majja, manifestations of Kshaya and Vriddhi of Majja Dhatu.

8. Shukra Dhatu:

Etymology, derivation, location, properties, functions and Praman of Shukra Dhatu, physiology of Shukraravaha Srotas and formation of Shukra Dhatu. Features of Shuddha Shukra, characteristics of Shukra-Sara Purusha, manifestations of Kshaya and Vriddhi of Shukra Dhatu.

9. Concept of **Ashraya-Ashrayi** bhava i.e. inter-relationship among Dosha, Dhatu Mala and Srotas.

10. Ojas: Etymological derivation, definition, formation, location, properties, Praman, classification and functions of Ojas. Description of Vyadhikshamatva. Bala Vriddhikara Bhava. Classification of Bala. Etiological factors and manifestations of Ojavisramsa, Vyapat and Kshaya.

11. **Upadhatu**: General introduction, etymological derivation and definition of the term Upadhatu. Formation, nourishment, properties, location and functions of each Upadhatu.
    a) Stanya: Characteristic features and methods of assessing Shuddha and Dushita Stanya, manifestations of Vriddhi and Kshaya of Stanya.
    b) Artava: Characteristic features of Shuddha and Dushita Artava. Differences between Raja and Artava, physiology of Artavavaha Srotas.
    c) Tvak: classification, thickness of each layer and functions.

12. **Mala:** Etymological derivation and definition of the term Mala. Aharamala: Enumeration and description of the process of formation of Aharamala.
    a) Purisha: Etymological derivation, definition, formation, properties, quantity and functions of Purisha. Physiology of Purishavaha Srotas, manifestations of Vriddhi and Kshhaya of Purisha.
    b) Mutra: Etymological derivation, definition, formation, properties, quantity and functions of Mutra. Physiology of Mutravaha Srotas, physiology of urine formation in Ayurveda, manifestations of Vriddhi and Kshhaya of Mutra.
    c) Sveda: Etymological derivation, definition, formation and functions of Sveda. Manifestations of Vriddhi and Kshaya of Sveda. Discription of Svedvaha Strotas
    d) Dhatumala: Brief description of each type of Dhatumala.

13. **Panchagyanendriya:** Physiological description of Panchagyaanendriya and physiology of perception of Shabda, Sparsha, Rupa, Rasa and Gandha. Physiological description of Karmendriya.
14. **Manas:** Etymological derivation, definition, synonyms, location, properties, functions and objects of Manas. Physiology of Manovaha Srotas.
15. **Atma:** Etymological derivation, definition, properties of Atma. Difference between Paramatma and Jivatma; Characteristic features of existence of Atma in living body.
16. **Nidra:** Nidrotpatti, types of Nidra, physiological and clinical significance of Nidra; Svapnotpatti and types of Svapna.

PART –B **50 marks**

Modern Physiology

1. Haemopoetic system – composition, functions of blood and blood cells, Haemopoiesis (stages and development of RBCs, and WBCs and platelets), composition and functions of bone marrow, structure, types and functions of haemoglobin, mechanism of blood clotting, anticoagulants, physiological basis of blood groups, plasma proteins, introduction to anaemia and jaundice.
2. Immunity, classification of immunity: Innate, acquired and artificial. Different mechanisms involved in immunity: Humoral (B-cell mediated) and T-Cell mediated immunity. Hypersensitivity.
3. Muscle physiology – comparison of physiology of skeletal muscles, cardiac muscles and smooth muscles. Physiology of muscle contraction.
4. Physiology of cardio-vascular system: Functional anatomy of cardiovascular system. Cardiac cycle. Heart sounds. Regulation of cardiac output and venous

return. Physiological basis of ECG. Heart-rate and its regulation. Arterial pulse. Systemic arterial blood pressure and its control.

5. Adipose tissue, lipoproteins like VLDL, LDL and HDL triglycerides.
6. Functions of skin, sweat glands and sebaceous glands.
7. Physiology of male and female reproductive systems. Description of ovulation, spermatogenesis, oogenesis, menstrual cycle.
8. Physiology of Excretion – functional anatomy of urinary tract, functions of kidney. Mechanism of formation of urine, control of micturition. Formation of faeces and mechanism of defecation.
9. Endocrine glands **–** General introduction to endocrine system, classification and characteristics of hormones, physiology of all endocrine glands, their functions and their effects.

PRACTICAL **100 marks**

Teaching hours-180

Ayurvedic practical

1. Assessment of Prakriti
2. Assessment of Dosha (Features of Vriddhi- Kshaya)
3. Assessment of Dhatu (Features of Vriddhi- Kshaya)
4. Assessment of Agni
5. Assessment of Koshtha
6. Assessment of Sara
7. Nadi pariksha

Modern physiology practical

1. Introduction to laboratory instruments- Simple & Compound Microscope, Scalp vein set, bulbs for blood collection, Sahli's Haemometer, Haemocytometer, pipettes, Urinometer, Albuminometer, Stethoscope, B.P. Apparatus, Harpenden's caliper, Clinical Hammer, Tuning Fork, Stop Watch, Thermometer, Centrifuge machine, ECG Machine
2. Collection of blood sample – prick, vene-puncture method, use of anticoagulants
3. Preparation of blood smear and staining
4. Estimation of Hemoglobin
5. Microscopic examination of blood
   a. Total RBC count
   b. Total WBC count
   c. Differential leucocyte count
6. Packed cell volume (PCV) demonstration
7. ESR demonstration
8. Bleeding time, Clotting time
9. Blood grouping and Rh typing
10. Examination of Cardio-Vascular system
    a. Pulse examination
    b. Arterial blood pressure measurement
    c. Examination of heart sounds
    d. ECG demonstration
11. Examination of Respiratory system
    a. Respiratory rate
    b. Breath sounds
    c. Spirometry
12. Examination of Nervous System- Sensory & Motor.

13. Urine examination –Physical examination, chemical examination. Test for normal constituents of urine. Detection of specific gravity and reaction of urine.

Distribution of Practical marks

1. Laboratory Practical - 20
2. Human Experiment - 15
3. Spotting - 15
4. Prakriti Saradi pariksha - 20
5. Practical Record - 10
6. Viva- voce - 20

REFERENCE BOOKS:-

- Ayurvediya Kriyasharir - Ranjit Rai Desai
- Kayachikitsa Parichaya - C. Dwarkanath
- Prakrit Agni Vigyan - C. Dwarkanath
- Sharir Kriya Vigyan - Shiv Charan Dhyani
- Abhinava Sharir Kriya Vigyana - Acharya Priyavrata Sharma
- Dosha Dhatu Mala Vigyana - Shankar Gangadhar Vaidya
- Prakrita Dosha Vigyana - Acharya Niranjana Dev
- Tridosha Vigyana - Shri Upendranath Das
- Sharira Tatva Darshana - Hirlekar Shastri
- Prakrita Agni Vigyana - Niranjana Dev
- Deha Dhatvagni Vigyana - Vd. Pt. Haridatt Shastri
- Sharir Kriya Vigyana (Part 1-2) - Acharya Purnchandra Jain
- Sharir Kriya Vigyana - Shri Moreshwar Dutt. Vd.
- Sharira Kriya Vijnana (Part 1 and 2) – Nandini Dhargalkar
- Dosha Dhatu Mala Vigyana - Basant Kumar Shrimal
- Abhinava Sharir Kriya Vigyana - Dr. Shiv Kumar Gaur
- Pragyogik Kriya Sharir - Acharya P.C. Jain
- Kaya Chikitsa Parichaya - Dr. C. Dwarkanath
- Concept of Agni - Vd. Bhagwan Das
- Purush Vichaya - Acharya V.J. Thakar
- Kriya Sharir - Prof. Yogesh Chandra Mishra
- Sharir Kriya Vigyana - Prof. Jayaram Yadav &Dr. Sunil Verma.
- Basic Principles of Kriya-Sharir (A treatise on Ayurvedic Physiology) by Dr. Srikant Kumar Panda
- Sharir Kriya – Part I & Part II – Dr. Ranade, Dr. Deshpande & Dr. Chobhe
- Human Physiology in Ayurveda - Dr Kishor Patwardhan
- Sharirkriya Vignyan Practical Hand Book– Dr.Ranade, Dr.Chobhe, Dr. Deshpande
- Sharir Kriya Part 1 – Dr.R.R.Deshapande, Dr.Wavhal
- Sharir Kriya Part 2 – Dr. R.R.Deshapande, Dr.Wavhal
- Ayurveda Kriya Sharira- Yogesh Chandra Mishra
- Textbook of Physiology - Gyton & Hall
- A Textbook of Human Physiology – A.K.Jain
- Essentials of Medical Physiology - Sembulingam, K.
- Concise Medical Physiology - Chaudhari, Sujit K.
- Principals of Anatomy & Physiology - Tortora & Grabowski
- Textbook of Medical Physiology- Indu Khurana

****

1.4 RACHNA SHARIR
(ANATOMY)

Theory- Two Papers-200 Marks–(100 marks each)
Teaching Hours-180 hours

PAPER-I **100 marks**

PART-A **50 marks**

1. Shariropkramaniya Shaarira
Sharira and shaarira vyakhya (definitions of sharira and shaarira), shadangatvam (six regions of the body), anga pratyanga vibhaga (sub divisions). Mrita sharir samshodhan. Shaarira shastra vibhaga, shaarira gyan prayojana . Constitution of purusha according to dhatubheda, panchabhautikatvam, trigunatmakatvam, tridoshamayatvam, karma purusha, and doshadhatumala-mulakatvam.

2. Paribhasha Shaarira
Kurcha, kandara, jala, asthisanghat, seemanta, seevani, rajju, snayu and lasika.

3. Garbha Shaarira
Garbha definitions, explanation of shukra, artava, garbhadhana. Role of tridosha and panchmahabhuta in the fetal development. Beeja, beejabhaga and beejabhagavayava, linga vinischaya, masanumasika garbha vriddhi-krama, garbhottpadakbhava, garbhavriddhikara bhava, garbha poshana, apara nirmana , nabhinadi nirmana. Aanga pratyanga utpatti.

4. Pramana Shaarira: Anguli pramana.

5. Asthi Shaarira
Asthi vyakhya, number, types, asthi swaroopa, vasa, meda and majja.

6. Sandhi Shaarira
Sandhi vyakhya, numbers, types of asthi sandhi.

7. Sira, Dhamani, Srotas Shaarira
a) Definition, types and number of sira and dhamani.
b) Description of Hridaya.
c) Sroto shaarira: Definition, types of srotas and srotomula.

8. Peshi Shaarira
a) Peshi vyakhya, structure, types, number and importance.
b) Description of Peshi.

9. Koshtha Evam Ashaya Shaarira
a) Definition of kostha and number of koshthanga.
b) Types and description of ashaya.

10. Kalaa Shaarira
Kalaa: definition and types.

11. Uttamangiya Shaarira
Shatchakra, ida, pingala and sushumna nadi - brief description.
12. Marma Shaarira

Marma: definition, number, location, classification, clinical importance with viddha lakshana. Explanation of trimarmas. Detail description of marmas.

13. Indriya Shaarira
Definition of indriya, indriya artha and indriya adhisthan, their number and importance. Description of gyanendria, karmendriya and ubhayendriya (manas).

PART-B **50 marks**

1. Definition and branches of anatomy. Preservation methods of the cadaver.

2. Anatomical Terminologies
Anatomical position, Planes, and explanation of anatomical terms related to skin, fasciae, bones, joints and their movements, muscles, ligaments, tendons, blood vessels, nerves,.

3. Embryology
Definitions and branches of embryology. Embryo and fetus. Sperm and ovum, fertilization. Cleavage. Germ layers formation and their derivatives. Laws of heredity, Sex determination and differentiation, Month-wise development of embryo. Foetal circulation, placenta formation, Umbilical cord formation.

4. Osteology
Bone: Definition, ossification, structure and types. Description of bones with clinical anatomy.

5. Arthrology
Joints: Definition, structure types and movements. Description of joints of extremities, vertebral joints and temporomandibular joint with their clinical anatomy.

6. Cardiovascular system
a. Definition, types and structure of arteries and veins.
b. Description of heart and blood vessels with their course and branches.
c. Pericardium with applied aspect.

7. Lymphatic system
Definition, types and structure of lymph vessels, lymph glands with their clinical aspect.

8. Myology
a) Structure and types of muscles.
b) Description of muscles; their origin, insertion, actions, nerve supply and clinical anatomy.

Paper II **100 marks**

Part A **50 marks**

1. Respiratory System
a. Bronchial tree and lungs with their clinical aspects.
b. Respiratory tract: nasal cavity, pharynx, larynx, trachea, bronchial tree.
c. Pleura with its clinical aspects.
d. Diaphragm.

2. Digestive system

a. Organs of digestive tract (alimentary tract) with their clinical aspects.
b. Digestive glands: liver, spleen and pancreas.
c. Description of peritoneum with its clinical aspects.

3. Urinary System

Urinary tract: kidney, ureter, urinary bladder and urethra with their clinical aspects.

4. Reproductive system

a. Male Reproductive system: reproductive organs, tract and glands (prostate and seminal vesicles) with their clinical aspects.

b. Female reproductive system: reproductive organs, tract and glands with their clinical aspects.

5. Endocrinology

Definition, classification & description of endocrine glands (pituitary, thyroid, parathyroid, thymus and suprarenal glands) with clinical aspects.

PART B **50 marks**

6. Nervous System

Nervous system: definition, classification and its importance. Description of brain and spinal cord.

Description of peripheral nervous system: cranial and spinal nerves, nerve plexuses, and autonomic nervous system, formation and circulation of cerebrospinal fluid and blood supply of brain and spinal cord.

7. Sensory organs

Description of structures of eye, ear, nose, tongue and skin with their clinical aspects.

8. Surface and radiological anatomy

a. Study of radio-imaging of limbs, abdomen, pelvis and vertebral column with its clinical application.

b. Surface anatomy of thoracic and abdominal viscera.

PRACTICAL **100 marks**

Teaching hours: 180

Content of practical

1. Practical study of bones
2. Practical study of organs
3. Practical study of surface and radiological anatomy.
4. Shava vichhedana – detailed dissection of the whole body.
5. Practical study of location of marma
6. Demonstration of histology slides (10 slides)

Distribution of marks

1. Spotting -	20 marks
2. Dissected organs and histology slides -	20 Marks
3. Bones, joints, marma -	20 Marks
4. Surface & radiological anatomy -	10 Marks
5. Practical records -	10 Marks
6. Viva-Voce -	20 Marks
Total	**100 Marks**

Reference Books :-

S. No.	Name of Book	Author
1.	Brihat Shariram Vaidyaratna-	P.S. Varrier
2.	Abhinava Shariram-	Acharya Damodar Sharma Gaur
3.	Manava Sharir (Revised Edition)-	Prof. Dinkar Govind Thatte
4.	Manava Bhruna Vigyana -	Prof. Dinkar Govind Thatte
5.	Manava Anga Rekhankan Vikrian -	Prof. Dinkar Govind Thatte
6.	Sharir Rachana Vigyan (English)-	Vaidya P.G. Athawale
7.	Manual of Practical Anatomy Cunnigham Practical Manual Vol-1, Vol-2, Vol-3	
8.	Clinical Anatomy in Ayurveda -	Prof. D.G. Thatte & Prof. Suresh Chandra
9.	Sharir Rachna Vigyan (English)-	Prof. D.G. Thatte
10.	Ayurvedic Human Anatomy -	Prof. Dr. Giridhar M. Kanthi
11.	Regional Anatomy -	B. D. Chaurasia
12.	Rachana Sharir Vigyana -	Dr. Mahendra Sing
13.	elevant chapters of Brihtrayee and Laghuthrayee	
14.	Gray's Anatomy	
15.	Text Book of Human Anatomy-	Inderbir Singh
16.	Clinical Anatomy-	Richard S Snell
17.	Fundamentals of Human Anatomoy-	Dr. Chakraborthy
18.	Human Osteology -	Poddar

****

1.5 Maulik Siddhant avum Ashtang Hridaya
(Basic Principles and Ashtang Hridaya- An ancient text of Ayurveda)

Theory- One Paper– 100 marks
Teaching Hours -120 hours

Part A **60 marks**

Ashtang Hridaya Sutrasthana Adhyaya 1 to 15

Part B **40 marks**

1. Ashtang Hridaya Sutrasthana Adhyaya 16 to 30
2. Description of Ashta Prakriti
3. Shastra Lakshan (Tantra), Tantraguna, Tantradosha, Tachitalya, Arthasraya, Kalpana

Reference Books:

1. Astang Hridaya : Hindi commentary by Lalchanda Vaidya
2. Astang Hridaya : Hindi commentary by Vd. B.L. Gaur
3. Astang Hridaya : English commentary by Dr. T. Sreekumar
4. Astang Hridaya : English commentary by Dr. Vishwavasu Gaur
5. Astang Hridaya : Sanskrit commentary by Hemadri
6. Astang Hridaya : Sanskrit commentary by Arunadatta

****

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

2ND PROFESSIONAL

1.1	DRAVYAGUNA VIGHYAN	2-9
1.2	ROGA NIDAN	10-14
1.3	RASASHATRA	15-23
1.4	CHARAK SAMHITA	24

2.1 DRAVYAGUNA VIGYAN

(PHARMACOLOGY & MATERIA MEDICA)

Lectures: 200 Hrs.

Practicals: 200 Hrs.

Total Marks -400

Theory Two Papers– 100 Marks Each

Practical/Viva voce – 200 Marks

Paper I **100 Marks**

Part A **50 Marks**

1- Dravyaguna Shastra Paribhasa- Lakshana of Sapta Padartha of Dravyaguna Vijnana viz Dravya- Rasa-Guna- Virya- Vipaka- Prabhava and Karma.

2- Dravya:
Etymological derivation, definition, panchbhoutikatwa.
Classification of Dravya according to Samhitas and Nighantus Taxonomical classification.

3- Guna:
Etymological derivation, definition and Classification of Guna.
Detailed knowledge of Gurvadi Guna & Paradi gunas.

4- Rasa:
Etymological derivation, definition, Meaning of "Rasa" in various contexts. Shad Rasas (Madhura, Amla, Lavana, Katu, Tikta, and Kashaya), Panchabhautik constitution of Rasas, Nirvrittiviseshakrama (manifestation in general and particular), Ritu and shad rasa Rasanurasayoh bheda (Difference between rasa and anurasa), Lakshana (characteristics),Guna and Karma of shad Rasas, Kopana and Shamana of Dosha and dushya by Shad rasas. Effects of excess usage of Rasa. Rasopalabdhi, Rasaskandha.

5- Vipaka:
Etymological derivation and definition, difference between Avasthapaka and Vipaka, Types of Vipaka, (Dvividha-Trividha,Panchavidha) Guna and karma of Vipaka.
Grades of Vipaka (taratamya), Vipakopalabdhi hetu (Factors to determineVipaka).

6- Veerya:
Etymological derivation, definition and Swarupa of Virya, Number of Virya.
(Dwividha & Ashtavidha), Panchabhauthikatva
Virya karmani (Effects of Virya), General principles in determination of virya along with exceptions.

7- Prabhava:
Definition, Effects of Prabhava.

8- Interrelation of Rasa-Guna-Virya-Vipaka-Prabhava with respect to their strength (balabal nirupana). Samanapratyayarabdha and Vichitrapratyayarabdha dravyas.

9- Karma:
Lakshana, swaroopa and bheda of karma (Definition, nature and types of action).

Explanation of the following Karmas with examples:

1. Deepana	2. Pachana	3. Samshodhana
4. Samshamana	5. Anulomana	6. Sransana
7. Bhedana	8. Rechana	9. Chhedana
10. Lekhana	11. Grahi	12. Sthambhana
13. Madakari	14. Pramathi	15. Abhishyandi
16. Vyavayi	17. Vikashi	18. Rasayana
19. Vajeekarana	20. Jeevaneeya	21. Balya
22. Brimhana	23. Langhana	24. Medhya

10. Brief information on Karmas of dashemani gana of Charak Samhita.

11- Mishraka Gana:

11a)- Audbhida Gana (Vegetable origin) Brihatpanchamoola, Laghupanchamoola, Vallipanchamoola, Kantakapanchamoola, Trinapanchamoola,Madhyamapanchamoola, Jeevaneeya panchamoola, Panchapallava, Panchavalakala, Triphala, Trikatu,Trimada, Chaturusana, Panchakola, Shadusana, Chaturbeeja, Jeevaniya gana, Ashtavarga, Trijataka, Chaturajataka, Katuchaturjataka Panchatikta, Amlapanchaka, Chaturbhadra,Trikarshika, Swalpatriphala, Madhuratriphala, Mahavisha, Upavisha,
Agrya aushadh varga- Knowledge of Agrayaaushadha Varga with example.

11 b)- Jangama Gana (Animal origin)- Ksheerashtaka, Mutrashtaka, Pitta panchaka.

11 c)- Parthiva Gana (Mineral origin) - Lavana Panchaka, Kshara dvaya, Kshara Ashtaka.

12- Basis of nomenclature:
Basis of nomenclature of dravya, Basis and Derivation of synonyms.

13. Bheashaja Pariksha vidhi (as described in Charaka samhita vimana sthana 8), Dravya Sangrahana (collection of dravya)- Ecology- Classification of desha (geographical area) and bhumi (soil), swarupa of sangrahaniya dravya of (Nature and quality of drug to be collected). Sangrahana vidhi (Method of collection) -Vegetable and Animal origin drugs according to part used. Period of collection according to virya, samrakshana vidhi (preservation of collected dravyas), bheshajagara (Storehouse), study on different prayojyanga (useful plant parts).

Part B **50 Marks**

(I) **20 Marks**

14 a) Concept of dravya shodhan (purification of dravya).
14 b) Brief knowledge of Apamishran (adulterants)
14 c) Concept of Abhava pratinidhi dravya (substitutes)

15- Prashasta bheshaja (ideal drug), plant extracts. Concept of viruddha Dravya (incompatibility of the dravya).

16- Introduction to Nighantu Vigyan - Dhanwantari Nighantu, Bhavaprakashanighantu, Rajanighantu.

17- Brief knowledge of cultivation, conservation of medicinal plants and information about endangered species**.**

(II) **30 Marks**

18. - Introduction, Definition & scope of Pharmacology and Principles of general Pharmacology. Brief Knowledge about pharmacology of the following - Anaesthetics, CNS depressants, Sedatives, Hypnotics, Tranquilisers, Antipyretics, Analgesics, Antiepileptics, Antihypertensive, Antianginal, Antiplatelet, Hypolipidaemic, Haemopoetic, Coagulants, Bronchodialators, Aerosols/ Inhalants, Expectorants, Digestants, Carminatives, Antacids, Antiulcer, Laxatives, Antidiarrhoeals, Antiemetic, Hepatoprotective, Diuretic, Antidiuretic, Lithotriptic, Antiinflammatory, Hormonal therapy, Antiobesity, Antidiabetic, Antithyroid, Oxytocic. Galactagogues, Contraceptives, Styptics, Antihistamines, Antimicrobial, Antibiotics, Antimalarial, Amoebicidal, Antifilarial, Anthelmentic, Antifungal,Vitamins, Minerals,Water imbalance and IV fluids, Vaccines, antivenom, antirabbies serum, Local anti septics, drugs in ophthalmic practice, Anti cancer drugs and immunomodulators.

Paper II **100 Marks**

Part A **70 marks**

1-Detailed Knowledge of Following Dravya –

1- Detailed knowledge of following drugs with respect to Basonym of drug, Main Synonyms, Regional Name, Botanical Name, Family, Classification of Dravya (Gana) as described in Charak and Sushrut, External morphology, Useful parts, Important phytoconstituents, Rasa panchaka, Action on Dosha, Dhatu, Mala, Prayogarha vyadhi (therapeutic indications), Amayikaprayoga and Matra (Therapeutic administration and Dose), Vishishta yoga (names of important formulations), Vishakta Lakshan (adverse effects), Chikitsopachara (remedial measures) and Shodhana (as required)

[Alphabetical order and Botanical names to all the drugs are to be added]

Agaru	Guggulu	Pashanabheda
Agnimantha	Haridradvaya	Patala
Agnimantha	Haritaki	Pippali-Pippalimula
Ahiphena	Hingu	Prishniparni
Amalaki	Jambu	Punarnava
Apamarga	Jatamansi	Pushkarmoola
Aragvadha	Jatiphal	Rasna
Aragvadha	Jeerakadvaya	Rasona
Ardraka-Sunti	Jyotishmati	Rohitaka
Arjuna	Kalamegha	Saireyaka
Arjuna	Kampillaka	Sarivadvaya
Arkadvaya	Kanchanara	Sarpagandha
Ashvagandha	Kantakari	Shalaparni
Asoka	Kapikacchu	Shallaki
Ativisha	Karkatakshringi	Shalmali
Bakuchi	Karpura	Shankhapushpi
Baladvayam.	Katuki	Shatavari
Bhallataka	Khadira	Shigru
Bharangi	Kiratatikta	Shirisha
Bhrungaraj	Kumari	Shyonaka
Bibhitaka	Kumkum Kesara	Talisa Patra
Bijak/ Vijaysar	Kupilu	Tila
Bilva	Kushta	Trivrut
Brahmi	Kutaja	Tulasi
Bruhati	Lavanga	Tvak
Chandanadvaya,	Lodhra	Ushira
Chitraka	Madanaphala	Vacha
Dadima	Mandukaparni.	Varahi
Devadaru	Manjishtha	Varahi
Dhataki	Maricha	Varuna
Durva	Musta	Vasa
Eladvayam	Nagakeshara	Vatsanabha
Eranda	Nimba	Vidanga
Gambhari	Nirgundi	Vidari
Gokshura	Palasha	Yastimadhu
Guduchi	Parpata	Yavani

Part B-

II- Brief Knowledge of following dravyas with Respect to Sanskrit Name, Botanical Name, Family, Habit (Samanya Swarupa), Parts Used and Indications.

Agastya	Jati	Palandu
Ajamoda	Jayapala	Parasika Yavani
Akarkarabh	Jeevanti	Parijata
Amlavetasa	Kadali,	Parisha
Amra	Kadamba	Parnabija

Amragandhiharidra
Ankola
Aparajita
Ashvagol
Ashvattha
Asthishrunkhala
Atasi
Avartaki
Avartani
Babbula
Badara
Bakula
Bhumyamalki
Bijapoora
Bola
Chakramarda
Champaka
Chandrashura
Changeri
Chavya
Chirbilva
Chopachini
Danti
Darbha
Dattura
Dhanvayasa
Dhanyaka
Draksha
Dronapushpi
Gandhaprasarini
Garjara
Gojihva,
Gorakshaganja
Gunja
hinsapa
Hinstra
Hribera
Hrutpatri
Ikshu
Indravaruni
Ingudi
Irimeda
Ishvaku
Isvari
Japa
Kaidarya
Kakamachi
Kamala
Kankola
Karanja
Karavellaka
Karavira
Karira
Karpasa
Kasamarda
Kasha
Kasni
Kataka
Katphala
Kebuka
Kharjura
Kitmari
Kokilaksha
Koshataki
Kulatha
Kumuda
Kusha
Kusmanda
Lajjalu
Langali
Latakaranja
Latakasturi
Madayantika
Mahanimba
Mandukaparni
Markandika
Masha
Mashaparni
Matulunga
Mayaphala
Meshashrungi
Methika
Mudgaparni
Mulaka
Murva
Nagabala
Nala
Narikela
Nili
Padmaka
Parnayavani
Parpataka
Parushaka
Patalagarudi
Patha
Patola
Patranga
Pilu
Plaksha
Prasarani
Priyala
Priyangu
Puga
Putiha
Putranjivaka
Rajika/Sarshapa
Rohitaka
Saptachakra
Saptaparna
Saral
Sarja
Shala
Shara
Sharapunkha
Shatahwa
Shati
Snuhi
Sringataka
Svarnakshiri
Tagara .
Tailaparni
Talmuli
Taruni
Tavakshira
Teja Patra
Tuvaraka
Udumbara
urana
Vamsha
Vata
Vatada
Vrudhadaru
Vrukshamla

III .-Introduction, Guna, Karma and Uses of following Jantava Dravya (Drugs of Animal Origin).

1. Kasturi
2. Gorochana
3. Mrigasringa

IV- Introductory Knowledge of Following Annapana Varga:

1. Jala Varga	2. Dugdha Varga	3. Madhu Varga
4. Taila Varga	5. Sukadhanya Varga	6.Shamidhanya Varga
7. Phala Varga	8. Shaka Varga	9. Mamsa Varga
10. Aharayogi		

PRACTICALS

1. A. Study of Macroscopic, Microscopic characters and Demonstration of organoleptic charcteristics and grahya-agrahyatva of following plants and their useful parts.

i. Kanda (stem) - Guduchi or Ashtishrinkhala
ii. Patra (leaves) - Vasa or Kumari
iii. Pushpa (flower and Parts of flower)- Dhataki or Japa
iv. Phala (fruit) – Maricha or Madanaphala or Vidanga
v. Beeja (seeds) – Eranda or Kapikacchhu
vi. Twak (bark) – Kutaja or Arjuna or Ashwattha
vii. Moola(Root)- Punarnava or Chitraka
viii. Niryasa (exudate) – Guggulu or Mocharasa
ix. Jangama dravya - Madhu or Ghrita.

2. Records of Herbarium sheets of 50 medicinal plants Compulsory study tour other state/s for field knowledge and procurement of plant species.

PRACTICAL MARKS DIVISION

1	Herbarium	20 Marks
2	Practical record	20 Marks
3	Drug identification- spotting –Raw/crude drugs	30 marks
4	Plant identification spotting –fresh	30 marks
5	Practical	40 marks
6.	Viva-Voce	60 Marks
Total		**200 marks**

Reference Books

1.	Abhinav Buti Darpan (Vol.1-2)	-	Vd. Roop Lal Vaishya
2.	Aushadna Vigyna Shastra	-	Acharya Pt. Vishvanatha Dwidevi
3.	Ayurvediya Aushadnkarma vigyana	-	Acharya V.J. Thakur
4.	Bedi Vanaspati Kosha	-	Prof. Ramesh Bedi
5.	Bhaishajyaguna Vigyana	-	Dr. Alakhnarayan Singh
6.	Bhav Prakash Nigantu (English)	-	Shreekanthamurti
7.	Bhav Prakash Nighantu	-	With Vd. Krishna Chandra Chunekar commentary
8.	Bhrinad dravyagunadarsha	-	Mahendra Kumar Shastri
9.	Classical Uses of Medicinal Plants	-	Acharya Priyavrata Sharma
10.	Controversial Medicinal Plants	-	Vd. G. Bapa Lal
11.	Dalhana Ka Dravyaguna Shastra Ke Kshetra Me Yogadana	-	Vd. Shiv Kumar Vyas
12.	Dravyaguna Kosha	-	Acharya Priyavrata Sharma
13.	Dravyaguna Sutram	-	Acharya Priyavrata Sharma
14.	Dravyaguna Vigyana	-	Dr. Gyanendra Pandey
15.	Dravyaguna Vigyana(Vol. 1-2)	-	Acharya Yadavji Tikram Ji
16.	Dravyaguna Vijyana	-	Dr. V.M. Gogate
17.	Dravyaguna Vigyana (Vol. 1-5)	-	Acharya Priyavrata Sharma
18.	Dravyaguna Shastrum	-	Vaidya G.A. Phadake
19.	Dravyaguna Vijyana	-	Dr. A.P. Deshpande
20.	Dravyagunavijnana basic Principles	-	Prof.D.S.Lucas
21.	Forgotten Healers (Indian Medicinal Plants)	-	Dr. Prakash Pranjape
22.	Glossry of Vegetable Drugs in Bhrittrayis	-	Thakur Balwant Singh & Vd. Krishna Chandra Chunekar
23.	Introduction to Dravyaguna	-	Acharya Priyavrata Sharma
24.	Kriyatamka Aushadi Parichaya	-	Acharya Pt. Vishvanath Dwidevi
25.	Materia Medica	-	Acharya Ghosh
26.	Nighantu Adarsh (Vol. 1-2)	-	Vd. Bapa Lal
27.	Pharmacological basis of Medical Practice	-	Goodman & Gillman
28.	Pharmacology and Pharmacotherapeutics	-	Satoskar Bhandarkar & Ainapure
29.	Prayogatamaka Dravyaguna Vigyana	-	Dr. Maya Ram Uniyal
30.	Priya nighantu	-	Acharya Priyavrata Sharma
31.	Raspanchaka/Dravyaguna Siddhanta	-	Prof. Shivcharan Dhyani
32.	System of Plant Nomenclature in Ayurveda	-	Dr. Gyanendra Panday
33.	Text Book of Pharmacognosy	-	Trees & Valis
34.	Textbook of Dravyaguna	-	Dr.K.Nishteswar
35.	Unani Dravyaguna Vigyana	-	Hakim Daljeet Singh

36.	Useful parts of Charaka, Sushurut, and Vagbhata.	-	
37.	Uttarakand Ki Vanaspatiya	-	Dr. Gyanendra Pandey
38.	Vanoaushadi Darshika	-	Thakur Balwant Singh
39.	Vanoaushadi Nidarshika	-	Dr. Ram Sushil Singh
40.	Vedic Vanaspatiyan	-	Dr. Dinesh Chandra Sharma

*****
***
*

2.2 ROGA NIDANA

Theory Two Papers – 100 Marks Each
Practical/Viva voce – 100 Marks

PAPER -1 **100 Marks**

Part A **50 Marks**

I. Dosha Dushyadi Vigyan

1. Definition and importance of Roganidana.
2. Samanya Nidana and Samanya Lakshana of Dosha Vriddhi, Kshaya and Prakopa.
3. Dosha Dhatu Ashraya Ashrayi Bhava.
4. Dhatu Kshaya Vriddhi Lakshana.
6. Mala Kshaya Vriddhi Lakshana.
7. Hetu, Bheda and Lakshana of Agni Dushti.
8. Definitions and Samanya Lakshana of Ama.
9. Sama and nirama Dosha, Dushya Lakshana.
10. Dosha Paka and Dhatu Paka Lakshana.
11. Concept, classification, diagnosis and general complications of Avarana.
12. Doshagati and Rogmarga.
13. Detailed study of Srotomoola and Srotodushti Samanya and Vishishta Hetu Lakshana of all Srotas. Differences between Sroto Dushti and Kha Vaigunya.

II. Vyadhi Vigyan

1. Definition, synonyms and classification of Vyadhi & Vyadhi Ghatak.
2. Criteria for nomenclature of Diseases in Ayurveda (Vyadhinamakarana).
3. Bija, Bija Bhaga and Bija Bhaga Avayava Dushti.
4. Basic knowledge of Hereditary, Congenital, Acquired, Multifactorial, Traumatic and Environmental disorders.
5. Introduction to ICD Classification of Diseases of WHO and DSM classification.
6. Samanyaja and Nanatmaja Vikara. NidanarthakaraVyadhi, Hetu Sankara, Lingasankara, Vyadhisankara, Vyadhi Awastha.
7. Dhatu, Updhatu, Mala and Indriya Pradoshaj Vikara.
8. Concept of AshtaMahagada .
9. Introduction to Ashta Nindita.
10. Definition and classification of Vyadhikshamatva.
11. Ojas – types of Ojo Dushti- Visrimsa- Vyapad & Kshaya & It's Diseases.

III. Basic Pathology

1. Introduction to pathology and its sub-divisions.
2. Introduction to Cell Injury and Cellular adaptations.
3. Definition and brief description of inflammation – Healing/repair.
4. Definition and brief description of edema – shock – hemorrhage, Thrombosis , embolism, Ischemia and Infarction.
5. Types of Immunity – different types of immune responses in the body – Basic knowledge of auto immune diseases, Acquired immune deficiency disease and hypersensitivity.
6. Nomenclature and classification of tumors - difference between benign and malignant tumors.
7. Introduction to Nutritional disorders – disorders of macro and micro nutrients.
8. Introduction to infections.

9. Introduction and classification of microorganisms such as virus- bacteria-fungus.

Part B **50 Marks**

IV. Nidana Panchaka Vigyana

1. Difference between Roga and Rogi Pariksha.
2. Importance of Nidan Panchaka.
3. Hetu - Definition, Synonyms and Classification.
4. Purva Rupa – Definition, Synonyms, Samanya and Vishishta Purvarupa.
5. Rupa - Definition, Synonyms, Samanya and Pratyatma Lakshana. Difference between Vyadhi and Lakshana.
6. Upashaya / Anupashaya– Definition, Types and its importance in diagnosis.
7. Samprapti – Definition, Synonyms and Type and Samprapti Ghataka.
8. Shat Kriyakaala. Relationship between Nidana Panchaka and Shat Kriyakaala.
9. Upadrava and Udarka.
10. ArishtaVigyan – Definition, Types and its importance.
11. Sadhyasadhyatwa – Types, their parameters and importance.
12. General diagnostic principles of AnuktaVyadhi (Ch. Vi. 4).

V. Pariksha Vigyana

1. Importance and knowledge of Aptopadeshadi & Darshanadi Trividha, Chaturvidha, and Shadvidha Pariksha.
2. Importance and Knowledge of Ashtasthana Pariksha.
3. Importance and Knowledge of Karanadi Dashavidha Parikshya Bhava.
4. Importance and Knowledge of Dashavidha Pariksha.
5. Basic knowledge of ECG, USG, X Ray, CT Scan,MRI.

Paper II **100 Marks**

Part A **50 Marks**

Systematic study of Nidana Panchaka of following diseases (Including Upadrava, Arishta and Sadhyasadhyata).

I. Diseases of Rasavaha Srotas

1(a) Jwara(Jwarabheda-Ama, Pachyamana and Nirama Jwara,Agantukajwara, Punaravartaka Jwara,Vishama Jwara, Dhatugata Jwara, Charakokta Sannipata Jwara.

1(b) General mechanism of Fever, Introduction to the Aetiopathogenesis of Malaria,Typhoid, Dengue fever, Influenza and Chikungunya.

2(a) Pandu, Amavata, Hridroga, Shotha.

2(b) Introduction to Anaemia & its Classification, Rheumatic fever, Rheumatoid Arthritis, Hypertension, Angina, Ischaemic Heart Disease, Myocardial Infarction and CCF.

II. Diseases of Raktavaha Srotas

1. Kamala - Raktapitta - Vatarakta – Kroshtuksheersha - Shitapitta – Maha Kushtha – Visarpa – Shwitra and Introduction to Kshudra Kushtha.
2. Introduction to Hepatomegaly, Spleenomegaly, Leukaemia, Thalessemia, Sickle cell Anaemia.
3. Introduction to Urticaria, Psoriasis, Eczema, Pemphigus.

III. Diseases of Mamsavaha Srotas

(a) Galganda
(b) Introduction to Thyroid disorders

IV. Diseases of Medovaha Srotas

1. Sthoulya - Karshya – Prameha.
2. Introduction to Obesity and Diabetes Mellitus.

V. Diseases of Asthi – Majjavaha Srotas

1. Vatavyadhi - Akshepaka - Apatanaka - Ardita - Pakshaghata – Gridhrasi –Vishwachi, Avabahuka, - Manyasthambha ,Katigraha**,**Pangutwa
2. Sandhigatavata, Asthi-Majjagata vata.
3. Introduction to Osteo- Arthritis, Osteoporosis.
4. Introduction to Parkinson's disease, Stroke, Lumbago- Sciatica syndrome, Bell's Palsy, Cervical- Lumber & Ankylosing Spondylitis.

VI. Diseases of Shukravaha Srotas

1. Introduction to Klaibya and Vandhyatva.
2. Introduction to male and female infertility.

Part B

50 Marks

VII. Diseases of Pranavaha Srotas

1(a). Kasa - Shwasa - Hikka – Urahkshata – Shosha – Rajayakshma.
1(b). Introduction to the aetiopathogenesis of Pneumonia, Pleural effusion, Bronchitis, Bronchiectasis, Bronchial Asthma.

VIII. Diseases of Annavaha- PureeshavahaSrotas

1. Agnimandya - Ajirna - Aruchi- Chhardi - Amlapitta- Shoola – Parinama Shoola – AnnadravaShoola- Atisara – Pravahika - Grahani –Gulma- Udara Roga.
2. Introduction to Anaha, Adhmana, Atopa, Visuchika Alasaka, Vilambika.
3. Introduction to Peptic Ulcer, Irritable Bowel Syndrome (IBS) Diarrhoea, Dysentry, Constipation, Inflammatory Bowel Diseases.

IX. Diseases of Udakavaha Srotas

1(a) Introduction to Trishna, Daha.
1(b) Introduction to water and electrolyte imbalance disorders.

X. Diseases of Mutravaha Srotas

1(a) Mutrakrichha – Mutraghata.
1(b) Introduction to Urinary Tract Infection, Nephropathies.

XI. Diseases of Swedavaha Srotas

1(a) Introduction to Khalitya, Palitya.

XII. Diseases of Manovaha Srotas

1(a) Apasmara, Unmada, Atatwabhinivesha-Vishada, Anidra, Mada, Murchha, Sanyasa.
1(b) Introduction to Epilepsy, Depression, Anxiety neurosis.

XIII. Upasargajanya Vyadhi (Communicable diseases)

1(a) Romantika – Masurika – Upadamsha – Phiranga.
1(b) Introduction to Measels, Chickenpox, Leprosy, Tuberculosis and AIDS**.**

XIV. Krimi Vigyana

1) Definition, classification of Krimi and features of Krimiroga
2) Snayuka, Shleepada.
3) Introduction of Filariasis and classification of common parasites.

PRACTICAL **(100 Marks)**

i) Fundamental Principles of Laboratory Tests

Introduction to laboratory, Sterilization, glass wares, solutions reagents and safety procedures, Disposal of biomedical wastes.

ii) Haematology

1 Haemoglobin estimation.
2 Blood cells counting - WBC, RBC, platelets.
3 Hematocrit /Packed cell volume (PCV).
4 Erythrocyte indices - MCV, MCH, MCHC.
5 Peripheral blood smear, staining technique and differential leucocyte count.
6 Peripheral blood film examination in Anemia, Leukemia, Malaria, Filaria (Demonstration).
7 ESR.
8 Screening test for bleeding disorders- bleeding time (BT)**,** Clotting time (CT), Demonstration of Prothrombin time (PT).
9 Blood grouping - ABO system, Rh typing (Rhesus system).

iii) Urine Examination

1. Ayurveda anusara mutrapariksha.
2. Physical Examination - Volume, Reaction (Ph) & Specific Gravity.
3. Chemical Examination for - Proteins, Glucose, Phosphate, Ketone, Bile salts, Bile pigment.
4. Dipstick examination
5. Demonstration of Microscopic Examination.

iv) Stool Examination

1 Ayurveda anusara purishapariksha.
2 Physical examination, Sama-Nirama Pariksha.
3 Microscopic examination of ova & cyst (Demonstration)
4 Occult Blood Test.

v) Demonstration of Sputum Examination

1 Ayurveda anusara sthivanapariksha.
2 Physical, Chemical and Microscopic Examination of the sputum.
3 Sample collection and Demonstration of AFB.

vi) Demonstration of Semen examination

1 Ayurveda anusara Retaspariksha.
2 Semen examination.

vii) Biochemical Examination – (Demonstration)

Blood Glucose, Serum Bilirubin, Blood Urea, Lipid Profile, Serum Creatinine, Serum Uric acid etc.

viii) Demonstration of different staining techniques in microbiology.

ix) Demonstration of Sero-immunological Investigations: RA and Widal.

x) Laboratory record – maintenance of laboratory record book.

Bed side Practical (Clinical Methods)

1. Introduction and demonstration of clinical methods (General and Systemic Examination).
2. Practical demonstration of examination of Roga based on Pancha Nidana.
3. Demonstration of instruments used for clinical examination.
4. Practical records of clinical examination of at least 20 long cases in I.P.D including Atur-bala-pramana pareeksha.
5. Practical records of clinical examination of at least 20 short Cases based on Ashta vidha pariksha in O.P.D.

6. Demonstration of ECG, USG and Radio imaging techniques.

Distribution of Marks for final Practical Examination

1. Daily Record -10 Marks
2. Indentification of Instruments -10 Marks
3. Laboratory Experiments -20 Marks
4. Short Case -10 Marks
5. Long Case -20 Marks
6. Viva - Voce -30 Marks

Total 100 Marks

Reference Books

1. Madhava Nidana (Madhukosha Pt. Yadunandan Upadhyay Commentary) Part 1 – 2
2. Doshakaranatwa Mimamsa - Acharya P.V. Sharma
3. Nadi Darshan - Vd. Tara Shankar Mishra
4. Nadi Vigyana Vidyotini Hindi Tika
5. Nadi Vigyan- Shri Satya Dev Vashisht
6. Nadi Vigyan- Gangadhar Tika
7. Rogi Pariksha vidhi Acharya- Priyavrata Sharma
8. Ayurvediya Roga Vargikaran- Vd. Ramanath Dwivedi & Vd. Gurdip Singh.
9. Ayurvediya Nidan Evum Chikitsa Ke Siddhanta - Prof. Ram Harsh Singh.
10. Relevant portions of Charak Samhita, Sushrut Samhita and Vagbhata.
11. Text Book of Pathology- William Boyds.
12. Text Book of Pathology- Harsh Mohan.
13. Text Book of Pathology- Dey and Dey.
14. Text Book of Parasitology -Ramnik Sood.
15. Clinical Pathology and Bacteriology- S.P. Gupta.
16. Clinical methods in Ayurveda- K. R . S. Murthy.
17. Parameswarappa's Ayurvediya Vikriti Vigyan and Roga Vikriti Vigyan-Dr. P.S. Byadgi.
18. Oxford Handbook of Clinical Examination Oxford Handbooks and Practical Skills.
19. Advanced Clinical Evaluation System for Practical Assessment of Clinical Examination Skills.
20. Symptoms & Signs in Clinical Medicine - Chamberlains.
21. Clinical Methods- Hutchison's.
22. Bedside Clinics in Medicine Part- I & II-Kundu.
23. Common Medical Symptoms- Mehta.
24. Advances in Pathology & Lab Med- Weimstean, Gralem, Anderson, Cortan, Wick, Zumwelt.
25. Clinical Laboratory medicine Edited by Kenneth D Mc. Chately.
26. General Pathology- Walter & Israel Churchill Living stone.
27. A Comprehensive Dictionary of Pathology- Chris Newann.
28. Practical Pathology- Dr. K. Uma Chaturvedi.
29 .Clinical examination- Douglas/Macleod's.
30. Pathology Practical book for Undergraduates- Harsh Mohan.
31. Medical Laboratory Technology - R. Sood.
32. Clinical Diagnosis and Management by Todd, Sanford and Davidson Laboratory methods
33. Clinical Hematology In Medical Practice- Degruchy's.
34. Robbins Basic Pathology- Kumar, Abbas, Fausto at al.

2.3. Rasashastra Evam Bhaishajyakalpana

(IATROCHEMISTRY AND AYURVEDIC PHARMACEUTICS)

Theory -Two Papers
Total Marks- 200
Teaching hours-200
Practical :-
Total Marks-200
Teaching hours-200

RASASHASTRA

Paper 1 **100 Marks**
Part A **50 Marks**

1. Definition and etymology of Rasa, History of Rasashastra, Importance of Rasaushadhi, Concept of Rasa-Rasayana, Concept of Raseshwar Darshana. Concept of Rasashala and Rasamandap.

2. Brief Description and Application of Technical terminologies (Paribhasha): Avapa, Nirvapa, Dhalana, Bhavana, Jarana, Murchana, Shodhana, Marana, Amrutikarana, Lohitikarana, Mruta Loha, Satwa Patana, Druti, Apunarbhava, Niruttha, Rekhapurna, Varitara.

3. Dravya Varga: Amlavarga, Panchamrittika, Panchagavya, Panchamrita, Ksharashtaka, Dravakagana, Mitra panchaka, Rakta varga, Lavanapanchaka.

4. Brief description of Yantras and their application Ulukhala Yantra, Khalwa Yantra, Kachhapa Yantra, Damaru Yantra - Vidhyadhara Yantra- Urdhwapatan, Addhapatan & Tiryakpatana Yantra, Jaranartha Tulayantra, Dolayantra, Patalayantra, Palika Yantra, Baluka Yantra, Bhudhara Yantra, Sthali Yantra, Swedana Yantra.

5. Brief description & application of Musha (Crucible): Samanya Musha, Gostani musha, Vajra Musha, Maha musha, Yoga musha, Vrintaka Musha, Malla / Pakwa musha. Different types of crucibles e.g. Silica crucible, platinum crucible. Mudra and Sandhi Bandhana.

6. Brief description & applications of Chullika, Satwapatana Koshthi, Patala Kosthi, Gara Koshthi, Angarakoshthi and knowledge of various heating appliances viz. Gas stove, Hot plate, Heating mantle, Induction Stove, Hot Air Oven.

7. Concept, definition and types of Puta: Suryaputa, Chandraputa, Gomayaputa, Lawakaputa, Kukkutaputa, Kapotaputa, Varahaputa, Gajaputa, Mahaputa, Kumbhaputa, Valukaputa, Bhudharaputa, Applications of Electric muffle furnace and fuel (diesel) dependent furnace. Brief introduction to thermocouple and pyrometer.

8. Knowledge of Parada: Synonyms, Occurrence, natural and artificial sources of Parada, Hingulottha parada, Types of Parada, Parada Dosha: Naisargika, Yougika, Aupadhika

(Kanchuka). Grahya-Agrahya Parada, Parada gati, Parada bandha, Shodhana of Parada. Parada sanskara and brief description of Ashtasamskara.

9. Concept of Murchhana and Jarana of Parada, Preparation of Kajjali, Classification of Rasaushadhi: Khalvi rasa e.g. Tribhuvana Keerti Rasa, Parpati Rasa- Rasa Parpati, Kupipakva Rasa- Rasa sindur, Pottali rasa - Hemagarbha pottali. Rasa sevana vidhi and pathya and apathya.

10. Brief introduction of quality control , standardization and GMP of Rasaoushadhies.

Part B **50 Marks**

Occurrence, Synonyms, Minerological identification, Sources, Types, Grahya and Agrahyata, Shodhana, Marana and other processing techniques. Properties, dose, anupan and therapeutic uses, pathya – apathya and ashuddha, apakwa and avidhee sevanjanya dosha and its management, important formulations of the following:

1. **Maharasa –**Abhraka (Biotite Mica), Vaikrantha, Makshika (Chalco-pyrite), Vimala (Iron Pyrite), Shilajatu, Sasyaka (Peacock ore), Chapala and Rasaka (Sphalerite).

2. **Uparasa –** Gandhaka (Sulfur), Gairika (Red Ochre), Kasisa (Green Vitriol), Kankshi (Alum), Haratala (Orpiment), Manahshila (Realgar), Anjana and Kankustha.

3. **Sadharana Rasa –** Kampillaka, Gauri pashana (Arsenic oxide), Navasadara (Ammonium chloride), Kaparda (Cowry), Agnijara, Giri Sindura (Red oxide of Hg), Hingula (Red Cinnabar) and Mriddara shringa (Litharge).

4. **Dhatu -**Swarna (Gold), Rajata (Silver), Tamra (Copper), Loha (Iron), Vanga (Tin), Naga (Lead), Yashada (Zinc), Kamsya (Bronze), Pittala (Brass), Vartaloha. Dhatu -graha sambandha.

5. **Ratna** - Manikya (Ruby), Mukta (Pearl), Pravala (Coral), Tarkshya (Emerald), Pushparaga (Topaz), Vajra (Diamond), Nilam (Sapphire), Gomeda (Zircon or Cinnamone stone), Vaidurya (Cats eye). Ratnapariksha, Ratnadosha, Ratna-graha sambandha.

6. **Uparatna-** Vaikranta (Tourmaline), Suryakanta (Sun stone), Chandrakanta (Moon stone), Rajavarta (Lapis lazuli), Perojaka (Turquise), Sphatikamani (Quartz), Trinakanta, Palanka, Putika, Rudhir.

7. **Sudha varga –** Sudha (Lime stone), Kaparda (Cowries), Shukti (Oyster Shell) , Shankh (Conch Shell), Mriga shringa (Stag horn), Khatika, Godanti (Gypsum) and Samudraphena (Cattle Fish bone), Kukkutanda twak (Hen's Egg Shell).

8. **Sikata varga -** Sikata (Silica), Dugdhapashana (Talc), Nagapashana / Jaharmohara (Serpentine), Badarshama (silicate of lime), Vyomashma (Sangeyashab - Jade), Kousheyashma (Asbestos) and Akika (Agate).

9. **Kshara varga** - Sarja kshara (Sodium bicarbonate), Yava kshara, Tankana kshara (Borax), Surya Kshara (Potassium Nitrate).

10. **Miscellaneous** - Mandura, Bola, Dam-ul Akhawayan (Raktabandhini), Kasturi, Bhoonag, Mayurpiccha, Sarjarasa, Madhoocchishta.

11. **Visha and Upavisha-**Introduction, collection and storage, classification, synonyms, shodhana, antidote, therapeutic and toxic doses, anupan, therapeutic uses, and formulations of following Visha and Upavisha-Vatsanabha, Kuchala, Jayapala, Dhattura, Bhanga, Bhallataka, Gunja, Arka, Snuhi. Langali, Karaveera, Ahiphena and Chitrakmool.

12. **Aushadhi Yoga Gyanam- ingredients, manufacturing process, and bheshajprayogvidhi.** Arogya Vardhini Gutika, Kasturibhairava Rasa, Kumara Kalyana Rasa, Garbhapala Rasa, Chandraprabha Vati, Chandramrita Rasa, Pratapalankeshwara Rasa, Pravalapanchamrita Rasa, Anandbhairava Rasa, Yogendra Rasa, Laxmivilas Rasa, Vasantakusumakara, Vasantamalati Rasa, Brihat Vata Chintamani Rasa, Shankha vati, Shwaskuthara Rasa, Hinguleswara Rasa, Hemagarbhapottali, Hridyarnava Rasa, Swarnavanga, Makaradhwaja, Putapakwavaisham Jwarantaka Loha, Vatvidhvamsan Rasa, Kamadugha Rasa, Laghusutshekhar Rasa, Navayasa Loha, Saptamrita Loha, Tamra Parpati, Panchamrita Parpati, Sveta Parpati.

13. **Introduction to** pharamcovigilance and its status in India, with reference to Ayurvedic drugs.

A) Necessary to know – From part A and B : S. No. 1 to 9
B) Desired to know – From part B : S. No. 10

Practical **100 Marks**

Minimum Twenty five practicals to be performed

1.	**Rasa [Parada]**	Samanya Shodhana of Parada Kajjali Mugdha rasa
2	**Maharasa varga**	Shodhana of Abhraka Dhanyabhraka nirmana Shodhana of Makshika Shodhana of Shilajatu Shodhana of Sasyaka.
3.	**Uparasa varga**	Shodhana of Gandhaka Shodhana of Gairika Shodhana of Kasisa Shodhana of Kankshi Shodhana of Haratala Rasa manikya nirman Shodana of Manashila

4.	**Sadharana rasa varga**	Shodhana of Hingula Sodhana of Navasadar Shodhana of Kapardika
5.	**Sudha Varga**	Shodhana of Shankha Shodhana of Shukti Shodhana of Pravala mula Shodhana of Godanti
6.	**Dhatu varga**	Samanya Shodhana of Lauha Shodhana of Mandura Samanya Shodhana of Tamra Shodhana of Naga Shodhana of Vanga Shodhana of Yashada
7.	**Kshara Varga**	Shodhana of Tankana
8.	**Parpati**	Preparation of Rasaparpati, Bola Parpati and Swetaparpati
9.	**Visha varga**	Shodhana of Vatsanabha, Bhallataka, Kupilu, Dhattura beeja, Jayapala, Gunja, Chitrakamoola.

PRACTICAL FOR DEMONSTRATION / GROUP PRACTICALS

1. Hingulad rasakrishti (Hingulottha Parada).

2. Bhasma: 4 (One from each group)
- i. Abhraka bhasma, Swarna Makshika bhasma, Tamra bhasma
- ii. Vanga bhasma, Naga bhasma, Yashada bhasma
- iii. Mandura bhasma, Kasisa bhasma
- iv. Shankha bhasma, Kapardika bhasma, Godanti bhasma.

3. Pishti : 1 Pravala pishti, Jaharmohara / Akika pishti, Trina kantha mani pishti, Mukta pishti.

4. Druti : 1 Gandhaka druti.

5. Formulations 4 (one from each group)
- i. Rasasindura, Swarna vanga, Sameer pannaga rasa
- ii. Saptamruta lauha, Punarnava mandura, Navayasa lauha
- iii. Agnitundi vati, Tribhuvana kirti rasa, Sootshekhara rasa, Laghusutashekhara Rasa
- iv. Arogyavardhini vati, Laghumalinivasanta rasa, Hinguleshwar rasa, Anandbhairav rasa, Rajapravartini vati

BHAISHAJYAKALPANA

Paper II **100 Marks**

Part A **50 Marks**

1. **History and Chronological (kramika vikasa) development** of Bhaishajyakalpana. Concept of Aushadha and Bheshaja.

2. **Fundamental principles of Bhaishajya Kalpana.**

3. **Study of Ancient and Contemporary systems of 'Maana' (Units of measurement), Shushka -ardra –drava- dravya grahan niyam (**Rules of measures of dry, fresh, liquid drugs); Grahyagrahyatva, Nava Puran dravya grahan niyam.

4. Guidelines and Methods of collection, storage, preservation of Aushadhi dravya. Concept of Saviryatavadhi (shelf life) and stability in ancient and contemporary science.

5. **Bheshajprayogavidhi : Aushadha Matra, Anupana and sahapan and Aushadh sevan kaala. (Posology).**

6. **Panchavidha kashaya kalpana and Other kalpana :** Kashaya Yoni, Swarasa, Kalka, Kwatha, Hima and Phanta, Pramathya, Aushadha siddha paniya, Tandulodaka, Laksha rasa, Mantha, Panaka, Arka, Churna, Rasakriya, Ghana, Phanita, Avaleha, Prasha, Gudapaka, Sharkara, Syrups, Ksheerapaka, Satva, Guggulu kalpana, Vati, Guti, Pinda, Modaka, Varti Preparation of Tablets, pills, capsule and Suppositories. Masi kalpana, Lavana kalpana, Kshara kalpana and Kshara sutra.

7. **Introduction and general knowledge of useful instruments/ Equipments -** Disintegrator, Mixer, Grinder, End Runner, Edge Runner, Sieve-Shaker, Granulator, Tableting machine, Pill making machines, coating and polishing pan, capsule filling machine, sieves and mesh.

8. **Sneha kalpana :** Sneha yoni, Types of Sneha, Sneha murchana vidhi, Sneha paka vidhi, patra paka, types and their use. Sneha siddhi lakshana, dose, Preparation and uses of Triphala Ghrita, Bramhighrita, Narayana taila, Anutaila.

9. **Sandhana Kalpana and its types:** Madya Kalpana, Asava, Arishta, Sura (Prasanna - Kadambari - Medaka - Jagala - Bakkasa), Maireya, Surasava, Shukta, Kanjika, Sauviraka, Tushodaka, Sidhu kalpana their methods of preparation, siddhi lakshana, properties, uses, doses. Takrarishta, Draksharishta, Ashokarishta, Dashamoolarishta, Kumaryasava, Chandanasava.

10. **Kritanna and Aushadhisiddha anna Kalpana:** Definition of Kritanna, Concept of Pathya and Apathya, Yavagu –types of yavagu, Manda, Peya, Vilepi, Anna, Bhakta, Odan, Yush -types, Krishara, Mansa rasa, Vesavara, Khad Kamblika, Raga, Shadava, Dadhi and Takra Varga – Takra, Udasvita, Katvar, Mathita, Chhachika.

PART B

1. **Bahyopacharartha kalpana (External Applications)**-**Lepa** -Types of Lepa, methods of preparation and mode of application. Udvartan and Avachurnan, Method of preparation of Siktha Taila, Malahara – Sarjarasa Malahara, Gandhak Malahara, Upanaha, Atasi upanaha, Shatadhouta and Sahastradhouta Ghrita. Brief introduction of semi solid dosage forms- Ointments, Creams, Emulsions, Gels, Lotions.

2. **Principles and precautions for preparation of formulations for following**:
   - **2.1 Netraupacharartha kalpana (Opthalmic preparations)** – Seka, Drava, Pindi, Anjana - Ashchyotana - Tarpana - Putapaka and Vidalaka, Methods of preparation of eye drops, eye ointments.
   - **2.2 Nasyopacharartha Kalpana** - Classification of Nasya, Navana, Avapidana, Pradhaman, Marsha and Pratimarsha nasya.
   - **2.3 Dhumapanarth kalpana** - Classification of dhumpaan, Method of preparation of dhumvarti and it's therapeutic uses. Dhupan: Vranadhupan, arshodhupan.
   - **2.4 Mukhaprayogarth kalpana** - Gandoosha - Kavala - Pratisaran, Tooth paste, Tooth powders and Mouth wash.
   - **2.5 Basti kalpana**- Classification, Method of preparation of Niruha and Anuvasana, Basti Therapeutic properties and uses of Basti.

3 Brief knowledge of Standardization of Ayurvedic formulations- Kasthaushadhi.

4 Brief introduction of Drug and Cosmetics Act 1940 and Rules 1945.

5 Concept of, Aushadhi Nirmanshala, with respect to Good Manufacturing Practices (GMP) in accordance to Schedule T.

Practical Bhaishajya Kalpana **50 Marks**

Following practicals to be performed- (Minimum one from each category)

Method of preparation, therapeutic uses, dose and anupana of the following

1. Swarasa- Ardraka swarasa, Tulasi swarasa, Kumari Swarasa, Vasa putapaka swarasa
2. Kalka- Nimba kalka, Rasona kalka.
3. Kwatha- Punarnavasthaka kwatha, Rasna Sapthaka kwatha, Kulattha kwath.
4. Hima- Dhanyaka hima, Sarivadi hima .
5. Phanta- Panchakola phanta,Yastimadhu Phanta.

6. Pramathya- Mustadi pramathya
7. Mantha- Kharjuradi mantha
8. Aushadh siddha paniya- Shadanga paniya
9. Laksha Rasa.
10. Arka - Yavani arka, Gulab arka, Misreya arka
11. Panaka- Chincha panaka, Chandan panaka.
12. Sharkara- Banapsha sharkara, Nimbu sarkara.
13. Churna- Sitopaladi Churna, Hinguwashtaka Churna.
14. Gutika- Chitrakadi Gutika, Sanjivani Vati.
15. Guggulu-Triphala Guggulu, Kaishora Guggulu.
16. Avaleha- Chyavanaprashavaleha, Vasavaleha, Vyaghri Haritaki avaleha, Manibadra avaleha.
17. Rasa kriya - Darvi Rasakriya, Guduchi Ghana, Kutaja Ghana.
18. Khanda- Haridra khanda, Narikela khanda, Sowbhagya shunti paka
19. Satva- Amruta satva,
20. Varti- Phala varti, Chandrodaya varthi
21. Lavana- Arka lavana, Narikela lavana
22. Masi- Triphala masi, Mayurpiccha Masi
23. Ksheerapaka- Arjuna ksheerapaka, Rasona ksheerapaka, Shunthi Ksheerpaka
24. Kshara- Apamarga kshara, Snuhi kshara, Ksharasutra. .
25. Manda, Peya, Vilepi, Yavagu, Krishra, Vesavara
26. Yusha - Mudga yusha, Saptamushtika yusha, Kulattha yusha
27. Aristha- Kutajarishta, Takrarishta .
28. Asava - Kumaryasava, Kanakasava
29. Sukta kalpana- Kanji
30. Udaka- Tandulodaka
31. Upanaha- Atasi Upanaha
32. Siktha Taila Nirmaan
33. Malahara- Sarjarasa malahara, Gandaka malahara, Cream, Emulsion. Sneha Kalpana

Sneha Murchhana - Ghrita Murchana, Taila Moorchhana, Ghrita kalpana: Jatyadi ghrita, Triphala ghrita, ksheerashatphala ghrita- Taila kalpana-Panchaguna taila,Arka **t**aila, Bala taila,Jatyadi taila

35. Taila patana- Bhallataka taila patana, Jayapala taila patana
36. Shodhana- Guggulu, Hingu.

II. Visit of minimum three GMP approved Ayurvedic manufacturing units.

Distribution of Practical Marks: Total 200 Marks

Rasashastra - 100

1. Record Book - 10 Marks
2. Experiment - 30 Marks
3. Spotting - 20 Marks
4. Viva-voce - 40 Marks

Bhaishajyakalpana - 100

1. Record Book - 10 Marks
2. Experiment - 30 Marks
3. Spotting - 20 Marks
4. Viva-voce - 40 Marks

Reference Books

1. Adyatan Rasa Shastra	R.K. Goyal
2. Abhinav Rasa Shastra	Vaidya Somadev Sharma
3. Asava Arishta Vigyanam	Dr. Pakshdhar Jha
4. Ayurvediya Rasa Shastra (Sachitra)	Chandrabhusan Jha
5. Ayurvediya Rasa Shastra	Badrinarayan Pandey
6. Rasa Bhaishajya Paribhasa	Sureshananda Thapaliyal
7. Ayurvediya Rasa Shastra	Prof. Siddhi Nandan Mishra
8. Ayurved Prakash	Vaidya Gujrat Mishra
9. Drugs and Cosmetic Act - 1940	
10. Paka Darpana	Dr. Indradev Tripathi
11. The Paka-darpana of King Nala	Dr. Madhulika critical study
12. Parada Vigyaniyam	Vasudev M. Dwivedi
13. Pratyaksha Aushadh Nirmanam	Acharya VishwanathDwivdei
14. Bhaishjyakalpana Vigyanam	Dr. Agnihotri
15. Rasa Tarangini	Sadanand Sharma
16. Rasa Darpan	Prof. Bhajan Das Swami
17. Rasa Bindu	Dr. Sanjay Sharma
20. Rasa Bhaishajya Kalpana Vigyan Vaidya	Santosh Kumar Khandal
21. Rasa Mitra	Dr. Tryambak Nath Sharma
22. Rasa Ratna Samuchchaya (Hindi)	Dattattreya Ananta Kulkarni.
23. Rasaratna samuchchaya-	Ambikadatta shastri
24.Rasaratna samuchchaya -	Damodar Joshi
25. Rasa Shastra Prayogiki Srivastava,	Yadav and Prof. Ramesh Saxena
26. Rasamritam	Vaidya Yadavji Tirkramji Acharya
25. Rasayan Sara	Vaidya Shyam Sunderacharya

	Vaishya
26. Rasendra Sampradaya	Vaidya Hajari Lal Sukul
27. Rasendra Sara Sangraha	Vaidya Gopal Krishna
29. Vaidyak Paribhasha Pradeep (Hindi Translation)	Dr. Indradev Tripathi
30. Sharangadhara Samhita	Dr. Radhakrishna Parashar
31. Bharatiya Bhaishajya Kalpana Vigyana	Gananath Vishwanath Dwivedi
32. Bhaishajya Kalpana Vijnanam	Dr. K Ramachandra Reddy
33. Rasa Shastra (English)	Prof. Damodar Joshi
34. Rasa Ratna Samuchchaya (English)	Prof. Damodar Joshi
35. Rasendra Chintamani (Hindi)	Prof. Siddhinandan Mishra
36. Ayurvedic formulary of India	
38.Ayurvedic Pharmacopiea of India , CCRAS	
39. Bhaishjya Kalpana Vigyan	Siddhi Nandan Mishra
40. Textbook of Rasashasra	Dr. K Ramachandra Reddy.
41. Ashadhayoga Vigyanam	Dr. K. Ramachandra reddy
42. Vaidyaka Paribhasha Pradipa (Enlgish Translation)	Dr. K. Ramachndra Reddy & Dr. P. Suresh
43. Relevant parts of Brihatrayee	
44.Text book of Bhaishjya Kalpana -	Dr Shobha G Hiremath
45. Text Book of Rasa Shastra	Dr P H C Murthy
46.Rasa Chandashu	Prof S S Savirkar (CCRAS Publication)
47 .Bhaishjya Ratnawali	Prof S N Mishra
48 Yoga Ratnakar	

*****
***
*

2.4 CHARAKASAMHITA -PURVARDHA

(Sutrasthana, Nidanasthana, Vimanasthana, Sharirasthana and Indriyasthana)

Theory- One Paper– 100 Marks
Lectures – 200 Hours

Part A

1.	Sutrasthana	-	40 Marks
2.	Indriyasthana	-	10 Marks

Part B

1.	Nidanasthana	-	15 Marks
2.	Vimanasthana	-	20 Marks
3.	Sharirasthana	-	15 Marks

Reference Books

1. Charakasamhita –Ayurveda Dipika commentary by Chakrapani.
2. Charakasamhita (Hindi Commentary): Vaidya Jayadev Vidyalankar or Vd. Atridev Vidyalankar or Prof. Gorakha Nath Chaturvedi & Kashinath Shastri or Dr. Brahmanand Tripathy or Dr. Ravi Dutta Tripathy
3. Charakasamhita (English Commentary): Dr. Ram Karan Sharma & Vd. Bhagwan Dash or Acharya Priyavrata Sharma.
4. Charakasamhita-Ayurveda Dipika Commentary-Hindi Translation by Dr. B L Gaur, published by Rashtriya Ayurved Vidyapeeth.

*****
***
*

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

3RD PROFESSIONAL

3.1. AGADTANTRA	02-04
3.2. SWASTHAVRITTA	05-12
3.3. PRASUTI TANTRA EVUM STRI ROGA	13-17
3.4. KAUMARBHRITYA PARICHAYA	18-21
3.5. CHARAK SAMHITA (UTTARARDHA)	22

AGADTANTRA, VYAVAHAR-AYURVED EVUM VIDHIVAIDYAK

(TOXICOLOGY, FORENSIC MEDICINE AND MEDICAL JURISPRUDENCE)

Theory One Paper – 100 Marks
Practical/Viva voce -50 Marks
Theory -200 hrs
Practical - 100 hrs

Part- A **50 Marks**

1 Derivation, definition of Visha and Agadatantra. Scope of Agadatantra. Visha Utpatti, Visha Prabhava, Visha Pranaharana Kriya, Visha Guna, Visha Gati, Visha Vega Visha Sankata, Shanka Visha.

2 Definition of toxicology, Definition of poison, suicidal and homicidal poisons, classification of poisons, their action and route of administration, absorption, excretion, metabolism, diagnosis and general principles of treatment, duties of a medical practitioner in case of suspected poisoning.

3 Origin and Classification of Visha:-Its sources, Difference between Visha, Madya and Oja guna, Visha Upadrava and Visha Mukta Lakshana.

4 Tests for detection of Visha, and Modern Toxicological Techniques of detection of poisons
Visha Data Lakshana, Visha Peeta Lakshana, Signs and symptoms of Visha afflicted organs and personal effects. (Poisoning with Anjana, Lepa paduka, Abharana etc.

5 Introduction to Environmental Toxicology- Samuhika Vishaprayoga- effect of chemical and nuclear warfare.

6 Vishopakrama described by Charak**,** General principles of Management of poisoning.

7 Manifestation of poisoning due to poisons of plant origin their fatal Dose, fatal period, management of poisoning, post mortem appearance and its medico legal importance.
Visha and Upavisha- Arka, Snuhi, Langali, Karaveera, Gunja, Ahiphena, Dhattura, Bhallataka, Vatsanabha, Kupeelu, Jayapala, Bhanga & Tobacco, Parthenium hysteriphorus, Chitraka, Eranda, Digitalis and Cerebra Odallam.

8 Garavisha, Dooshivisha, Viruddhahara. Food adulteration and poisoning–classification, diagnosis, management and contemporary significance.

9 Jangama Visha – Detailed study of Sarpa, Keeta, Loota, Vrischika, Mooshika, Alarka – Visha; Lakshana, Bheda, Chikitsa and their Sadhyasadhyata (contemporary and classical views).

10 Introduction to poisoning due to Acids, Alkalis, metals, Non-metals, Asphyxiants and others, their Fatal Dose, Fatal period, Manifestation, management, medico legal importance and postmortem appearance of poisoning due to:

a) Acid and Alkalis– Sulphuric acid, Hydrochloric acid, Nitric acid, Hydrocyanic acid, Oxalic acid, Carbolic acid, Formic acid, alkalis in general.
b) Asphyxiants – Carbon monoxide, Carbon dioxide, Hydrogen sulphid**e**
c) Nonmetallic poisons – Phosphorous, Iodine
Metallic poisoning – Arsenic, Mercury, Lead, Copper, Zinc, Tin.
d) Others - Petroleum – Kerosene Organo phosphorus compounds -Aluminum

phosphate, Organo Chlorinated Compounds, Household poisons.

11 Madya and Madatyaya. Alcohol poisoning (Ethanol and Methanol).

12 *Introduction to Narcotic drugs and Psychotropic substances Act 1985.*

Part –B **50 Marks**

1. Definition of Vyavahara Ayurveda (Forensic medicine) and Vidhivaidyaka (Medical jurisprudence), concise history of Vyavahara Ayurveda (Forensic medicine) and Vidhivaidyaka (Medical jurisprudence). Introduction to Indian Penal Code, Indian Evidence Act and Criminal Procedure Code.

2. Legal Procedures:- Inquest, Evidence, Witness, Courts and their powers.

3. Personal identity and its Medico legal aspects, forensic odontology, Introduction to Forensic Serology and DNA profiling.

4. Death and its Medico Legal Aspects, Medico Legal autopsy and *exhumation.*

5. Injuries and thermal injuries, their medico Legal aspects, general introduction of weapons.

6. Dowry deaths (Domestic Violence), their Medico Legal importance and laws in relation to it.

7. Asphyxial deaths and its Medico Legal importance.

8. Medico Legal importance of Pregnancy, Delivery; Impotence & Sterility, Abortion, Infanticide, battered baby. Virginity, Artificial Insemination, Legitimacy.

9. Sexual offences, and their Medico Legal aspects. Sexual perversions.

10. Introduction to Forensic psychiatry.

11. Introduction to forensic laboratory.

12. Ethics as in classical Texts. Types of Vaidya, Pranabhisara and Rogabhisara Vaidya, Qualities of Vaidya, Responsibilities of Vaidya, Chaturvidha Vaidyavrutti, Duties of Vaidya to his patient, Vaidya Sadvrittam, Apujya Vaidya, Code of conduct.

13. Laws in relation to Medical practitioners: Indian Medicine Central Council Act.

14. Maintenance of medical record.

15. Physician's responsibility in criminal matters, Professional negligence, Civil negligence, Criminal negligence, Medico Legal aspects of Acquired Immune Deficiency Syndrome, Rights of an unborn child, Medical Termination of Pregnancy Act Transplantation of human organs Bill 1994, Pre Natal Diagnostic Testing Act, Malingering of feigned diseases, International Code of Medical Ethics for Doctors. Clinical establishment Act.

Consumer Protection Act 1986.

PRACTICAL

Practical Training

1. Post Mortem examination
2. Evidence in the court
3. Demonstrations in the Forensic & Toxicology museum
   (Toxic & Anti toxic substances, medico legal specimens & Charts)
4. Clinical postings
5. Library Hours for compilation

Distribution of Practical Marks

1. Post Mortem examination and Court posting – Case Record	10 Marks
2. Practical/Clinical Record Book	10 Marks
3. Identification (spotting)	10 Marks
4. Viva – voce	20 Marks
Total	**50 Marks**

Reference Books

1. Topics related to Agada Tantra from Charak Samhita, Sushrut Samhita, Ashtanga Hridaya, Ashtanga Samgraha, Kasyapa Samhitha, Yogaratnakara, Bhavaprakasha and Madhava Nidana.
2. Vidhivaidyaka (Vyavahar Ayurveda Vijnan) — Dr.Charuchandra Pathak
3. Medical Jurisprudence and Toxicology — Modi
4. Basavarajeeyam — Edited by Vd.Govardhan
5. Agada Tantra — Sh. Ramanath Dwivedi
6. Text book of Agada Tantra — Edited by Dr Huparikar, Dr.Joglekar
7. Agadatantra ki Pathyapustaka — Edited By Dr Huparikar, Dr.Joglekar
8. Agad Tantra — Dr. Shekher Namboodri
9. Vishachikitsa (Ayurveda Toxicology English Translation) — Vaidya Balakrishnan Nair, Kerala
10. Medical Ethics and Medical Laws in India — Dr. H.S. Mehta
11. Toxicology Ayurvedic Perspective — VPSV Ayurveda college Kottakkal
12. Kautilya Arthashastra (English) — Prof. Kangle
13. Kautilya Arthashastra (Hindi) — Dr. Raghunath Singh
14. Vyavahar Ayurveda — Dr.Ayodhya Prasad Achal
15. Vyavahar Ayurveda Vigyanam — Dr.Indramohan Jha (Sachchan)
16. Textbook of Forensic Medicine and Toxicology — Dr. V.V.Pillay
17. Forensic Medicine — Dr. B. Umadathan
18. Relevant Acts — Govt. of India
19. Relevant topics from Manu Smriti

*****
***
*

3.2 SWASTHAVRITTA

Theory- Two papers - 100 marks each
Practical / Viva voce -100 marks
Lectures –200 Hrs
Practicals and demonstration – 100 Hrs

Paper-I

PART A- VAIYAKTIKA SWASTHAVRITTA 50 marks

Introduction

Definition of swastha & swasthya and swasthavritta. Arogya lakshana, swasthavritta prayojanam, WHO definition of health.
Dimensions of health-Physical, Mental, Social.
Concept of wellbeing- objective, subjective, standard of living, quality of life.

Dinacharya

1. Definition of Dinacharya
2. Aims and importance of dinachary
3. Brahma Muhurta evam Utthana
4. Usha Jalapana
5. Sharirachinta
6. Malatyaga
7. Mukha prakshalan
8. Dantadhavana and preparation of Ayurvedic tooth powder and paste
9. Jihvanirlekhanavidhi
10. Anjana
11. Pratimarsha Nasya
12. Gandusha and Kavala
13. Tambulasevana
14. Dhoomapana
15. Abhyanga
16. Udvartana
17. Utsadana
18. Vyayama
19. Chankramana
20. Snana
21. Anulepana
22. Vastra dharana
23. Danda dharana
24. Padatra dharana
25. Chatra dharana
26. Ushnisha dharana
27. Ratnabharana dharana
28. Madhyahna charya
29. Cosmetic effect of Dinacharya procedures

Rathricharya

1. Sandhya charya
2. Rathri bhojana vidhi
3. Shayanavidhi according to Bhavamishra

Ritucharya

1. Importance of ritucharya
2. Ritu presentation as per different acharyas
3. Adana kala & visarga kala
4. Sanchaya-Prakopa-Prashamana of Dosha according to ritu
5. Doshashodhana in Ritu Charya
6. Relation of Agni bala and Ritu
7. Pathya and Apathya Ahara and Vihara in different ritus
8. a) Ritusandhi
   b) Yamadamsthra
   c) Rituharitaki
   d) Rituviparyaya

Sadvritta

Description of Sadvritta and Achara Rasayana their role in Prevention and control of diseases.

Trayopastambha

i)Ahara- Nirukti, Swarupa, Pramukhatva, Ahara dravya Vargikaranam, Aharavidhividhana, Dwadashashana pravicharana, Ashtaharvidhiviseshayatanani, Pathyahara, Apathyahara, Samashana, Adhyashana, Vishamashana, Ahara dushparinama & tajjanya vyadhaya, Santarpanajanya evam Apatarpanajanya vyadhi, Viruddhahara and its effects, Shadrasabhojanasya mahatwam.

Dietetic standards, Proximate principles of Food, Nutritional requirements, Sources and deficiency diseases of Protein, Carbohydrate, Fat, Vitamins and Minerals.
Concept of balanced diet in Ayurveda, Nitya sevaneeya dravya, Balanced diet for different sections of people in the society, Social aspects of nutrition.
Aharavarga - Dhanya varga(Cereals and millets), Shaka and Harita varga (Leafy and Non leafy vegatables), Kanda varga (roots and tubers), Phala varga (Fruits), Taila varga(Fats and Oils), Ikshu varga & Madhya varga(Alcoholic Beverages), Dugdha varga (Milk and Milk products), Masala and vyanjana dravyas (Spices & Condiments), Kritanna varga(Prepared Food), Mamsa varga (Meat types).

Food hygiene

Milk hygiene-Milk composition, Source of infection (for Milk), Milk borne diseases, Clean and Safe milk, Pasteurization of milk.
Meat hygiene-Meat inspection, Slaughter house, Freshness of fish and egg. Fruits and Vegetables hygiene
Sanitation of eating places, Preservation of food, Food handlers, Food borne diseases, Food fortification, and Food adulteration, Food toxicants, Properties of Vegetarian and Non- vegetarian diet, Effects of spices and condiments
Consumption of Alcohol and its effects on personal and social health. Effects of pathya-apathya in life style disorders-Diabetes, Hypertension, Obesity and Coronary heart Disease.

ii) Nidra- Nirukti and Utpatti, Types , Nidra – Swasthya sambandha, Properties of Yukta Nidra, Effects of Ratri Jagarana, Diwaswapna, Anidra, Atinidra, Ahara and Vihara causing disturbed sleep , Ahara and Vihara Causing sound sleep.
Duration of sleep according to age, Sleep in healthy and diseased persons.

iii) Brahmacharya – Brahmacharya and Abrahmacharya, Importance of Bharmacharya and Abrahmacharya, Vyavaya sambandhi niyama, Effects of Ativyavaya. Methods of Virya Raksha, Surataspriha(Libido) through Vajikarana, Viryanasa phala.

Roganutpadaniya- Concept of Vega- Adharaniya Vega and Dharaneeya Vega, Diseases due to vegadharana and their chikitsa, sharir shodhan.

Rasayana for Swastha-Nirukti, paribhasha(definition), classification and examples

Ashta nindita purusha

Menstrual hygiene

Part B (YOGA AND NISARGOPACHARA) 50 marks

YOGA

Introduction

Yoga shabda utpatti, definitions, Different schools of Yoga – Rajayoga, Hathayoga, Mantrayoga, Layayoga, Jnanayoga, Karmayoga, Bhaktiyoga.
Yoga prayojana
Ayurveda yoga sambandha, swasthya rakshane yogasya mahatvam
Yogabhyasa pratibhandhaka & siddhikara bhavas as per Hathayoga.
Mitahara and Pathyapathyani during Yogabhyasa.

Panchakosha Theory

Astanga yoga
Yama, Niyama
Asana and its importance
Standing Postures
Ardhakatichakrasana, Padahastasana, Ardhachakrasana, Trikonasana.
Sitting postures
Swasthika, Gomukhasana, Padmasana, Vajrasana, Bhadrasana, Shashankasana, Ushtrasana, Pashchimottanasana, Suptavajrasana, ardhamatsyendrasana, Siddhasana.
Supine Postures
Pavanamuktasana, Sarvangasana, Matsyasana, Halasana, Chakrasana, Shavasana,Setubandhasana.
Prone postures
Bhujangasana, Shalbhasana, Dhanurasana, Makarasana.
Suryanamaskara – procedure and benefits.

Pranayama
Benefits of pranayama, time of practice, avara-pravara-madhyama lakshana, yukta-ayukta lakshana
Nadishudhi Pranayama .
Kumbhakabheda – suryabhedana, ujjayi, sheetali, Sitkari, Bhastrika, Bhramari Murcha, Plavini.
Nadishudhilakshana

Shatkarma

Dhauti, Basti, Neti, Trataka, Nauli, Kapalabhati

Bandhas and Mudras

Shad chakras, Ida-pingala-sushumna nadis.

Pratyahara, Dharana, Dhyana, Samadhi

Description of Yoga in Ayurveda
Moksha and Muktatma lakshana and upaya, Naishthiki chikitsa, Satyabuddhi, Tatvasmriti, Ashta Aishwarya, Ashta siddhis.

NISARGOPACHARA (Prakritika chikitsa)

Definition, history, aims and objectives
Theories as per Western school of Naturopathy
Indian school – Panchabhutopasana
Relation of Ayurveda and Naturopathy
Importance of Naturopathy in present era.
Jalachikitsa(hydrotherapy) – Hot water treatment, Cold water treatment, foot and arm bath, Spinal bath, hip bath, abdominal wet pack, Steam bath, enema and whirl pool bath.
Mrittika chikitsa (Mud therapy)
Types of soil, doctrine of mud selection, mud bath.
Suryakirana sevana (sun bath - heliotherapy)
Mardana (Massage) – different methods and effects.
Diet types – Soothing, Elimininative, Constructive,Positive and negative diet, Acidic and alkaline diet
Upavasa chikitsa(Fasting therapy) – Importance, types, therapeutic effects of fasting.
Visrama chikitsa upayoga

PAPER II – SAMAJIKA SWASTHAVRITTA

Part A **50 marks**

Janapadodhwamsa
Causes, Manifestations and control measures, importance of Panchakarma and Rasayana.

Vayu (Air)
Vayu guna according to sushruta samhita, Properties of Vayu as per different directions, Vayu shudhi prakara – Ayurvedic aspect.
Composition of air.
Air of occupied room- Thermal discomfort and comfort zone, indices of thermal comfort.
Air pollution – health and social aspects, Prevention and control of air pollution ,Global warming.
Ventilation and its types.
Mountain air & High altitude – Health problems

Jala (Ayurvedic and modern aspects)
Importance of water , safe and wholesome water, water requirements, properties, types and sources of water,water pollution and health hazards, Methods of water purification.

Hardness of Water.
Examination,Tests and analysis of water.
Rain water harvesting and water recycling

Bhumi and nivasa sthana(Land and housing)
Types of soil,soil & health, Land pollution, Bhumi shodhana, Nivasa yogya bhoomi, Social goals of housing, Housing standards, Mahanasa (Kitchen) standards, Rural housing, Housing and health, Overcrowding.

Prakasha(lighting)
Requirement of good lighting,natural lighting, artificial lighting, biological effects of lighting.

Dhwani pradooshana(Noise pollution) -Noise, Sources, effects,& control
Vikirana(Radiation)- sources, effects and control

Apadravya Nirmulana (Disposal of solid waste)
Different types of solid waste
Storage and collection of refuse
Methods of disposal of solid waste (Rural & urban)
Bio-medical waste management

Malanishkasana Vyavastha (Excreta Disposal)
Methods for Unsewered area and Sewered area
Latrines for camps, fairs and festivals
Disposal of dead body – Burial, Burning, Electric cremation.
Meteorology (Ritu evam Vatavarana jnanam)
Definition of weather and climate,factors influencing weather and climate.
Disaster management
Definition, natural and man-made disasters,epidemiologic surveillance and disease control.
Occupational Health
Occupational Hazards, Occupational Diseases, Prevention of Occupational Diseases, Health & precautionary measures, ESI Act, Indian factories Act.
Offensive Trades- Effects on health and precautionary measures .

School health services
Health problems of school children, aspects of school health service, duties of school medical officers, Maintenance of healthy environment

Epidemiology
Concept of Epidemiology, Dynamics of disease transmission, concept of diseases, concept of causation, Epidemiological triad, natural history of disease, concept of control, concept of prevention, Risks factor, modes of intervention, incidence and prevalence. Susceptible host, host defenses, Immunizing Agents, Disease prevention and control,investigation of epidemic.
Disinfection – definition, types.
Ayurvedic concept of Vyadhikshamatva and sankramaka rogas.

Epidemiology of communicable Diseases
Chicken Pox, Measles, Diphtheria, Pertussis, Mumps, Tuberculosis, SARS, Influenza, Pneumonia, Cholera, Polio, Viral Hepatitis , Typhoid, Leptospirosis, Dengue Fever, Chikungunia, Malaria, Filariasis , Leprosy, Rabies , Tetanus, Emerging and re-emerging diseases

Kuprasangaja vyadhi (STDs)

AIDS, Syphilis, Gonorrhoea, Chanchroid

Non-communicable disease epidemiology
Diabetes, Obesity, Hypertension, Coronary Heart Diseases, Rheumatic Heart Disease, Cancer

Chikitsalaya Bhavana (Hospital Building)

Part B **50marks**

Prathamika swasthya samrakshana(Primary Health Care)
Definition, principle, elements,levels of health care.
Structure at village, sub centre, PHC,CHC, Rural hospital levels.
Health insurance, Private agencies, Voluntary health agencies, NGOs and AYUSH sector.
Role of Ayurveda in Primary Health Care.

Parivara kalyana Yojana (Family welfare Programmes)– Demography, demographic cycle, life expectancy.
Family planning, methods of family planning.

Matru sishu kalyana Yojana – MCH programme
Ante natal, intra natal, post natal, neo natal care. Child health problems and indicators of MCH care.

Preventive geriatrics-Problems of elderly,prevention and control measures.

World Health Organisation-Objectives,structure and functions.
International health agencies-United Nations agencies,Health work of bilateral agencies.

Alma Ata declaration
National Health Policy
Health statistics- Definition, Sources, uses Data collection, Classification, Presentation.
Vital statistics-Morbidity rates,Mortality rates ,Fertility rates.
Health survey

Swasthya prashasana(Health Administration) – Health administration at Central including AYUSH, state, district, village levels.

National health programmes
Tuberculosis(RNTCP), Leprosy(NLEP), AIDS (NACP), Blindness (NPCB), Polio(PPI),Diabetes (NDCP), Cancer (NCCP) , Guinea worm, Vector born disease control programme, NRHM, all the upcoming national health programmes, RCH programme, Universal Immunization Programme.

National Nutritional Programmes - IDD, Vitamin A prophylaxis, Mid day meal, anemia control programmes.

PRACTICALS

Demonstration of Dinacharya procedures- anjana, nasya, kavala, gandoosha dhoomapana, abhyanga, udvarttana.

Parichaya of aharadravya, immunization agents, disinfectants and family planning devices

Practical demonstrations of Asanas mentioned in the syllabus
Pranayama (Suryabhedana, Ujjayi, Shitali, Sitkari, Bhastrika, Bhramari and Nadishuddhi) and Shad karmas(Jala dhauti, Jalaneti, Sutraneti, Trataka, Kapalabhati).

Preparing and delivering of a health educational talk on health related issues.
A short compilation on any topic on environmental health.

Educational Visits
Observe the functioning of the Milk Dairy,Water purification unit, Sewage treatment unit,MCH/Family welfare centre,Leprosy hospital and industraial unit.
Visit to Primary Health Centre for knowledge of actual implementation of National health programmes including knowledge of rural health.
Visit of rural Ayurvedic dispensary.
Visit to naturopathy centre to observe naturopathic treatment modalities.

Health survey- Minimum 5 families of rural and urban areas.
There should be 3 case sheets for Yoga Naturopathy & pathya apathya together and 3 case sheets for communicable diseases.
Proformas for Case sheets/practical records/survey/Dinacharya projects etc should be prepared by the respective universities.

Practical and Viva Voce examination

Marks distribution	**100 marks**
1. Vaiyaktika Swasthavritta	20
2. Samajik swasthavritta	20
3. Demonstration of Yoga	10
4. Naturopathy	10
5. Journal and compilation work	10
6. Viva voce	30

Reference Books:

Relevant portions of Charaka, Sushruta, Vagbhata, Sarngadhara, Bhavaprakasha, Yogaratnakara, Madhavanidana and Bhelasamhita.

Swasthavritta Samucchaya - Pandit Rajeshwar dutt Shastri
Swasthya Vigyan - Dr. Bhaskar Govind Ghanekar
Swasthya Vigyan - Dr. Mukund swarup Varma
Swasthavritta - Vaidya Sakad
Swasthavritta - Dr. Ranade and Dr. Firke

Ayurveda Hitopadesh	- Vaidya Ranjit Rai Desai
Yoga and Ayurved	- Acharya Rajkumar Jain
Swasthavritta vigyan	- Dr. Ramharsha Singh
Swasthavrittam	- Dr.Brahmanand Tripathi
Swasthavrittam	- Dr. Shivkumar Gaud
Ayurvediya Swasthavritta	- Vaidya Jalukar Shastri
Patanjala yogasutra	- Patanjali Maharshi
Hathayogapradipika	- Swatmaram Yogendra
Gheranda samhita	- Gherand Muni
Yoga Paddhati	- Bharatiya Prakritik Chikitsa Parishad
Yogik Chikitsa	- Shri. Kedar Nath Gupta
Sachitra Yogasan darshika	- Dr. Indramohan Jha
Yoga deepika	- Shri. B.K.S. Iyengar
Light on Yoga	- Shri. B.K.S. Iyengar
Light on Pranayama	- Shri. B.K.S. Iyengar
Yoga and yoga chikitsa	- Dr. Ramharsha Singh
Foundations of Contemporary Yoga	- Dr. Ramharsha Singh
Yoga Sidhant evam Sadhana	- Harikrishna Shastri datar
Prakritik chikitsa Vidhi	- Sharan Prasad
Prakritik chikitsa vigyan	- Verma
Preventive and Social Medicine	- J. Park
Preventive and Social Medicine	- Baride and kulkarni
Janasankhya Shiksha Sidhanta Evam upadesya	- Dr. Nirmal Sahani
Health Administration in India	- S.C.Seel
Health and family welfare	- T.L.Devaraj
Positive Health	- L.P. Gupta
Biogenic Secrets of food in Ayurveda	- L.P.Gupta
Smriti granthon mein nihit Swasthaprakara samagri	- Dr. Smt. Nigam Sharma
Dr. Reddy's comprehensive guide to Swasthavritta	- Dr.P.sudhakar Reddy
Nutritive value of Indian foods	- ICMR
Yoga and Nisargopachar	- Vd. Prama Joshi
Prachin Vangmay mein prakritic chikitsa	- swami Anant Bharati, CCRYN
Swasthavritta	- Vd Yashwant Patil and Vd. Vhawal
Food and nutrition	- Swaminathan
Organology and sensology in yoga	-Prashant S Iyengar
Yoga-A game for Women	-Geeta S Iyengar

Yoga-A game for Women(hindi translation)-Madhu Pandey

3.3 PRASUTI TANTRA & STRIROGA

Marks 200 (100marks each paper)
Practical-100 marks
HOURS Theory-200 Hrs
Practical-100 Hrs

PAPER-1 PRASUTI TANTRA

PART-A

INTRODUCTION TO SUBJECT

STRI SHARIRAVIJNAN

Etymological origin of the word Stri. Artava vaha and Stanyavaha strotamsi. Tryavarta yoni Stri Vishishta,Peshi Marmani.

Anatomy of female reproductive system.(External and internal genital organs) Soft & Bony Pelvis and its obstetrical importance.

DESIRABLE (non detail)

Vayobhedena Stri sangnya

RAJO VIGYANA

Description of Raja, Artava and Prathama Rajo Darshana, Rajasvala Charya. Ritumati Lakshana, Ritumaticharya, Ritukala

Menarche, Menstrual cycle and their regulation by endocrine glands,

Ovulation –Importance in conception

DESIRABLE (non detail)

Concept of Stri Sukra

GARBHA VIGYANA

a) Garbhasya paribhasha, Garbhadhanavidhi, Garbhavakranti, Garbha Sambhava samagri, Garbhakara bhava, Panchabhautikatwa of Garbha, Masanumasika Vridhi of Garbha, Garbha Poshana , Garbhasayasthe Garbhasthiti

   Foetal attitude, lie, position, presentation

b) Apara, GarbhaNabhinadi, Jarayu, Ulba

Formation, Development, Function of Placenta, Umbilical cord, Amniotic fluid

Foetal membranes -Abnormalities of Placenta

DESIRABLE (non detail)

Garbhalingotpatti, Garbhasya Avayavotpatti, Garbha Varnotpatti, Garbha Vikriti

GARBHINI VIGYANA

a) Lakshana of Sadhyograhita Garbha, Lakshana of Vyakta Garbha, Pumsavana vidhi

Diagnosis of Pregnancy

b) Garbhini vyavastha: Garbhini Paricharya, Garbha Upaghatakara Bhava, Dauhrida

Ante Natal care-Examination, Investigation and Management

c) Garbha Vyapada: Nidana, Samprapthy and Chikitsa Garbhasrava and Garbhapata-

Garbha shosha-Upavishtaka, Nagodara, Upashushka, Leena garbha,

Antarmrita garbha, Raktagulma, Bahugarbhatha

d) Abortions, Rh-incompatability-

Causes, clinical features, complications and management.

Gestational trophablastic neoplasias, Ectopic pregnancy, IUGR, Intrauterine foetal death, Multiple pregnancy

GARBHINI VYAPAD

a) Hrillasa, Chardi, Aruchi,Atisara, Vibandha, Arsa, Udavarta, Sotha, Parikarthika, Vaivarnya, Kandu, Kikkisa, Pandu, and Kamala, makkala
b) Common ailments of Pregnancy-High Risk Pregnancy, Emesis gravid arum, Gestational Anemia, Gestational Hypertension, Gestational Diabetes, Toxemias of Pregnancy, Jaundice, AIDS,

Ante Partum Hemorrhage causes, clinical features complications and Management

PART B

PRASAVA VIGYANA

a) Prasava Paribhasha,Prasavahetu,Prasavkaala, Sutikagaranirmana, Sangrahaniya Dravyani, Sutikagara praveshavidhi.

b) Prasavavastha; Prajayani/ Upasthita Prasava/ Asannaprasava lakshana, Aavi. Prasavaparicharya, Jatamatraparicharya

c) Normal Labour:-Definition of Labour, Physiology & Mechanism of Labour, Monitoring of Labour and management, Pictogram, Episiotomy, care and resuscitation of newborn.

PRASAVA VYAPAD

a) Garbhasanga, Yonisamvarana, Aparasanga, Mudagarbha-defenition, Nidana, Types & Management

b) Induction and augmentation of labour,Cervical dystocia,Cephalopelvic disproportion, Prolonged labour, Preterm labour, Post term labour, foetal distress, Assisted Labour, Caesarian

c) Retention of Placenta, PPH - causes, clinical features and management, Genital tract Injuries during labour

DESIRABLE (non detail)
Uterine Inversion, Amniotic Fluid Embolism, Garbhasthithi parivarthan(Version), Forceps Delivery, Ventouse Delivery.

SUTIKA VIGYANA

a) Sutika Paribhasha, Sutika Kaal, Sutika paricharya. Changes during sootika avastha(Sareerika&Manasika)

Normal and abnormal Puerperium and its Management

b) Sutika Roga – Number of Sutika Roga, Sutika Jwara, Shotha and Makkala.

c) Stanyavijnan- Sthanyadushti, Sthanyakshaya,Sthanyavridhi -their causes, clinical features and treatment

d) Emergency care in obstetrics

DESIRABLE(non detail)Stana stanya –Pareeksha,Stanya sampat.

PART-2 STRI ROGA

PART-A

ARTAVA VYAPAD

a) Artava-kshaya vridhi, Ashtartavadushti lakshana chikitsa
Asrigdara lakshana samprapti Chikitsa

b) Menstrual disorders-Amenorrhoea, hypomenorrhoea, Oligomenorrhoea, Dysmenorrhoea, Abnormal uterine Bleeding

YONI VYAPAD
Sankhya, Nidana, Lakshana, Upadrava evam Chikitsa

Endometriosis, Fibroid uterus, Genital Prolapses, Retroverted Uterus, Pelvic infections, Cervical erosion, Pelvic Inflammatory Diseases

VANDHYATWA – Prakar, Nidana, Chikitsa
Infertility – Causes, Types, Investigations and Management.

Yoni Kanda, Yoni Arsa, Granthi, Arbud,

Pelvic Infections including Sexually Transmitted Infections, HIV, AIDS, Preventive measures.

MENOPAUSE-changes during menopause ,menopause syndrome, management.

DESIRABLE (non detail)
Congenital malformations of female genital tract.
Sukra vijnan –kshaya,vridhi, dushti hetu lakshana and chikitsa
Benign and Malignant tumours of Genital Tract

PART-B

STANA ROGA

a) Stanakeela- nidana lakshana chikitsa, Stanagranthi, Stanavidradhi, Stanashoph Mastitis, Breast abscess, Galactocele -Etiopathology, clinicalfeatures, diagnosis, prognosis and complications

b) Sthanik Chikitsa
Snehana, Swedana, Uttarabasti, Pichu, Varti, Lepana, Dhupana, Dhavana, Dahana, Ksharakarma -. Practical knowledge of all these procedures along with indications, complications and management.

Shastra Karma

Surgical procedures their Indications, Contraindications of cauterization of cervix, cervical dilatation and curettage, female surgical sterilization

Knowledge of indication and procedure of PAP smear. Endometrial biopsy and interpretation of the reports

Stri roga Sambandhita Pramukha Aushadhyai, Prasuti & Stri Roga Chikitsa Upayogi
Yantra Shastra Parichaya and Vyadhivinischaya Upaya (Investigative and Diagnostic Aids)

Garbhanirodhaka Upaya.

Parivar Niyojana, Reproductive and Child Health Care, AIDS/HIV control Programme, MCH, PNDT Act, MTP Act, and importance of current National Programme

Knowledge of important Commonly used Ayurvedic and Allopathic drugs used in Prasutitantra and Streeroga. Pharmacotherapuetics of allopathic drugs in obstetrics and Gynaecology

Record keeping,ethical and medicolegal issues in Streeroga and prasutitantra

DESIRABLE (non detail)
Laproscopy, hysteroscopy, hysterosalphingography, USG, X-RAY, Colposcopy, Cervical Biopsy. Granthi evum Granthi nirharan samanyajnan (Myomectomy, hysterectomy)

CLINICAL TRAINING-OBSTETRIC SKILLS

To perform independently

1. History taking and examination of antenatal and gynaecological cases

2. Diagnosis of Pregnancy, assessing of gestational period, to diagnose onset of labour

3. To monitor labour progress, able to plot Partogram

4. Observation of 10 labours

5. To diagnose abnormalities of labour and decide about the referral of the patient

6. Able to provide first aid for obstetric emergencies

7. Recognition of post partum complications

8. Councelling and promoting of breast feeding

9. Record 5 antenatal cases, 5 intrapatum and 5 post partum cases

To observe/assist-D&C, D&E, Caesarean section, Repair operations, Resuscitation of new born.

GYNAECOLOGICAL SKILLS -To perform independently

1.History taking and examination of gynaecological cases

2.Recording 10 gynaecological cases, 5 gynaecological procedures

3.Taking vaginal smear, high vaginal swab

4.Practical knowledge of sthanika chikitsa

5.Observation and practical knowledge of minor gynaecological procedures

6.Observation of Surgical procedures

7.Identification, uses., Demonstration of surgical instruments

8. Observation of Method of sterilization, MTP, Surgical procedures Hystrectomy, Oopherctomy

DISTRIBUTION OF PRACTICAL MARKS

1.Case taking-2cases –one Gynec,one obstetric- 30marks

2.Instruments ,Drugs, &Models-	20 marks
3.General Viva-	40 marks
4.Record -2-(one Prasuti, one streerog)-	10 marks
Total	**100 marks**

3.4. Kaumarbhritya (Ayurvedic Pediatrics)

Theory One Paper – 100 Marks
Practical Viva Voce - 50 Marks

Paper I **100 Marks**

Kaumarbhritya Parichaya Evum Balaka Paricharya
(Introduction to Ayurvedic Pediatrics and Child Care)

Part A **50 Marks**

1. General introduction and scope of Kaumarbhritya (Ayurvedic Pediatrics), Definitions and terminologies used in Kaumarbhritya.
2. Scientific contribution of Kashyapa Samhita in Kaumarbhritya.
3. Vayobheda (Classification of age): Garbha, Bala, Kumara; Kshirada, Kshirannada & Annada etc. and modern classification of childhood period.
4. Prana Pratyagamanam (Neonatal Resuscitation): Methodology; complications and their management (Ayurvedic and modern view). Assessment of gestational age.
5. Navajata Shishu Paricharya (Neonatal Care): Care of the Jatmatra (Newly born child) and the Sadyojata, Care of the Samaya-purvajata Shishu (Preterm), Purnakalika Shishu (Full term), and Samaya-Paschatjata Shishu (Post term neonate), Nabhinala Chhedana (Cutting of umbilical cord), Complications of improper cutting of umbilical cord and its treatment, Rakshoghna Karma (Protective measures- Ayurvedic and modern view).
6. Navajata Shishu Parikshana (Examination of newborn): Ayu-Parikshana, Modern approach to Neonatal Examination
7. Navajat Shishu Poshana (infant feeding): Specific feeding schedule as per Ayurvedic texts and modern concept; Stanya-Sampat (Properties of normal breast milk) Stanyotpatti (Physiology of lactation), Stanya Sangathana (Composition of breast milk), Stanya Parikshana (Examination of breast milk), Stanya-Piyusha (Colostrum); Stanya-Pana-Vidhi (Techniques of breast feeding), Stanyakshaya-Stanyanasha (Inadequate production and absence of breast milk), Dhatri (wet nurse)- Stanyabhave dugdh Vyavastha (alternative feeding in the absence of breast milk), Various other milk feeding methods.
8. Stanyadosha (Vitiation of Breast milk), Stanya Shodhana (Purification of breast milk), Stanya Janana and Vardhanopakrama (Methods to enhance breast milk formation).
9. Garbha Vridhi Vikasa Krama: Samanya Parichaya (brief monthwise development of

fetus), Milestones of development during infancy and childhood including concepts of various Samskaras.

10. Poshana (Nutrition): Normal requirements of nutrients and common food sources.
11. Dantotpatti evum Danta Raksha Vidhi (Dentition and dental care): Danta-sampat (Characteristics of healthy teeth), Danta Nisheka evum Dantodbheda (Eruption of teeth), Dantodbhedjanya Vikara (Dentition disorders).
12. Vyadhikshamatva: General concepts of Bala (Immunity) and methods of Bala Vriddhi.
13. Prashan & Lehana: Indications, contra-indications, different drugs used in lehana
14. Knowledge of National Programs related to Child Health Care: Reproductive and Child Health (RCH) Program, Community Child Health Programs, Nutritional Programs, National Immunization Program and other programs incorporated by Govt. of India from time to time

Part B **50 Marks**

Samanya Chikitsa Siddhanta and Balaroga
(General Principles of Treatment and Management of Pediatric Disorders)

1. Bala Pariksha-vidhi Evam Shishu Vedana Parigyan (Examination of sick child and Diagnostic methods-Ayurvedic and modern). Samanya Chikitsa Siddhanta (General principles of treatment in children).
2. General Aushadhl Matra Nirdharana - for Ayurvedic and modern drugs preparations (drug doses according to age, weight and drug contents)
3. Specific therapeutic panchakarma procedures in children with special emphases on snehan, swedan and basti.
4. Prasava Kaleena Abhighata (Birth injuries): Shwasavrodha (Asphyxia neonatorum), Ulvaka, Upashirshaka (Caput Succidanum and Cephalohaematoma), Facial Paralysis, Erb's Paralysis, Bhagna (fractures).
5. Brief description of Sahajavyadhi (Congenital disorders): Sahaja Hridaya Vikara (Congenital Cardiac Disorders) Jalashirshaka (Hydrocephalus), Khandaoushtha (cleft lip), Khanda-Talu (cleft palate) Sanniruddha Guda (Anal stricture / imperforated anus), Pada Vikriti (Talipes equanovarus and valgus), Spina bifida, Meningocele, Meningomyelocele.
6. Brief knowledge of genetic disorders): Down syndrome, Turner Syndrome, Muscular dystrophy, Sickle-Cell Anemia, Thalassaemia, Sahaja Madhumeha (Juvenile diabetes).
7. Prasavottara Vyadhi (Neonatal disorders): Navajata Kamala (Neonatal Jaundice), Navajata Netrabhishyanda (Neonatal conjunctivitis), Nabhiroga (Umbilical disorders), Navajatshishu-raktavishmayata (Neonatal Septicemia)
8. Dushta Stanyapanajanya Vyadhi (Disorders due to Vitiated Milk): Lactose intolerance, Kshiralasaka, Kukunaka, Ahiputana (Napkin Rashes)
9. Kuposhanajanya Vyadhi (Nutritional disorders): Karshya, Phakka, Balashosha and Parigarbhika (Protein Energy Malnutrition), Vitamin and Micro-nutrient deficiency

disorders, Hyper-vitaminosis, failure to thrive.

10. Aupasargika Vyadhi (Infectious Diseases): Karnamula Shotha (Mumps), Romantika (Measles), Rubella, Masurika (Chicken Pox), Rohini (Diphtheria), Kukkura-Kasa (Whooping Cough), Dhanurvata (Tetanus), Krimiroga (Worm Infestations), Antrika Jwara (Typhoid), Mastisakavarnashotha (Meningitis), AIDS, Dengue, Malaria, Rajayakshma (Tuberculosis), Jivanujanya Yakrit Shotha (Hepatitis)

1. Srotas Vikara:
   a) Pranavaha Srotas: Pratishyaya (common cold), Kasa (Cough), Shwasa (Respiratory distress syndrome), Tamaka Shwasa (Bronchial Asthma), Utphuliika, Swasanaka Jwara (Pneumonia/Pneumonitis,Bronchiolitis), Gala shotha (Pharyngitis, Laryngitis), Talukantaka(Tonsillitis)
   b) Annavaha_ Srotas: Ajirna (Indigestion), Atisara (Diarrhoea), Chhardi (Vomiting), Vibandha (Constipation), Mukhapaka (Stomatitis), Gudapaka (Proctitis), Parikartika (Anal fissure), Udarshula (Infantile Colic), Pravahika (Dysentry), Gudabhransa (Rectal Prolapse). Ama and its disorders like Ama vata jwara (Rheumatic fever).
   c) Rasavaha Srotas: Jwara (Fever), Pandu (Anemia), Mridbhakshanajanya Pandu (Anemia associated with clay eating/Pica).
   d) Raktavaha Srotas: Kamala (Jaundice), Raktapitta (Haemorrhagic disorders), Yakritodara (Hepatomegaly).and Pieehodara (Spleenomegaly)
   e) Mamsa-Medovaha Srotas: Apachi (Lymphadenitis), Galaganda (Goitre), Gandamala (Cervical Lymphadenopathy).
   f) Mutravaha Srotas: Shopha in Vrikka (Glomerulonephritis and Nephrotic syndrome)
2. Anya Bala Vikara (Miscellaneous Pediatric Disorders), Apasmara (Epilepsy), Akshepa (Convulsions), Nirudhaprakasha (Phimosis), Cerebral palsy.
3. Behavioral Disorders of Children, their management and counseling: Breath holding spell, Shayyamutra (Bed wetting), Pica, Unmada, Autism, ADHD (Attention Deficit and Hyperactive Disorders), Jadatwa (Mental retardation).
4. Pran raksha vidhi (Life saving measures in children): Principles of management of Shock and Anaphylaxis, Poisoning, Foreign body in respiratory tract, Status epilepticus, Hemorrhage, Acute Renal Failure, Febrile Convulsion, Status Asthmaticus, Fluid and Electrolyte Management.
5. Balagraha: General description, classification, clinical features and management.

PRACTICAL

Content of Practical / demonstration

1. Clinical training of above mentioned disorders of children.
2. Exposure to -
   a) Navajata Shishu Paricharya (Care of the newborn)
   b) Pranapratyagamana Vidhi (Resuscitation procedure of new born)
   c) Vaccination
   d) Panchakarma Vidhi (Panchakarma procedures) especially Snehan, Swedana, Basti.
3. Knowledge of various equipments such as phototherapy unit, overhead radiant

warmer, resuscitation equipments, Panchakarma equipments and their application

4. Knowledge of IV fluid administration, blood sampling
5. Anthropometry measurements and their interpretation
6. Various Ayurvedic & modern Procedures and investigations in pediatric practice

Distribution of Marks

Clinical work: Pediatric and neonatal case records [1.0 case sheets of each]	10 Marks
Patient Examination	20 Marks
Spotting	05 Marks
Viva – voce	15 Marks
Total	**50 Marks**

Reference Books

1. Kashyapa Samhita Complete Hindi translation by Satyapal Vidhyalankara English translation by Prof. Premvati Tiwari
2. Principles & practice of Pediatrics in Ayurveda: Dr. CHS Shastry
3. Child Health Care in Ayurveda: Prof. Abhimanyu Kumar
4. Ayurvedic Concepts of human Embryology: Prof. Abhimanyu Kumar
5. Kaumarbhritya by Prof. D.N. Mishra
6. Kaumarbhritya Ke Antargata Balgraho Ka Kramika Evam Vaigyanika Adhyana by Prof. Chanchal Sharma
7. Notes on Kaumarbhritya-by Dr. Dinesh K S
8. Pran - Pratyagannanann-by Dr. B.M. Singh
9. Ayurveda Dwara Matra Evam Shishu Paricharya by Dr. KS Patel,V.K.Kori & Raigopal
10. Kaumarbhritya related references from Charaka Samhita, Sushruta Samhita Vagbhata etc.
11. Clinical Methods in Paediatrics by Meharban Singh
12. Pediatrics Emergencies by Meharban Singh
13. Essential Pediatrics 0,P. Ghai
14. Text Book of Pediatrics Nelson
15. Care of New Born by Meharban Singh
16. Panchakarma in Pediatrics Dr. Yogita Srivas

3.5. CHARAK SAMHITA- UTTARARDHA

(Uttarardha: Chikitsa – Kalpa - Siddhi Sthana)

Theory- One Paper – 100 Marks

The marks of theory examination are distributed as follows:

1. Chikitsa sthana 60 Marks
2. Kalpa sthana 15 Marks
3. Siddhi sthana 25 Marks

Reference Books

1. Charak Samhita -Chakrapani Tika (Sanskrit Commentary)
2. Charak Samhita (Hindi Commentary) Vd. Jayadev Vidyalankar or Vd. Atridev Vidyalankar or Prof. Gorakh Nath Chaturvedi & Kashinath Shastri or Dr. Brahmanand Tripathy or Dr. Ravidutta Tripathy
3. Charak Samhita (English Commentary): Dr. Ram Karan Sharma & Vd. Bhagwan Dash or Acharya Priyavrata Sharma.

CENTRAL COUNCIL OF INDIAN MEDICINE
NEW DELHI

SYLLABUS OF AYURVEDACHARYA (BAMS) COURSE

INDEX

4TH PROFESSIONAL

4.1 KAYACHIKITSA	02-04
4.2 PANCHKARMA	05-10
4.3 SHALYA TANTRA	11-20
4.4 SHALAKYA TANTRA	21-26
4.5 RESEARCH METHODOLOGY AND MEDICAL STATISTICS	27-28

4.1 KAYACHIKITSA

Theory Two Papers – 100 Marks Each
Practical/Viva voce – 100 Marks

Paper I **100 Marks**

Part - A **50 Marks**

1 Derivation of the terms 'Kaya', 'Chikitsa' and their definitions and synonyms. Definition of 'Kayachikitsa, Definition of 'Bheshaja'. Types and detailed description of Bheshaja and Chikitsa, Knowledge about Chikitsa Chatushpada, Rogi Roga Pariksha Siddhantha, Astasthana Pariksha.
2 Importance of Kriya Kaala according to stages of Dosha and their management.
3 Chikitsa sutra and Management of vriddhi (increased) and kshaya (decreased) of Dosha, Dhatu and Mala, Ojo Vyapat (Kshaya, Visramsa and Vyapat) and its management. Chikitsasutra and Management of Sama-Nirama states, Roga-Anutpattikara Chikitsa, Roga Prashamana Chikitsa (Doshapratyanika, Vyadhipratyanika, Ubhayapratynika), Doshopakrama, Chikitsa sutra and Management of Sthanantara Dosha (Ashayapakarsha, Anuloma/Pratiloma gati of Dosha, Vimarga gamana of Dosha), Knowledge of Lina Dosha & its management, Diagnosis, Chikitsa Sutra and Management of Avarana and of Dhatu Pradoshaja diseases, Importance of Dosha, Dushya , Bala, Kaala, Agni, Prakriti, Vaya, Sattva Satmya, Desha, Ahara and stage of diseases in treating them. Chikitsa Sutra and Management of 'Samanyaja and Nanatmaja' diseases.
4 Detailed description of Dvividhopakrama (Santarpana and Apatarpana) and Shadavidhopakrama (Rookshana, Snehana, Swedana, Sthambhana, Langhana and Brimhana). Detailed description of Shodhana, Shamana and Nidana Parivarjana. Knowledge of Aushadha matra, Sevan kaala and Anupana, Definition and Knowledge of Pathya-Apathya with examples of diseases of various systems.
5 Derivation of the term 'Manas', its sthana (place), Guna (qualities) and Karma (functions)**.** Samanya Chikitsa Siddhanta of Manasa Roga.
6 Principles & Management of Nutritional deficiency disorders**.**
7 Management of Vardhakyajanita vikara, Indriyapradoshoja vikara, Alzhiemer's Disease, Sleep disorders, General debility.

8 General introduction and principles of Management of diseases produced by Genetic, Environmental and Iatrogenic factors. Disorders due to drug and Food allergy and their management and other allergic conditions.

Part B **50 Marks**

1. Detailed description of Chikitsa Sutra and Management of Jwara and its types. Etiopathogenesis & relevant Ayurvedic and Modern management of following types of Fevers-Typhoid, Pneumonia, Pleurisy, Influenza, Mumps, Meningitis, Encephalitis, Tetanus, Yellow fever, Plague, Dengue Fever, Chikun Guniya, Leptospirosis,Viral Fever, Anthrax, Masurika (Small pox), Laghu Masurika (Chicken pox), Romantika (Measles).
1. Chikitsa sutra and Management of the diseases of Rasavaha Srotas such as – Pandu, Amavata, Madatyaya, Hridroga, Hridshoola, Hypotension, Hypertension, Anaemia, Rheumatoid arthritis.
2. Chikitsa sutra and Management of the diseases of Raktavaha Srotas such as - Raktapitta, Kamala, Kumbhakamala, Halimaka, Daha, Mada, Murcha, Sanyasa, Vatarakta, Plihadosha, Yakrut dosha, Haemolytic disorders, Hepatitis, Cirrhosis of Liver, Leukaemia, Kushta, Shvitra, Visarpa, Sheetapitta, Udarda, Kotha and Kshudra Roga.
3. Knowledge of National Health Programmes and the relevant Ayurvedic Management of the following diseases enlisted by World Health Organisation- Malaria, Filaria, Kala Azar, Leprosy, Tuberculosis, AIDS.
4. Introduction of general principles of maintenance of health and management of diseases of following systems of Medicine- Yoga, Naturopathy, Unani, Siddha, Physiotherapy and Rehabilitation.
5. Diseases of different Endocrine Glands- such as Thyroid, Parathyroid, Pituitary, Pancreas and Adrenal glands and their management.
6. General introduction, types and Management of diseases caused by Vyadhi Kshamatwa Hinata (Immuno deficiency disorders), Auto Immune Disorders.
7. Description and Management of following Emergency Conditions- Acute Haemorrhage, Hypertensive Emergencies, Acute abdominal pain (Renal colic, Biliary colic, Gastritis, Pancreatitis, Peritonitis and Appendicitis), Acute Abdomen, Anuria/ Oliguria, Congestive Heart Failure, Myocardial Infarction/Angina, Shock, Syncope, Convulsions, Hyperpyrexia, Hyperglycaemia, Hypoglycaemia, Status Asthmaticus, Acute Respiratory distress Syndrome, Drowning and Electric shock.

PAPER II **100 Marks**

Part A **50 Marks**

1. Chikitsa sutra and Management of the diseases of Pranavaha Srotas such as - Kasa, Shwasa, Hikka, Rajayakshma, Urakshata, Parshwashoola, Bronchitis, Bronchiectasis, Emphysema and COPDs.
2. Chikitsa sutra and Management of the diseases of Udakavaha Srotas such as- Shotha, Jalodara, Trishna, Water & Electrolyte Imbalance.
3. Chikitsa sutra and Management of the diseases of Annavaha Srotas such as – Agnimandya, Aruchi, Ajirna, Anaha, Atopa, Adhmana, Alasaka, Vilambika, Visuchika, Chardi, Grahani, Amlapitta, Gulma, Shoola, Bhasmaka, Acid peptic disorders.
4. Principles of treatment and management of Vata Vyadhi such as - Pakshavadha, Ekangavata, Sarvangavata, Ardita, Avbahuka, Kati Graha, Manyastambha, Gridhrasi, Vishwachi, Khalli, Khanja, Pangu, Padaharsha, Padadaha, Vatakantaka, Kroshtukashirsha, Udavarta, Kampavata, Dhatugata and Ashayagata Avarana Vata, other Vata Rogas, Parkinsonism.
5. Nidana and Chikitsa of Urusthambha, Gullian Barrie syndrome, Muscular Dystrophy, Myasthenia Gravis, Motor Neuron Diseases and Neuralgia.

Part B **50 Marks**

1. Chikitsa Sutra and Management of Mamsavaha Srotas and Medovaha Srotas such as- Gandamala, Galaganda, Mamsashosha, Arbuda, Apachi, Prameha, Sthaulya, Karshya, Diabetes Mellitus, Dyslipidaemia.
2. Chikitsa Sutra and Management of 'Asthi and Majjavaha Srotas such as Asthimajja Vidradhi, Asthisoushirya, Asthi kshaya, Sandhigata Vata, Osteo Arthritis, Osteomyelitis, Osteoporosis, Osteopenia.
3. Chikitsa sutra and management of Shukravaha srotas such as Klaibya, shukralpata, shukradosha, kshina shukra, dhwajabhanga.
4. Chikitsa Sutra and Management of diseases of Mutravaha Srotas such as -Mutrakricha, Mutraghata, Ashmari, Cystitis, Nephritis, Nephrotic Syndrome, BPH, Renal Failure.
5. Chikitsa Sutra and Management of diseases of Purishavaha Srotas such as – Atisara, Pravahika, Arsha, Purishaj Krimi, IBS and Ulcerative Colitis.
6. Chikitsa Sutra and Management of Sexually Transmited Diseases such as – Phiranga, Puyameha, Upadamsha, lymphogranuloma inguinale, Syphilis, Gonorrhoea.
7. Introduction, Definition and Management of Kama, Krodha, Lobha, Moha, Mada, Matsarya, Shoka, Bhaya, Vishada, Dainya, Harsha and Pragyaparadha.
8. Manas and Manovahasrotas, Nidana and Chikitsa of the following disorders - Unmada-Apasmara-Atattvabhinivesha, Chittodvega, Vishada, Anxiety disorders, Depression, Somatoform and Mood disorders, Stress induced disorders, Psychosexual Disorders. Importance of Daivavyapashraya, Sattwavajaya, Adravyabhuta Chikitsa. Medhya Rasayana in the management of Manasa Roga. Bhuta Vidya diagnosis and management of graha disorders.
9. Derivation, definition and synonyms of Rasayana, importance of Rasayana and its benefits. Indications of Rasayana therapy. Classification of Rasayana. Kutipraveshika and Vatatapika Rasayana. Indications of Vatatapika Rasayana. Knowledge of Kayakalpa, Achara Rasayana. Procedures of Kutipraveshika, Poorvakarma and specific schedules to be followed after Kutipravesha, benefits of Kutipraveshika Rasayana, duration of process, Rasayana yoga and directions for their use. Determination of dose of Rasayana according to age. Rules and regulation after Rasayana therapy, Importance of Immunomodulators and antioxidants in Rasayana therapy.
10. Vajikarana- Derivation, definition, synonyms, necessity, benefits, importance of fertility, Symptoms of Shûkra (Semen), Vajikaran Dravya and Aushadhi. Properties, doses, methods of administration, ingredients and methods of formation of Rasayana & Vajikarana formulation. Classification and importance of Vajikarana Dravya

Distribution of practical Marks 100

1) Daily case record/ 20 cases	- 20 marks
2) Patient examination	
a) 1Long case	- 20 marks
b) 1 short case	- 10 marks
3) Viva –voice	
a) Paper I	- 25 marks
b) Paper II	- 25 marks

Reference books:

1. Charak Samhita, Sushrut Samhita, Ashtanga Samgraha and Ashtanga Hridaya with their commentries. Madhav Nidana with Madhukosha Commentary.
2. Ayurvediya Vyadhi Vigyana - Yadavji Trikamji
3. Roga Pariksha Vidhi - Priyavrat Sharma

4. Panchakarma Vigyan -Haridasa Sridhar Kasture
5. Cikitsadarsha -Pandit Rajesvardutta Shastri
6. Kayachikitsa I-IV -Ramaraksha Pathaka
7. Ayurved Nidan Chikitsa Siddhanta -Prof. R.H.Singh.
8. Kayachikitsa Vol. I-IV. -Prof. Ajay Kumar
9. Davidson's Principles and Practice of Medicine.
10. API Text Book of Medicine.
11. Harrison's Text Bok of Medicine.
12. Cecil Text Book of Medicine.
13. Panchkarma Illustrated by Dr. G.Srinivasacharya.
14. Other relevant publications on subjects concerned

4.2. PANCHAKARMA

Theory One Paper – 100 Marks

Practical Viva-voce – 50 Marks

Hours of teaching Theory – 100

Clinical training: 3 months

I. Introduction

1. Introduction to Panchakarma, Panchakarma and Shodhana, its importance for promotion of health, prevention and treatment of diseases.
2. Trividha Karma- Purva, Pradhana and Pashchat Karma in relation to Shodhana and their importance.
3. Indications of Shodhana, Shodhana according to Ritu
4. General Principles of doshagati from Koshta to Shaka and vice versa
5. General precautions (Pariharya Vishaya) for Panchakarma
6. Specifications of Panchakarma theatre and necessary equipments
7. Importance of Koshta and Agni Parikshan

II. Snehana

1. Etymology and Definition of Sneha and Snehana
2. Snehayoni- Sthavara and Jangama: Properties of Sneha dravyas, Snehopag Dravyas
3. General knowledge of Ghrita, Taila, Vasa and Majja with their specific utility and actions ,Yamaka, Trivrit and Maha Sneha
4. Metabolism of fat
5. Achcha and Pravicharana of Sneha
6. Snehapaka and its importance in Panchakarma
7. **Types of Snehana:** i) Bahya and ii) Abhyantara Snehana

i) Bāhya Snehana :

Methods, indications and contraindications of the following types of Bahyasnehana;

Mardana, Unmardana, Pādāghāta, Samvāhana, Karna Purana & Akshi Tarpan, Lepa, Talam,

Murdhni Taila: Siro-Abhyanga, Shiro Seka/dhārā, Siro Pichu and Siro-Basti

ii) Ābhyantara Snehana

Three Types of Ābhyantara Snehana: Shodhanārtha, Shamanārtha and Brimhanārtha Snehana, Indications and contraindications for Snehana

Shodhanārtha Snehana

a. Importance and method of Deepan Pāchan and Rookshana in Shodhanārtha Snehana. Properties of Rookshana Dravya. Samyak Rookshana Lakshana
b. Consideration of Agni and Koshtha in Snehana
c. Indication of Different Matra, Various dose schedules for Shodhanārtha Snehana; Hraseeyasi, Hrasva, Madhyama and Uttama Mātrā, Ārohana Mātrā
d. Methods of Shodhanārtha Snehana,
e. Anupāna of Sneha

f. Jeerna and Jeeryaman Lakshana
g. Samyak Yoga, Ayoga and Atiyoga of Snehana, Sneha Vyāpat & their management according to Ayurveda & Modern Medicine
h. Diet and regimen during Snehana

Sadyo Sneha: Method of administration, dose fixation and utility
Shamanārtha Snehana, Method of administration, dose fixation and utility
Bronhanarth Senhana: Method of administration, dose fixation and utility
Avapeedak Sneha: Method of administration, dose fixation and utility

8. Snehana Kārmukata (mode of action)

9. **Special Procedures:**
Takradhara, Udvartanam, Putpāka, Aschotana, Anjana, Gandusha, Kavala, Dhoompāna, Udvartana, Utsādana, Udgharshana,Talapothichil

III. Svedana

1. Etymology and Definition of Sveda and Svedana
2. Classifications of Sveda/Svedana
3. General Sweda dravya, Properties of Sweda dravyas, Swedaopag dravyas ,
4. Indications and contraindications of Svedana
5. Ten Types of Niragni Svedana
6. Knowledge of 13 types of Sagni Svedana and Chaturvidh Svedan
7. Detailed Knowledge with their Utility of the following Svedana procedures:
   Sankara/Pinda Sveda-Ruksha and Snigdha Sveda
   Patrapinda Sveda, Jambir Pinda Sveda,Vāluka Sveda,Churna Pinda Sveda,Kukkutand Pinda Sveda, Shashtika Shalipinda Sveda, Nadi Sveda, Bashpa Sveda Ksheer dhooma ,Ksheer Seka, Kwath Seka, Avagaha Sveda,Dhanymla Dhara
   Parisheka Sveda, Pizichil, Upanaha Sveda, Annalepa
8. Local Basti such as Kati Basti, Janu Basti, Greeva Basti and Urobasti
9. General precautions during Sagni Svedana and Methods to protect vital during svedana
10. Samyak Yoga, Ayoga and Atiyoga of Svedana
11. Complications of Svedana and their Management according to Ayurveda & Modern Medicine
12. Diet and management during and after Svedana
13. Parihār Vishaya
14. Svedana Kārmukata (Mode of action)
15. General Knowledge about current Sudation techniques like Sauna bath, Steam bath

IV. Vamana Karma

1. Etymology, definition and importance of Vamana Karma
2. Utility of Vamana Karma in health and disease
3. Indications and Contraindications for Vamana
4. Knowledge of Koshta and Agni
5. General knowledge of Vamana and Vamanopaga drugs; properties, actions, preparations, preservation with special reference to Madanphala, Kutaj, Nimba, Yashti, Vacha
6. Purva Karma of Vamana:Deepan-Pāchana, Abhyantara Snehana and diet

7. Management of one gap day-Abhyanga & Svedana, diet, special Kapha increasing diet
8. Preparation of the patient on Morning of Vamana day
9. Vamaka Yoga, Anupana, fixation of dose and method of administration
10. Administration of Vamanopaga Dravya such as milk, sugarcane juice, Yashtimadhu decoction
11. Lakshana indicating Doshagati during the process
12. Management during Vamana Karma & observations
13. Symptoms of Samyak Yoga, Ayoga and Atiyoga of Vamana Karma
14. Post Vamana management
15. Types of Shuddhi-Hina, Madhya and Pravara
16. Peyadi Samsarjana Krama and Tarpanadi Kram with their specific indications
17. Complication of Vamana and their management with Ayurveda and modern drugs
18. Pariharya Vishaya
19. Vamana Karmukata (Mode of action).

V. Virechana Karma

1. Etymology, definition and importance of Virechana Karma
2. Utility of Virechana Karma in health and disease
3. Indications and Contraindications for Virechana
4. Knowledge of Koshta and Agni
5. Classification of Virechana Drugs, General properties of Virchana dravya
6. General knowledge of single and compound Virechan drugs; properties, actions, preparations, preservation with special reference to Trivrutta, Aragvadha, Eranda, Katuki, Jaipal
7. Purva Karma of Virechana: Deepan- Pachana, Abhyantara Snehana and diet
8. Management of 3 gap days-Abhyanga, Svedana & diet
9. Management on Morning of Virechana day
10. Preparation of Virechana Kalpa, Anupana, dose and method of its administration
11. Method of Virechana Karma and management during Virechana Karma & observations
12. Symptoms of Samyak Yoga, Ayoga and Atiyoga of Virechana Karma
13. Post Virechana management
14. Types of Shuddhi-Hina, Madhya and Pravara and accordingly Samsarjana Krama
15. Complications of Virechana and their management with Ayurveda and modern drugs
16. Pariharya Vishaya
17. Virechana Kārmukatā (Mode of action)

VI. Basti Karma

1. Etymology, definition and importance of Basti as Ardha-Chikitsa
2. Utility of Basti Karma in health and disease
3. Basti Yantra- Putaka & Netra, Detailed study of traditional Basti Yantra and their Doshas
   Knowledge of alternative Basti Yantra-enema can, enema syringe, modified plastic/rubber bag for Putaka, modified plastic netra.
4. Classifications of Basti

5. Karma, Kāla and Yoga Basti schedules along with their utility.
6. **Niruha Basti:** Its etymology, synonyms, definition, classifications, sub-classifications & indications and contraindications.
    a. Dose fixation of Niruha Basti according to age
    b. Contents and Method of preparation of Niruha Basti dravya
    c. Diet
    d. Administration of Niruha Basti
    e. Pratyāgamana Kāla, Post Niruha Basti management
    f. Samyak Yoga, Ayoga and Atiyoga of Niruha.
    g. Complication of Niruha Basti and its management according to Ayurved and Modern Medicines
    h. Pariharya Vishaya and kala
7. **Anuvasana Basti:** Its etymology, synonyms, definition, classifications, sub-classifications & indications and contraindications.
    a. Dose fixation of Anuvasan Basti according to age
    b. Contents and Method of preparation of Anuvasan Basti dravya
    c. Diet
    d. Administration of Anuvasan Basti
    e. Pratyāgamana Kāla, Post Anuvasan Basti management
    f. Samyak Yoga, Ayoga and Atiyoga of Anuvasana.
    g. Complication of Anuvasan and its management according to Ayurved and Modern Medicines
    h. Pariharya Vishaya and kala
8. Basti Kārmukatā (Mode of action).
9. Knowledge of following types of Basti:
   Madhutailika Basti, Erandmuladi Basti, Yāpana Basti, Pichchha Basti, Kshira Basti, Kshara Basti, Vaitarana Basti, Panchaprasutik Basti, Lekhan Basti,Krumighna Basti,Tiktashir Basti,Ardhamātrika Basti
10. **Uttara Basti**,: its definition, indications and contraindications, Detailed study of traditional Basti Yantra and their Doshas Knowledge of alternative Basti Yantra
    a. Preparation of patient,
    b. Preparation of Trolley for Uttarbasti,
    c. drug preparation and Fixation of dose,
    d. method of administration in male and females,
    e. observations,
    f. complications and their management

VII. Nasya

1. Etymology, definition, Significance of Nasya Karma.
2. Classifications and sub-classifications
3. Knowledge of general Dravya used for Nasya Karma, Shirovirechan Gana, Shirovirechanopag dravyas
4. Indications and contraindications of Nasya
5. Time of administration of Nasya
6. Dose fixation of different types of Nasya
7. Diet and regimen before and after Nasya Karma
8. Administration of Marsha, Pratimarsha, Avapeedaka, Dhoomapana and Dhuma Nasya
9. Symptoms of Samyak-yoga of Nasya,

10. Complication of Nasya and their management
11. Parihār Vishaya
12. Nasya Karmukata (mode of action)

VIII. Raktamokshana

1. Definition, importance and Types of Raktamokshana
2. General Principles and rules of Raktamokshana
3. Classification of Raktamokshan
4. General Indication and Contra indication of Raktamokshan
5. **Jalaukavacharana:** Knowledge of different types of Jalauka (Leech) , Indications and contraindications of Jalaukavacharana, various types of Jalauka. Method of Application, Samyak Lakshan, Complication of Jalaukavcharana and their management with Ayurveda and Modern medicines.
6. **Pracchāna:** Indications and contraindications of Pracchana. Method of Application, Samyak Lakshan, Complication of Pracchana and their management with Ayurveda and Modern medicines
7. **Sirāvedha:** Indications and contraindications of Siravedha. Method of Application, Samyak Lakshan, Complication of Siravedha and their management with Ayurveda and Modern medicines
8. Knowledge of emergency management of complications such as water & electrolyte imbalance, shock, bleeding per rectal, hemetemsis, epistaxis

IX.Physiotherapy

1. Definition, Utility and Importance of Physiotherapy.
2. Basic Knowledge of Static exercise, Infrared, Short wave diathermy, Electromagnetic therapy, Wax bath therapy, Ultrasonic therapy.

PRACTICALS / CLINICAL TRAINING –

Total Duration of 3 Months posting

OPD (for 1-Month): observation of OPD patients, selection of the patients, observation of OPD base Panchakarma procedures

IPD (Panchkarma) and Panchakarma Unit – Observation of different procedures of Panchakarma, Assistance to the procedure under guidance of Panchakarma specialist

Under clinical posting, each student has to study and write 15-long Cases and 10 short cases in prescribed format

Long case Paper- minimum 1 Vaman , 1 Virechan, 1Niruha & Anuvasan Basti, 1Nasya, 1 Raktamokshan

Short case paper –Minimum one each of Pinda sweda, Shirodhara,Abhyanga, Netra Tarpan, Bahya Basti, Nadi Sweda etc.

Distribution of Marks

1. Practical Record of 25 procedures 05 Marks
2. Long Procedure 10 Marks

3. Long Procedure Viva	05 Marks
4. Short Procedure	08 Marks
5. Viva on Short Procedure	02 Marks
6. General Viva-voce	20 Marks
Total	**50 Marks**

Reference Books

1. Charak Samhita with Commentary of Ayurveda Dipika by Chakrapanidatta & Jalpakalpataru by Gangadhara
2. Sushrut Samhita with the Sushruta Nibhandha Samgraha Commentary of Dalhana & Nyayachandrika Panjika of Gayadasa on Nidana Sthana
3. Ashtanga Hridaya with Sarvanga Sundara & Ayurveda Rasayana Commentaries
4. Ashtanga Sangraha with Shashilekha Commentaries
5. Ayurvediya Panchakarma Chikitsa — Dr Mukundilal Dwivedi
6. Panchakarma Vigyan — Dr Haridas Shreedhar Kasture
7. Illustrated Panchakarma — Dr.G Srinivasa Acharya
8. Clinical Panchkarma (English) — Dr. P.Yadaiah
9. Prayogika Panchkarma (Hindi) — Dr. P. Yadaiah
10. Vivida Vyadhiyome Panchkarma (Hindi) — Dr. P. Yadaiah
11. The Panchkarma Treatment of Ayurveda with Kerala Specialtie — Dr. T.L. Devaraj
12. Panchkarma Therapy — Dr. R.H. Singh
13. Ayurveda-Principles and Panchakarma Practice — Dr Mandip R. G. & Prof. Gurdip Singh
14. Principles and Practice of Basti — Dr. Vasudevan & Dr. L. Mahadevan
15. Panchakarma Sangraha — Dr. Manoj Shamkuwar
16. Essential of Panchakarma Therapy — Dr.Pulak Kanti Kaur
17. Principles and Practice of Panchakarma — Vaidya Vasant Patil
18. Harrison's Principle of Internal Medicine
19. Guyton's Physiology

4.3 SHALYA TANTRA

Theory Two Papers – 100 Marks Each
Practical - Viva voce – 100 Marks

PAPER –I **100 Marks**

Part – A **50 Marks**

Definition of Shalya, Shalya Tantra and its importance. Introduction to Shalya Tantra: Historical background and progress made.

- **Target -** Fluency in textual reading and comprehension.
- Preferable targets - Know recent developments and controversies.

Description of Yantra, Shastra, Anushastra: Definition, number, types, uses, Dosha, Guna, Karma. Relevant modern instruments.

- Target - Basic understanding of the concepts of Yantra and Shastra. Acquaintance with commonly used surgical instruments. Knowledge of textual descriptions.
- Preferable targets - Knowledge about currently used surgical instruments, their specifications, procurement sources etc.

Nirjantukarana / Sterilization: Methods, types and its role in surgical practice.

- Target - Basic surgical discipline of maintaining asepsis.
- Preferable targets- Knowledge of recently developed chemicals, instruments for sterilization.

Sangyaharan / Anaesthesia: Definition and Types.

i. **Local anaesthesia –** Drugs, Techniques, Indications, Contraindications, Complications and their Management.
ii. **Regional and General anaesthesia**- Drugs, Techniques, Indications, Contraindications, Complications and their Management.

- Target-Basic knowledge of the drugs and instruments of anaesthesia. To observe the process of induction, monitoring and recovery.
- Preferable targets- Assisting and handling anaesthesia.

Trividha Karma – Purva Karma, Pradhana Karma and Paschat Karma.

- Target- Capability to identify conditions which can affect the outcome of surgery in pre, intra and post- operative period.
- Preferable targets- Experience of handling incidents.

Ashtavidha Shastra Karma - Surgical procedures.

- Targets- Appreciation and comprehension of concepts and indications of different procedures.
- Preferable targets –Hands on experience of surgical procedures.

Yogya - Experimental Surgery.

- Target –Appreciation and comprehension of concepts of Yogya. Idea of patient's safety in experimental training.
- Preferable targets- Hands on training on mannequins.

Marma: Nirukti, types, description and importance.

- Target –Clinical application of concepts of marma.
- Preferable targets- Study of relevance of marma in the light of current anatomical and surgical knowledge.

Kshara and Kshara Karma:

i. **Nirukti, Pradhanyata, Guna, Dosha, Karma, Prakara, Yogya, Ayogya, Procedure, Upadrava and Chikitsa.**
ii. Kshara nirmana vidhi, knowledge of Kshara Varti, Taila and Pichu.
iii. **Kshara Sutra – Preparation, Indications, Contraindications and Method of application, Complications and their Management.**

- Target – Capability to identify and practice the use of kshara, kshara sutra in common clinical conditions.
- Preferable targets – Broader knowledge of current trends and ongoing researches in kshara application.

Agnikarma: Mahatva, Upakarana, Vidhi, Akruti bheda, Yogya, Ayogya and Upadrava Chikitsa.

Contemporary techniques and tools of Agnikarma.

- Target - Capability to appreciate the clinical indications and comprehend Agnikarma procedure.
- Preferable targets - Hands on experience of use of cautery in surgical practice.

Raktamokshana: Mahatva, Prakara - Siravyadha, Pracchanna, Shringa, Alabu, Jaloukavacharana – Yogya, Ayogya, Procedure, Upadrava and Chikitsa.

- Target- Capability to appreciate and comprehend clinical indications of Jaloukavacharana and other Raktamokshana procedures.
- Preferable targets - Uses of bloodletting in current therapy.

Bandha Vidhi – Prayojana, Dravya, Indications, Contraindications, Prakara, Upadrava, Pichu, Plota, Kavalika and Vikeshika.

- Target- Hands on experience of techniques of bandaging.
- Preferable targets - New generation of bandaging and splintage tools.

Pranasta Shalya and Nirharana Upaya.

- Target – Importance of concepts of Sushruta in the management of Shalya and concerns of patient safety. Identification and management of foreign bodies.
- Preferable targets - Current concepts and diagnostic tools of dealing with foreign bodies.

Fluid, Electrolyte, Acid Base Balance and Nutrition:

i. Introduction of physiology of fluids and electrolytes.
ii. Dehydration and over hydration.
iii. Specific electrolyte loss, Acidosis, Alkalosis, Symptomatology and Management.
iv. Electrolyte changes in specific diseases like pyloric stenosis, intestinal obstruction and anuria.
v. Various replacement fluids in surgery, mode of administration and complications.
vi. Nutrition.

- Target – Capability to identify and manage fluid and electrolyte imbalance. Ability to administer parenteral fluid.
- Preferable targets - Advanced techniques of fluid and electrolyte assessment and management.

Rakta Mahatwa, Raktasrava / Haemorrhage: Prakara and Lakshana.

i. Raktastambhana – Haemostasis.
ii. Blood Transfusion –Blood groups, Compatibility, Indications, Contraindications and Complications with Management.
iii. Component therapy.

- Target-Knowledge of achieving haemostasis in haemorrhage.
- Preferable targets - Detailed knowledge of blood bank techniques.

Antibiotics, analgesics, anti-inflammatory and emergency drugs in surgical practice.

- Target – Working knowledge of commonly used drugs.
- Preferable targets - Advanced pharmacological study of the above drugs.

Diagnostic techniques – X-ray, Imaging techniques, Ultrasonography, CAT Scan, MRI, Biopsy / Cytological study.

- Target- Knowledge of proper indications for optimum investigational tools and their interpretation.
- Preferable targets - Capability to work independently in the field of diagnostic techniques.

Part - B

50 Marks

Shat Kriyakala in surgical practice.

- Target- Clinical utility of the concepts.
- Preferable targets - Applied aspects of Kriyakalas in the light of current concepts of pathogenesis.

Nirukti, Nidana, Samprapti, Prakara, Lakshana, Sadhya-asadhyata, Upadrava and Chikitsa of the following disorders.

i. Vranashotha - Inflammation
ii. Vidhradi - Abscess
iii. Pidika - Boils
iv. Nadi Vrana - Sinus / Fistulae
v. Vrana Granthi - Keloid / Hypertrophic scar

vi. Marmagata - Shock
vii. Kotha – Gangrene and Principles of Amputation.
viii. Granthi - Cyst
ix. Arbuda - Tumour

- Target-Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Vrana – Nirukti and Prakara

i. Nija Vrana – Nidana, Samprapti, Vrana Vasthu, Prakara, Lakshana, Vrana Pariksha – Sthana,Vrana Akruti, Srava, Gandha, Vedana. Vrana Avastha- Dustavrana, Shuddha Vrana, Ruhyamana Vrana, Samyak Roodha Vrana, Vrana Sadhya-asadhyatha and Vrana Upadrava.

ii. Vrana Chikitsa – Pathya-apathya and Shashti Upakrama,Vranitagara and Rakshakarma.

iii. Agantuja Vrana :

a. Sadyo Vrana - Traumatic wounds – Nidana, Prakara, Lakshana, Upadrava and Chikitsa.
b. Management of bites and stings.

iv. Dagdha Vrana – Burns and scalds.

v. Ulcer - Types and their management.

vi. Wound healing stages and their management.

vii. Pramehapidaka - Diabetic carbuncle and wounds.

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Twak Vikara - Nidana, Samprapti, Lakshana and Chikitsa of Chippa – Paronychia, Kadara – Corn and Kshudra rogas.

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Manya Vikara – Nidana, Samprapti, Lakshana and Chikitsa of Galaganda – Goitre, Gandamala, Apachi –Lymphadenitis, Pashanagardhabha – diseases of parotid gland.

- Target-Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Sira Vikara - Venous disorders – Superficial and Deep venous thrombosis, Haemangioma, Varicose veins - Diagnosis and their Management.

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Dhamani Vikara - Arterial disorders – Nidana, Samprapti, Lakshana and Chikitsa of **Aneurysm, Buerger's disease, Atherosclerosis**, **Raynaud's disease.**

- Target - Clinical application of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Snayu Vikara - Diseases of tendons and ligaments – Tennis elbow, Ganglion and their Management.

- Target - Clinical application of the concepts.

- Preferable targets - Hands on experience of management of different conditions.

Care of AIDS - HIV and hepatitis infected patients.

- Target - *Knowledge of safety precautions.*

PAPER - II **100 Marks**

Part - A **50 Marks**

Bhagna – Skeletal injuries: Prakara including pathological fracture, Samanya Lakshana, Upadrava and Chikitsa.

Description of fracture of following bones with Clinical features, Diagnosis, Complications and Management – scapula, clavicle, humerus, radius, ulna, femur, patella, tibia and pelvis bones.

Sandimoksha - Dislocation: Dislocation of following joints with Clinical features, Diagnosis, Complications and Management of shoulder, elbow and hip.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of bone: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Osteomyelitis, Cysts, Tumours and Tuberculosis.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Cranio-cerebral injuries: Mechanism, Pathology, Classification, Investigations, Complications and primary management**.**

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Spine: Mechanism, Pathology, Classification, Investigations, Complications and primary management of Tuberculosis, Ankylosing Spondylitis and Disc prolapse.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of breast: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Sthana Vidradhi - Breast abscess and Sthana Arbuda - Breast tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of chest: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Chest injury, Pleural effusion, Pleurisy and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of esophagus: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Oesophagitis, Varices, Ulcer and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Gulma Roga - Nidana, Prakara, Lakshana, Upadrava and Chikitsa.

Shoola vyadhi - Nidana, Prakara, Lakshana, Upadrava and Chikitsa.
- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of acute abdomen.

Udara Roga: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Jalodara - Ascites, Chidrodara – Perforation, Peritonitis and Badhagudodara-Intestinal obstruction**.**
- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of stomach and duodenum: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pyloric Stenosis, Peptic Ulcer and Tumours.
- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of small intestine: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Tuberculosis, Obstruction and Perforation.
- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of large intestine - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Tuberculosis, Obstruction, Perforation, Tumours, Appendicitis, Crohn's disease and Ulcerative Colitis.
- Target - Clinical utility of the concept.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Rectum and Anal Canal – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital disorders, Arshas - Haemorrhoids, Parikartika - Fissure-in-ano, Bhagandara - Fistula-in-ano, Guda Vidradi - Anorectal abscesses, Gudabhramsa - Rectal prolapse, Sanniruddaguda - Anal stricture, Incontinence, Rectal Polyp and Tumours.
- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Abdominal injuries and their management.
- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Part – B

50 Marks

Diseases of Liver: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Yakrit Vidhradi - Abscess, Neoplasia, Portal hypertension and Yakritdalyodar –Hepatomegaly.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Gallbladder: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Cholecystitis, Cholelithiasis, Obstructive jaundice and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Pancreas: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pancreatitis, Cysts of Pancreas and Tumours.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Spleen – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Pleehodara – Splenomegaly and Splenic rupture.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Kidney and Ureters - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Polycystic kidney, Injuries, Perinephric abscess, Calculus and Neoplasms.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Urinary bladder – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Injuries, Ashmari - Vesical Calculus, Cystitis and Neoplasms.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Mutraghata and Mutrakrichra - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management. Retention of urine.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Prostate - Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Prostatitis, Prostatic abscess, Benign Enlargement of Prostate and Carcinoma of Prostate.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Urethra – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Urethritis, Stricture and Rupture.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Penis: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Congenital anomalies, Niruddhaprakasha -Phimosis, Parivartika -Paraphimosis, Avapatika - Prepuceal ulcer, Arbuda- Tumours and Lingarsha - Penile Warts.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Diseases of Scrotum and Testis: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Epididymo-orchitis, Epididymal cyst, Scrotal filariasis, Shukrashmari - Seminal calculus, Torsion of testis, Ectopic testis, Undescended testis and Tumours.

Vriddhi Roga: Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Mutravriddhi – Hydrocele.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

Antra Vriddhi – Aetiopathogenesis, Classification, Clinical features, Diagnosis, Complications and Management of Hernia - Inguinal, Femoral, Epigastric, Umbilical, Incisional and rare forms of Hernia.

- Target - Clinical utility of the concepts.
- Preferable targets - Hands on experience of management of different conditions.

PRACTICALS

Content of Practicals:

1. Identification, uses, demonstration of surgical instruments and methods of sterilization.
2. Training of case taking, bed side clinicals and case presentation.
3. Demonstration and Practical training in Anaesthesia.
4. Training to develop skills in following Parasurgical and other procedures
    i. Kshara Karma
    ii. Agnikarma
    iii. Kshara Sutra
    iv. Raktamokshana
    v. Application of bandages and splints
    vi. Catheterization
    vii. Wound management procedures like Parisheka and Patradana
    viii. Ryle's tube aspiration
    ix. Injections -Intramuscular / Intravenous / Subcutaneous / Intradermal
    x. Incision and drainage of abscess
    xi. Suturing of open wounds
5. **Observation of following procedures**

i. Circumcision
ii. Hydrocele
iii. Hernial repair
iv. Vasectomy
v. Haemorrhoidectomy
vi. Fistulectomy
vii. Fissurectomy
viii. Appendecectomy
ix. Cholecystectomy

6. **Training of Surgical Emergencies and Management.**

Clinical Training (Indoor and Outdoor)	**09 Months**
• Shalya (Samanya)	03 Months (atleast one month in OT)
• Shalya (Kshara and Anushastra Karma)	03 Months (atleast one month in OT)
• Asthi and Sandhi Chikitsa (Orthopaedics and Trauma)	02 Months
• Anaesthesia	15 days
• Radiology	15 days

Distribution of Marks

1)	Daily records	- 10 Marks
2)	Instruments	- 20 Marks
3)	Short case	- 10 Marks
4)	Long case	- 20 Marks
5)	Viva – voce	- 40 Marks
	Total	**- 100 Marks**

Reference Books

1. Sushruta Samhita
2. Ashtanga Sangraha
3. Ashtanga Hridaya
4. Charaka Samhita
5. The Surgical instruments of the Hindus - Girindranath Mukhopadhyaya
6. Shalya Tantra Samuchchaya - Pandit Ramadesh Sharma
7. Shalya Vigyan (Part 1-2) - Dr. Surendra Kumar Sharma
8. Shalya Samanvaya (Part 1-2) - Vd. Anantaram Sharma
9. Shalya Pradeepika - Dr. Mukund Swaroop Verma
10. Soushruti - Dr. Ram Nath Dwivedi
11. Clinical Shalya Vigyan - Dr. Akhilanand Sharma
12. Bhagna Chikitsa - Dr. Prabhakar Janardhan Deshpande
13. Kshara sutra management in anorectal ailments - Dr. S.K. Sharma, Dr. K.R.Sharma and Dr. Kulwant Singh.
14. Anorectal diseases in Ayurveda - Dr. Sijoria and Dr. Praveen Kumar Chowdary.
15. Adhunika Shalya Chikitsa Siddanta - Dr. Katil Narshingham Udupa
16. Agnikarma Technology Innovation - Dr. P.D. Gupta
17. Shalya Tantra Ke Siddhant - Dr. K.K.Takral
18. Recent advances in the management of Arshas / Haemorrhoids - Dr. P. Hemantha

Kumar
19. Arsha Evum Bhagander Mein sutra Avacharan - Vd. Kanak Prasad Vyas
20. Kshara Sutra - Dr. S.N.Pathak
21. Surgical ethics of Ayurveda - Dr. D.N. Pande
22. Bailey and Love's Short Practice of Surgery - Norman.S. Williams, Charles.V. Mann and R.C.G. Russell
23. Clinical methods in surgery - S. Das
24. Textbook of Operative Surgery - S. Das
25. Shalya Vigyan (Sachitra) - Anantram Sharma
26. Anushastra Karma - Dr. D.N. Pande
27. Concept of Vrana is Ayurveda - Dr. Lakshman Singh
28. Significance for Poorva Karma in Surgical Patient - Dr. Lakshman Singh
29. Sangyaharan Prakash - Dr. D.N. Pande
30. A concise Text Book of Surgery - S. Das
31. A manual on Clinical Surgery - S. Das
32. A System of Surgical Diagnosis - T.N. Patel
33. A Practical Guide to Operative Surgery - S. Das
34. Drugs and Equipment for Anaesthesia - Arun kumar
35. Manual of Surgical Instruments - M.M. Kapur
36. Ward Procedures - Patel Mansukh. B
37. Recent trends in the management of Arshas / Haemorrhoids - Dr. P. Hemantha Kumar
38. Primary Anaesthesia - Maurice King
39. Synopsis of Anaesthesia - Lee
40. Clinical Anatomy/ Surgical Anatomy - John E.Skandalakis
41. Surgical Instruments of the Hindus - Girindharnath Mukopadyay
42. Outline of Orthopedics - John Crawford Adams and David Hamblen. L
43. Outline of Fracture - John Crawford Adams
44. Recent trends in the management of Bhagandara / Fistula-in-ano - Dr. P. Hemantha Kumar
45. Principles and Practice of Agnikarma - Dr. Anand Kumar and Dr. Kanchan Shekokar
46. Manipal Manual of Surgery - Dr. Rajgopal Shenoy

4.4 SHALAKYA TANTRA

Theory Two Papers – 100 Marks Each
Practical/Viva voce – 100 Marks

NETRA ROGA VIGYAN

Paper I **100 Marks**

I. Introduction

a) Shalakyatantra nirukti, Parichayam, Ithihasam
b) Netra rachana shariram (Mandala, Patala, Sandhi, Drushti Vichara) and Netra Kriya Sharira alongwith modern anatomy of Eye.
c) Eye examination and knowledge of basic instruments/equipments required for examination of Eye.
d) Netrarognanam – Samanya Hetu (Nija and agantuja), Purvarupa, Samprapti, Rupa and Chikitsa.
e) Classification of Netraroga and its importance.

II. Netra Samanya and Vishishta Chikitsa - Kriya Kalpa

a) Netra and Chakshu swasthya hitkara Dinacharya,Ritucharya,Aahara evam Vihara.
b) Kriya-kalpa-Seka, Aschyotana, Pindi, Vidalaka, Tarpana, Putapaka, Anjana and importance of Panchkarma in Netra Chikitsa.
c) Basic fundamentals of Netra Shastra Chikitsa e.g. Purva – Pradhana - Paschat karma, Ama-Pachyaman-Pakva Vrana shotha, Vranitopasana, Pranashtashalya, & Vranbandhana. Methods and concepts of sterlization, asepsis and antisepsis as per ancient and modern point of view.
d) Basic applied knowledge of Ashtavidha shastrakarma, agni, kshara, raktamokshana in Nerta rogas.
e) Essential diagnostic and therapeutic modern pharmacological agents required in Netra Chikitsa

III. Sandhigata Roga(Diseases of junctional areas of eye)

a) Number of sandhigata rogas, detailed etiology, pathology, clinical features and management of Pooyalasa and Srava Rogas.
b) Brief Study of krimi granthi, Parvani and Alaji Rogas.
c) Study of Acute and Chronic Dacryocystitis, Epiphora, Blepharitis including their aetiology, pathology, signs & symptoms, differential diagnosis and medical & surgical management.

IV. Vartmagata Roga(Diseases of Lids)

a) Number of vartmagata rogas, and detailed knowledge of etiology, pathology, clinical features and management of Anjananamika, Utsangini, Lagana, Vatahata vartma, Pakshma kopa, Sikta vartma, Pothaki, Klinna vartma, Krichhronmeelana and Kukunaka diseases of Vartma.
b) Brief Knowledge of Vartmarbuda, Utklishta vartma, Nimesh, Pakshmashata, Vartmarsha
c) Knowledge of Hordeolum, Ptosis, Trachoma, Trichiasis, Entropion, Ectropion including their Etiology, signs and symptoms differential diagnosis and medical & surgical management.

V. Shuklagata Roga(Diseases of sclera and conjunctiva)

a) Number of Shuklagata rogas, detailed knowledge of etiology, pathology, clinical features

and management of Arma, Arjuna and Shuktika

b) Brief Knowledge of Sira pidika, Sira jala, Pishtaka, Balasgrathita.

c) Study of Pterygium, Scleritis, Episcleritis, Sub-Conjunctival Hemorrhage including their Etiology, signs and symptoms, differential diagnosis and medical & surgical management.

VI. Krishnagata Roga (Diseases of cornea and uvea)

a) Number of krishnagata rogas, detailed knowledge of Etiology, Pathology, Clinical features, differential diagnosis, complications and Management of Savrana /kshata Shukla (Shukra), Avrana shukra (Shukla)

b) Brief knowledge of Sira shukla, Akshipakatyaya and Ajakajata.

c) Knowledge of Corneal ulcer, Corneal Opacity, Uveitis,Acute Iridocyclitis, Staphyloma,their aetiology, pathology, symptoms, differential diagnosis, complications and management.

VII. Sarvagata Roga (Diseases effecting all parts of eye)

a) Number of Sarvagata rogas, detailed knowledge of etiology, pathology, clinical features, complications, differential diagnosis and Management of Abhishyanda, Adhimantha, Hatadhimantha and Shushkakshipaka.

b) Brief Knowledge of Amloshit, Vata paryaya, Anyato vata, Sashopha & Ashophakshipaka- Pilla roga, Sirotpata and Siraharsha.

c) Knowledge of Conjunctivitis, Glaucoma, Dry Eye Syndrome including their etiology, pathology, clinical features, differential diagnosis, complications and their management.

VIII. Drishtigata Roga (vision disorders)

a) Number of Drishtigata rogas detailed knowledge of - etiology, pathology, clinical features, differential diagnosis and management of Timira, Kacha and Linga nasha.

b) Brief Knowledge of Abhighataja lingnasha, sanimittaja & Annimittaja Lingnasha Doshandhya/Kaphavidagdha drishti, Naktandhya, Ushna vidagdha drishti, Pittavidagdha drishti, Dhumadarshi, Hriswajadya, Gambhirika, Nakulandhya, Nayanabhighata.

c) Knowledge of Refractive errors, Cataract including their etiology, pathology, clinical features, differential diagnosis, complications and their management.

d) Study of Eale's disease, Hypertensive & Diabetic Retinopathies, Age related Macular degeneration, Strabismus, Retinitis pigmentosa, Night blindness, Amblyopia, Central serous retinopathy, Optic Neuritis and Optic atrophy

IX. Miscellaneous Diseases

a) Xerophthalmia and other malnutritional eye disorders.

b) Knowledge of ocular trauma and their management.

c) Introduction to Eye bank, Eye donation, Corneal Transplantation

d) Preventive Ophthalmology and Community Ophthalmology

SHIRA - KARNA- NASA- MUKHA ROGAS

PAPER II **100 Marks**

I Samanya Chikitsa

a) Study of therapeutic procedures like Sveda, Kavala, Gandusa, Dhuma, Murdhni Taila, Nasya, Pratisarana, Karna Purana,karna prakshalana, nasa prakshalana Mukha Lepa.
b) Ashtavidha shastrakarma and anushastrakarma used in the treatment of Shira, Karna,Nasa evam Mukha Rogas.

II Shiro Roga

a) Importance and Superiority of Shira.
b) Number, general etiology, pathology and cardinal features of shiro rogas and kapalgata rogas along with their common line of management/treatment.
c) Detailed study of Vataja, Pittaja, Kaphaja shirashoola, Suryavarta, Ardhavabhedaka, Khalitya, Palitya.
d) Brief Knowledge of Raktaja shiraha shoola, Krimija shiraha shoola , Kshayaja shiraha shoola & Sannipataja shiraha shoola, Ananta vata, Indralupta, Darunaka.
e) Detailed study of Headache, Migraine its differential diagnosis and treatment.

III Karna Roga

a) Detailed study of Rachana and Kriyasharir of Karna (Ear) & Shravanendriya as per Ayurvedic and modern view, Examination of Ear along with instruments/equipments required in Ear examination.
b) Detailed study of etiology, pathology, classification, clinical features and management of diseases of Karna – karna shool, karna nada& shweda, Badhirya, karnastrava, karna pratinaha, pootikarna, karnagoothaka, karnavidradhi.
c) Brief Knowledge of karna kandu, karnapaka, karnarsha, karnarbuda,krimikaran &karnapali rogas , Karna sandhana(Auroplasty), fundamentals, method and Vaikritpaham
d) Detailed study of Otalgia, ASOM, CSOM, Deafness, wax including their etiology, pathology, clinical features, differential diagnosis, complications and medical & surgical management
e) Brief Knowledge of Otomycosis, Otosclerosis, Tinnitus, Vertigo , Foreign body in ear and Noise pollution.

IV Nasa Roga

a) Detailed study of Rachana and Kriyasharir of Nasa (Nose and paranasal sinuses)& Ghranendriya as per Ayurvedic and modern view, Examination of Nose. along with instruments/equipments required in Nose examination.
b) Detailed study of Pratishyaya, Dushta pratishyaya, Nasanaha, Kshavathu, Nasagata raktapitta & Nasarsha.
c) Brief Knowledge of Putinasa, Bhranshathu, Peenasa, Apeenasa, Nasarbuda, Nasashotha, Dipta, Nasa Sandhana.
d) Detailed study of Rhinitis & Sinusitis Epistaxis, Nasal Polyp, DNS, Foreign body including their Etiology, pathology, clinical features differential diagnosis and medical & surgical management.
e) Brief Knowledge of Nasal trauma, Tumours of nose and Para nasal sinuses.

V Mukha Roga (Diseases of Oral Cavity)

a) Detailed study of Rachana and Kriyasharir of Mukha Rogaadhisthana– oshtha, dantamoola, danta, jivha, talu, gal, sarvasara (Oral cavity) as per Ayurvedic and modern view along with their Basic examination including instruments/equipments required for the examination

b) Mukha and Danta Swasthya as per ancient and modern concepts including prevention of malignancy of oral cavity.

c) Number and general aetiology, pathology, cardinal features of Mukha rogas along with their common line of management/treatment.

Oshtha Roga (Diseases of Lips)

a) Detailed study of Etiology, pathology, classification, clinical features and management of - Oshtha prakopa, khandoshtha

b) Brief Knowledge of Gandalaji, Jalarbuda, Kshataja Oshthaprakopa

c) Knowledge of cleft lip.

Dant Mula Gata Roga (Diseases of Periodontia)

a) Detailed study of Etiology, pathology, classification, clinical features and management of - Shitada, Dantaveshta, Upakush, Danta Nadi, Danta Vidradhi, Adhimansa

b) Brief Knowledge of dantapupputaka, Saushira, Mahasaushira, Danta Vaidarbha , Paridara, Vardhana.

c) Detailed study of Etiology, pathology, classification, clinical features and management of Gingivitis, Apical abscess, Periodontitis (Pyorrhoea).

Danta Roga (Dental Diseases)

a) Detailed study of Etiology, pathology, classification, clinical features and management of Daalan, Krimidanta, Dantaharsha, Danta sharkara, Hanumoksha

b) Brief Knowledge of karala, Bhanjanak , Kapalika, Shyava Danta, Danta bheda,

c) Danta chaal, Adhidanta, Danta Utpatana including Jalandhar bandha method and Danta Purna.

d) Knowledge of Dental Caries, Dental Tartar & Tooth extraction.

Jihwa Gata Roga (Diseases of Tongue)

a) Detailed study of Etiology, pathology, classification, clinical features and management of - jivha kantaka (vataja, pittaja and kaphaja)

b) Brief Knowledge of Upajihva, Adhijihva, Alasa.

c) Knowledge of Glossitis,Tongue Tie, Ranula, Benign and Malignant Tumors of tongue.

Talu Roga (Diseases of Palate)

a) Detailed study of Etiology, pathology, classification, clinical features and management of - Gala shundika, Talushosha, Talupaka

b) Brief Knowledge of Talupupputa, Adhrusha, Kacchapa, Talvarbuda, Mamsasanghata.

c) Knowledge of Cleft palate, palatitis, uvulitis and tumours of the palate.

Kantha and Gala gata Roga (Diseases of Pharynx & Larynx)

a) Detailed study of Etiology, pathology, classification, clinical features and management of - Tundikeri, Kantha shaluka, Gilayu, Galaganda,

Swrabhedha , Galavidradhi.

b) Brief Knowledge of Rohini, Galashotha, Kantharbuda, Kanthavidradhi, Galarbuda Galaugham, Vrindam, Ekavrindam, Valaya, balasa , Shataghni, Swaraghna.
c) Detailed study of Etiology, pathology, classification, clinical features and management of - Pharyngitis, Laryngitis, Tonsillitis & Adenoiditis
d) Brief Knowledge of foreign body in the throat, Carcinoma of Larynx & Pharynx, Dysphagia Diphtheria & diseases of salivary glands.

Sarvasara Mukha Roga (Generalised mucosal affections of the oral cavity)

a) Detailed study of Etiology, pathology, classification, clinical features and management of Sarvasar mukhapaka
b) Brief Knowledge of urdhvaguda, putivaktrata, mukharbuda
c) Detailed Knowlege of Stomatitis.

VI Miscellaneous Diseases

National Programme for Prevention and Control of Deafness.

PRACTICAL

Content of Practical

Identification, Uses, Demonstration of surgical/non-surgical equipment/ instruments, materials used in shalakya chikitsa. Method of sterilization. Training of case taking, bedside clinics and case presentation.

Training in para- surgical procedures-
1) Kshara karma
2) Agnikarma
3) Raktamokshana
4) Training of ward procedures. Application of bandages, wound management
5) Training of minor procedures (ashtavidha)
6) Observation of surgical procedures in Shalakya

Clinical Training	04 Months (OPD, IPD OT and kriya kalpa)
Distribution of marks	
1) Long Case	30 Marks
2) Short Case	20 Marks
3) Identification of instruments quipments,medicines,etc	10Marks
4) Viva – voce	30 Marks
5) Daily Record (Case record)	10 Marks
Total	**100 Marks**

Reference Books:-

1. Shalakya Tantra — Dr. Rama Nath Dwivedi
2. Shalakya Vigyan — Dr. Ravindra Chandra Choudhary

3. Abhinava Netra Chikitsa	Acharya Vishva Nath Dwivedi
4. Netra Chikitsa Vigyan	Dr. Ravindra Chandra Choudhary
5. Netra Roga Chikitsa	Dr. Munje
6. Netra Roga Vigyan	Dr. Hans Raj
7. Parson's Diseases of Eye	
8. Diseases of ENT Log and Turner	
9. Shalakya Tantra	Shiv Nath Khanna
10. A text book of ophthalmology in Ayurveda	Dr. P.K.Shantha kumara
11. Shalakya Kriya Kalpa Vigyan	Prof. K. S. Dhiman

Useful portions of Charak, Sushrut, Vagbhata

4.5 Research methodology and Medical statistics

Total Marks 50 (Part A-30 and Part B- 20)

PART – A –Research Methodology

1. Brief historical background of research in Ayurved and contemporary medical science Evidences of researches in ayurvedic classics
2. Etymology, definitions and synonyms (Anveshana, Gaveshana, Prayeshana, Anusandhan and Shodha) of the word Research
3. Research in Ayurved - Scope, need, importance, utility
4. Types of Research (familiarization of the terms)
    a) Pure and Applied
    b) Qualitative , Quantitative and Mixed
    Observational and interventional.
5. Research process (Importance of each steps in brief)
    a. Selection of the topic
    b. Review of the literature
    c. Formulation of Hypothesis
    d. Aims and Objectives
    e. Materials and methods
    f. Observations and results
    g. Methods of communication of Research
6. Research tools – Role of the pramanas as research tools
7. The concept and importance of ethics in research
8. Concept of Evidenvce Based Medicine and Scientific Writing
9. Importance of IT in data mining and important research data portalsconcerned with Ayurved and contemporary medical science (DHARA , PubMed, Ayush Research Portal, Bioinformatics Center, Research Management Informatic System etc.)

Part – B Medical-Statistics

1. Definition, scope and importance of the Medical statistics
2. Common statistical terms and notations
    a. Population
    b. Sample
    c. Data
    d. Variable
    e. Normal distribution
3. Collection and Presentation of data
    a. Tabular
    b. Graphical
    c. Diagrammatical
4. Measures of location
    a. Average
    b. Percentile

    Measures of Central Tendency
    a. Arithmetic mean
    b. Median

    c. Mode
5. Variability and its measurement
    a. Range
    b. Standard deviation
    c. Standard error
6. Introduction to probability and test of significance
7. Parametric and non parametric tests
8. Introduction to commonly used statistical soft-wares.

Reference books for Research methodology :

1. Dawson, Catherine, 2002, Practical Research Methods, New Delhi, UBS Publishers' Distributors
2. Kothari, C.R.,1985, Research Methodology-Methods and Techniques, New Delhi, Wiley Eastern Limited.
3. Kumar, Ranjit, 2005, Research Methodology-A Step-by-Step Guide for Beginners, (2nd.ed), Singapore, Pearson Education
4. Students guide to research methodology – Undergraduates. Alexandria Medical Students Association.
5. Health research methodology. A guide for training in research methods. 2nd edition. Manila, World Health Organization Regional Office for the Western Pacific, 2001.

Reference Books for statistics :

1. Health research methodology. A guide for training in research methods. 2nd edition. Manila, World Health Organization Regional Office for the Western Pacific, 2001.
2. Statistical methods in medical research. P.Armitage (Ed) Oxoford Blackwell
3. Statistical methods . Snedecor GW and Cochran, WG
4. Altman, D. G. (1991). Practical statistics for medical research. London: ChapmanPrinciples of Medical Statistics by A. Bradford Hill
5. Interpretation and Uses of Medical Statistics by Leslie E Daly, Geoffrey J Bourke, James MC Gilvray.
6. Research in Ayurveda-M S Baghel
7. research methodlogy in ayurveda-V.J.Thakar,Gujarat Ayurved University
8. Ayurveda anusandhan paddhati-P.V.Sharma
9. Research methodology methods and statistical techniques- Santosh Gupta. Greenhouse SW.
10. The growth and future of biostatistics: (A view from the 1980s). Statistics in Medicine 2003; 22:3323–3335.
11. Knapp GR & Miller MC. Clinical epidemiology and Biostatistics, NMS series Antonisamy B, Christopher S & Samuel PP. Biostatistics : Principles and practice
12. Sundara Rao PSS & Richard J. An introduction to Biostatistics, PHI
13. Senn S (1997). Statistical Issues in Drug Development. Chichester: John Wiley & Sons.
14. Methods in Bio-statistics for Medical Students- BK Mahajan
15. Vaidyakeeya Sankhiki Shastra- Dr.S.S.Savrikar

ABHILASHI UNIVERSITY

Chail Chowk, Tehsil Chachyot, Distt. Mandi (H.P.)

Ph: 01907-250408, 9418006520, 9816700520, 9816005139

Email: abhilashigroup@gmail.com, website: www.abhilashiuniversity.in

BACHELOR OF PHYSIOTHERAPY COURSE

Duration: 4 years & 6 months

DURATION OF COURSE:

- BPT course will be a full time course.
- Duration will be four years followed by compulsory six months rotatory internship.
- This course shall be divided into four professional examinations namely BPT
    - First Professional B.P.T.
    - Second Professional B.P.T.
    - Third Professional B.P.T.
    - Fourth (Final) Professional B.P.T.
    - Internship

Admission criteria and qualifications:

A candidate seeking admission to first year BPT course should have passed senior secondary examination conducted by Boards/Councils/ Intermediate examination established by State/Central Governments or equivalent studies within India or abroad, with English as one of the subjects and Physics, Chemistry and Biology as optional subjects not less than 50%. The candidate should have completed 17 years of age on or before 31st day of December of the year of admission. The selection of students to the physiotherapy course shall be based on:

i) The candidate must appear for Abhilashi University competitive entrance examination and must have come in the merit list by securing not less than 40% marks in Physics, Chemistry and Biology taken together.
ii) The admission to the B.P.T. course shall be made on the terms & conditions prescribed in the Notification issued by the Government from time to time.

English shall be the medium of instruction for study and examination of the Bachelor of Physiotherapy degree course.

ATTENDANCE:

Every candidate should have attendance not less than 75% of total classes conducted in theory and 80% in practical in each calendar year calculated from the date of commencement of the term to the last working day as notified by the University, in each of the subjects prescribed to be eligible to appear for the University examination. A candidate lacking in the prescribed attendance and progress in any subjects in theory or practical/clinical shall not be permitted to appear for the University examination in those subjects.

EXAMINATION & CRITERIA FOR PASSING:

- There shall be an annual university examination at the end of each academic year in the form of theory papers and practical examinations. The candidate shall be required to appear in every subject as specified in the course structure for each year.
- There shall be a provision of internal assessment of 20% marks in each subject of B.P.T. course in theory.
- The minimum number of marks to pass the examination shall be 50% in theory including Internal Assessment and 50% in practical / clinical in each subject.
- A candidate securing 75% or above marks in any of the subjects shall be declared to have passed with Distinction in that subject provided he/she has passed the examination in first attempt.
- A candidate who passes in one or more subjects shall be exempted from appearing in all subject at a subsequent examination, but the candidate must pass the examination in a maximum of four attempts, failing which he/she shall have to appear in all the subjects, of the next year examination.

DURATION OF EXAMINATION:

- Each theory paper shall be of 3 hours duration.

SUPPLEMENTARY EXAMINATION:

A candidate failing in a subject/ subjects will be required to appear in the university examination after 3 months in that subject/ subjects while attending classes of next year.

If the candidate fails in supplementary examination his/her session will be shifted by one professional year. The candidate will have to take admission in the previous year and pay the tuition fee for the academic year. He/she will have to appear in all the subjects in the examination.

Supplementary examination will be held not earlier than 3 months and later than 6 months from the date of annual University examination.

DEGREE:

The degree of B.P.T. course of the University shall be conferred on the candidates who have pursued the prescribed course of study for not less than four academic years and have passed examinations as prescribed under the relevant scheme and completed 6 months of compulsory rotatory internship.

Internship:

- There shall be six months of Internship after the final year examination for candidates declared to have passed the examination in all the subjects.
- During the internship candidate shall have to work full time average 7 hours per day (each working day) for 6 Calendar months.
- The Internship should be rotatory and cover clinical branches concerned with Physiotherapy such as Orthopedics, Cardiothoracic including ICU, Neurology & Neurosurgery, Pediatrics, General Medicine, General Surgery, both inpatient and outpatient services.

- Based on the attendance and work done during posting the Director/Principal/ head of institution/department shall issue '**Certificate of Satisfactory completion**' of training following which the University shall award the Bachelor of Physiotherapy Degree or declare the candidate eligible for the same.

SUBJECTS AND TEACHING SCHEDULE

Table I: FIRST YEAR BACHELOR OF PHYSIOTHERAPY (0-12Months)

		Teaching hours		
Sr. No	**Name of the subject**	**Theory**	**Practical**	**Total**
1.	Anatomy	120	80	200
2.	Physiology	120	80	200
3.	Biochemistry	50	-	50
4.	Electrotherapy –I	100	100	200
5.	Exercise Therapy –I	100	100	200
6.	Computer Application		50	50
7.	English	50	-	50
8.	Clinical Education & Training	-	400	400
	TOTAL			**1000**

Table II: SECOND YEAR BACHELOR OF PHYSIOTHERAPY (II BPT) (13-24Months)

	Teaching Hours			
Sr. No.	**Name of the subject**	**Theory**	**Practical**	**Total**
1.	Pharmacology	50	-	50
2.	Pathology& Microbiology	100	-	100
3	Exercise Therapy-II	150	150	300
4	Electrotherapy-II	150	150	300
5	Bio-mechanics	75	75	150
6	Psychology & Sociology	100	-	100
7	Clinical Education & Training	-	400	400
TOTAL				**1400**

Table III: THIRD YEAR
BACHELOR OF PHYSIOTHERAPY (III BPT)
(25-36Months)

Sr. No.	Name of the Subject	Teaching Hours		
		Theory	**Practical**	**Total**
1.	Orthopedics	120	80	200
2.	General Medicine	120	80	200
3.	PT in Ortho-Condition	125	150	275
4.	PT in Medical Condition-I	125	150	275
5.	Research Methodology & Biostatics	50	-	50
6.	Clinical Education & Training	-	400	400
	TOTAL			***1400***

FOURTH YEAR
BACHELOR OF PHYSIOTHERAPY (IV BPT)
(37-48Months)

Sr. No.	Name of the subject		Teaching hours	
		Theory	**Practical**	**Total**
1.	General Surgery	90	60	150
2.	Neurology	90	60	150
3.	PT in Neurological Condition	100	100	200
4.	PT in Surgical Conditions	100	100	200
5.	Physiotherapy ethics, Administration & Rehabilitation	100	70	170
6.	Applied therapeutics	60	60	130
7.	Clinical Education & Training	-	400	400
	TOTAL			**1400**

Table V: SCHEME OF EXAMINATION FOR I BPT

Table I: FIRST YEAR BACHELOR OF PHYSIOTHERAPY (I BPT)

Sr. No.	Subject Name	Subject code	Marks		Marks		Total
			Theory	Internal Assessment	Practical	Internal Assessment	
1	Anatomy	AUBPT-101	80	20	100	-	200
2	Physiology	AUBPT-102	80	20	100	--	200
3	Biochemistry	AUBPT-103	80	20	-		100
4	Electrotherapy –I	AUBPT-104	80	20	100	-	200
5	Exercise Therapy-II	AUBPT-105	80	20	100	-	200
6	English	AUBPT-106	40	10	-	-	50
7	Computer Application	----------	-	-	50	-	50
	Total						**1000**

Table II: SECOND YEAR BACHELOR OF PHYSIOTHERAPY (II BPT)

Sr. No	Name of the subject	Subject code	Marks				Total
			Theory	Internal Assessment	Practical	Internal Assessment	
1	Pathology& Microbiolog	AUBPT-201	80	20	-	-	100
2	Pharmacology	AUBPT-202	40	10	-	-	50
3	Exercise Therapy-II	AUBPT-203	80	20	100	-	200
4	Electrotherapy-II	AUBPT-204	80	20	100	-	200
5	Bio-mechanics	AUBPT-205	80	20	50	-	150
6	Sociology & Psychology	AUBPT-206	80	20	-	-	100
	TOTAL						**800**

Table III: THIRD YEAR BACHELOR OF PHYSIOTHERAPY (III BPT)

Sr. No.	Name of the subject		Marks				Total
		Subject code	**Theory**	Internal Assessment	**Practical**	**Internal Assessment**	
1	Orthopedics	AUBPT-301	80	20	100	-	200
2	General Medicine	AUBPT-302	80	20	100	-	200
3	PT in Ortho-Condition	AUBPT-303	80	20	100	-	200
4	PT in Medical Condition	AUBPT-304	80	20	100	-	200
5	Research Methodology & Biostatics	AUBPT-305	80	20	-	-	100
	TOTAL						**900**

Table IV: FOURTH YEAR BACHELOR OF PHYSIOTHERAPY (IV BPT)

Sr. No.	Name of the subject	Subject code	Marks				Total
			Theory	Internal Assessment	**Practical**	**Internal Assessment**	
1.	General Surgery	AUBPT-401	80	20	100	-	200
2.	Neurology	AUBPT-402	80	20	100	-	200
3.	PT in neurological Condition	AUBPT-404	80	20	100	-	200
4.	PT in Surgical Conditions	AUBPT-405	80	20	100	-	200
5.	Physiotherapy ethics, Administration & Rehabilitation	AUBPT-406	80	20	50	-	150
6.	Applied therapeutics	AUBPT-407	80	20	50	-	150
	TOTAL						**1100**

1ST Year Syllabus

BACHEOLAR OF PHYSIOTHERAPY

ANATOMY

M. Marks: 200
Theory: 100
Practical:100

Course description:

It is designed to provide students with the working knowledge of the structure of the human body which is essential foundation for their clinical studies. Studies are concerned with the topographical and functional anatomy of the limbs and thorax. Particular attention is paid to the muscles, bones and joints of the regions. The abdomen, pelvis, perineum, head and neck and central nervous system (CNS) are studies with particular reference to topics of importance to physiotherapists. The study of CNS includes detailed consideration of the control of motor function.

Theory –

1. **General introduction** **15hrs**

   a. Histology

General Histology, study of the basic tissues of the body;

Microscope, Cell, Epithelium, Connective Tissue, Cartilage, Bone, Muscular tissue, Nerve Tissue – TS

& LS, Circulatory system – large sized artery, medium sized artery, large sized vein, lymphoid tissue, Skin and its appendages.

   b. Osteology –

      Theory of structure, function and growth,

      Fracture & repair of bones

      Physical study of all bones in the body

      Also general features and functions of the cartilage, tendon, ligaments, articular capsule, synovial membranes, burse, miscue, intra-articular cartilages.

      Classification of joints with their examples & specific features.

   c. Embryology- Development of muscles, bones, joints and nerves etc.

2. **Systems of the Human Body:** **40 Hrs**

   a. Cardio – Vascular System Mediastinum: Divisions and contents

Pericardium: Thoracic Wall: position, shape and parts of the heart; conducting System; blood Supply and nerve supply of the heart; names of the blood vessels and their distribution in the body – region wise.

b. Respiratory system

Outline of respiratory passages

Pleura and lungs: position, parts, relations, blood supply and nerve supply; Lungs – emphasize on bronchopulmonary segments.

Diaphragm: Origin, insertion, nerve supply and action, openings in the diaphragm.

Intercostal muscles and Accessory muscles of respiration: Origin, insertion, nerve supply and action.

c. Digestive System –Anatomy of the gastro intestinal tract with special emphasis on surface marking.
d. Urogenital System - Anatomy of Urinary System, male and female reproductive systems.
e. Endocrine System - The various endocrine glands with their structure, functions and neuro-regulation. Also role of hypothalamus.
f. Integuinentary System

3. **Neuro Anatomy** **20 hrs**

Organization of Central Nervous system - Spinal nerves and autonomic nervous system mainly pertaining to cardiovascular, respiratory and urogenital system

Cranial nerves
Peripheral nervous system
Peripheral nerve
Neuromuscular junction
Sensory end organs
Central Nervous System
Spinal segments and areas
Brain Stem
Cerebellum
Inferior colliculi
Superior Colliculi
Thalamus
Hypothalamus
Corpus striatum
Cerebral hemisphere
Lateral ventricles
Blood supply to brain

Basal Ganglia
The pyramidal system
Pons, medulla, extra pyramidal systems
Anatomical integration

4. Musculo Skeletal Anatomy - (All the topics to be taught in detail) 40 hrs

(A) Myology:

1. The fascia and muscles of upper limb.
2. The fascia and muscles of lower limb.
3. The fascia and muscles of trunk.
4. The fascia and muscles of head, neck and face.
5. Muscles of eye.

(B) Osteology & Artlirology:

1. General structure and classification of all bones of skeleton and their attachments.
2. Classification of joints.
3. Movements of Joints.
4. Factors permitting and limiting movements of joints.
5. Joints of Upper Limb.
6. Joints of Lower Limb.
7. Shoulder girdle
8. Pelvic Girdle
9. Joints of Head & Neck and T.M Joints.
10. Joints of Trunk.

5. Surface & Radiological Anatomy: 15 Hrs

Surface Anatomy of the body. Radiographic appearance of musculoskeletal system of upper limb, lower limb and spine.

PRACTICAL -

List of Practical / Demonstrations *

Topics

1. Surface anatomy: to study identify and mark the surface landmark on the human body.
2. To study the muscles of trunk, lower and upper extremities and face on a dissected human body.
3. To study the Bones of Human Body with special emphasis on origin and insertion of muscles & ligaments.

4. To study the anatomy of joints of upper and lower extremities and vertebral column on a dissected human body.
5. To study the anatomy of C.N.S. and P.N.S. on a dissected human body.
6. To study the gross anatomy of Respiratory, Digestive, Endocrine, Urinary and Genital system on a dissected human body.

PHYSIOLOGY

M. Marks: 200
Theory: 100
Practical: 100

Subject Description

The course in Physiology over the first year is designed to give the student an in-depth knowledge of fundamental reactions of living organisms, particularly in the human body.

The major topics covered include the following: the cell; primary tissue; connective tissue; skin; muscle; nervous tissue; blood; lymphoid tissues; respiration; blood vessels; circulation; cardiac cycle; systemic circulation; sensory receptors; special senses; motor unit; spinal cord; control of movement; hypothalamic functions; gastrointestinal tract; kidneys; uterus; urinary tract; pregnancy; endocrine system.

Practical classes include hematology experiments, clinical examinations, and recommended demonstrations.

Section —I **General Introduction:** **20 hrs**

1. Cell Introduction: Outline of basic concepts of cell structure, functions of components and transport across membrances.
2. Skin: Functions, blood of flow and temperature regulation.
3. Blood and Lymph: Cell renewal system, haemoglobin, erythrocyte granulocyte, lymphocyte, coagulation, regulation of hydrogen within concentration of body fluids, fluid distribution and exchange.

Section —II **Physiology of the *system of* the body:** **45 hrs**

1. Digestion: Control of food and water intake and secretion and absorption movements of the alimentary canal.
2. Circulation: Cardio-vascular system, mechanical and electro-physiological activity of the heart, regulation of heart, coronary circulation, hemodynamics, circulation through brain, skin and skeletal muscle.
3. Excretion: Renal functions including formation of Urine & Micturition.
4. Respiration: Respiratory gases, pulmonary gas exchange, control and mechanics of breathing, hypoxia, asphyxia, dyspnoea, oxygen therapy and resuscitation.
5. Endocrine System: Outline of various hormones and their actions, pituitary gland, thyroid, parathyroid, adrenal glands & Gonads.

6. General Metabolism: Carbohydrate, Protein & Fat Metabolism.

Section — III **Neuro - Physiology:** **20 hrs**

1. Neuron: Properties and functions.
2. Action Potential.
3. Special properties of nerve trunks and tracts.
4. Motor units.
5. Reflex physiology.
6. Synapse and synaptic transmission.
7. Supraspinal control.
8. Cerebellum and basal ganglia.
9. Autonomic nervous system
10. Somatic sensation.
11. Pain
12. Taste, Olfaction, Auditory and Vision
13. Neuro Physiological Psychology

Section — IV **Muscle Physiology:** **15 hrs.**

1. Structure and function of Muscle tissue - skeletal and cardiac
2. Chemical processes involved in muscle contraction
3. Physlology Of muscle contraction.

Section — V **Physiology of exercise and work:** **20 Hrs**

1. Neuromuscular activity, human movement, physiological mechanism in movement behavior, strength, endurance, analysis of movement.

2. Circulatory and respiratory response to exercise including effects on the heart blood circulation body fluid changes, pulmonary -ventilation, gas exchange and transport, etc.
3. Effects of exercise and work on other body functions.
4. Metabolic and environmental aspects of exercise and work - metabolism, energy requirement, efficiency of muscular work, nutritional aspects, heat and body temperature regulation & environmental factors.
5. Effects of Exercise training - endurance, fatigue and recovery.
6. Fitness and health - age sex, body type, race, stress and medical aspects of exercise.

PRACTICAL

To study the following physiological Phenomena: Identification of blood cells and different counts.

1. W.B.C. Count.
2. R.B.C. Count.
3. Haemoglobin percentage and color index.
4. E.S.R. and Blood groups.
5. Bleeding time and clotting time.
6. Respiratory efficiency tests.
7. Artificial respiration and C.P.R.
8. Pulse rate, heart rate and measurement of Blood I'ressure.
9. Respiratory rate and Ausculation.
10. Normal E.C.G.
11. Reflexes - Superficial Deep.
12. Sensations.
13. Tests for functions of Cerebrum. Tests for functions of Cerebellum

REFERENCE BOOKS:-

- Essentials of Medical Physiology – K.Sembulingam ,Prema Sembulingam
- A Textbook of practical Physiology-C.L.Ghai
- Textbook of Physiology - Guyton & Hall
- A Textbook of Human Physiology – A.K.Jain
- Concise Medical Physiology-Chaudhuri
- Human Physiology: Dr.C.C.Chatterjee

BIOCHEMISTRY

M. Marks: 100
Theory: 100
Practical: 0

Theory

1. Nutrition -
Introduction, Importance of nutrition Calorific values, Respiratory quotient – Definition, and its significance Energy requirement of a person - Basal metabolic rate: Definition,
Normal values, factor affecting BMR Special dynamic action of food.
Physical activities - Energy expenditure for various activities. Calculation of energy requirement of a person
Balanced diet
Recommended dietary allowances
Role of carbohydrates in diet: Digestible carbohydrates and dietary fibers Role of lipids in diet
Role of proteins in diet: Quality of proteins - Biological value, net protein utilization, Nutritional aspects of proteins-essential and non - essential amino acids. Nitrogen balance, Nutritional disorders.

2. Carbohydrate Chemistry -
Definition, general classification with examples, Glycosidic bond
Structures, composition, sources, properties and functions of Monosaccharides, Disaccharides, Oligosaccharides and Polysaccharides.Glycosaminoglycans (mucopolysaccharides)

3. Lipid Chemistry -
Definition, general classification
Definition, classification, properties and functions of Fatty acids, Triacylglycerol,
Phospholipids, Cholesterol
Essential fatty acids and their importance
Lipoproteins: Definition, classification, properties, Sources and function Ketone bodies

4. Amino-acid Chemistry -
Amino acid chemistry: Definition, Classification, Peptide bonds
Peptides: Definition, Biologically important peptides
Protein chemistry: Definition, Classification, Functions of proteins,

5. Enzymes -
Definition, Active site, Cofactor (Coenzyme, Activator), Proenzyme. Classification with examples, Factors effecting enzyme activity, Enzyme inhibition and significance,
Isoenzymes, Diagnostic enzymology (clinical significance of enzymes)

6. Nucleotide and Nucleic acid Chemistry -
Nucleotide chemistry: Nucleotide composition, functions of free nucleotides in body.
Nucleic acid (DNA and RNA) chemistry: Difference between DNA and RNA, Structure of DNA (Watson and Crick model), Functions of DNA. Structure and functions of tRNA,
rRNA, mRNA.

7. Digestion and Absorption -
General characteristics of digestion and absorption, Digestion and absorption of carbohydrates, proteins and lipids. Disorders of digestion and absorption – Lactose intolerance,

8. Carbohydrate Metabolism -
Introduction, Glycolysis – Aerobic, Anaerobic Citric acid cycle, Substrate level phosphorylation.
Glycogen metabolism – Glycogenesis, Glycogenolysis, Metabolic disorders glycogen,
Gluconeogenesis, Cori cycle Hormonal regulation of glucose, Glycosuria, Diabetes mellitus.

9. Lipid Metabolism -
Introduction to lipid metabolism, Lipolysis, Oxidation of fatty acids -oxidation of fatty acids,
Lipogenesis - Denovo synthesis of fatty acids, chain elongation, desaturation, triacylglycerol synthesis, fat metabolism in adipose tissues
Ketone body metabolism: Ketone body formation (ketogenesis), utilization (ketolysis), ketosis, Rothera's test.
Cholesterol metabolism: synthesis, degradation, cholesterol transport
Hypercholesterolemia and its effects (atherosclerosis and coronary heart diseases)
Hypocholesterolemic agents, Common hyperlipoproteinemia, Fatty liver

10. Amino acid and Protein Metabolism -
Catabolism of amino acids - Introduction, transamination, deamination, Fate of ammonia, transport of ammonia, Urea cycle
Specialized products formed from amino acids - from glycine, arginine, methionine, phenylalanine and tyrosine.

11. Vitamins -
Definition, classification according to solubility,
Individual vitamins - Sources, Coenzyme forms, functions, RDA, digestion, absorption and transport, deficiency and toxicity.

12. Mineral Metabolism-
Definition, Sources, RDA, Digestion, absorption, transport, excretion, functions, disorder of Individual minerals - Calcium, phosphate, iron, Magnesium, fluoride, selenium, molybdenum, copper. Phosphate, calcium and iron in detail.

13. Cell Biology -
Introduction, Cell structure, Cell membrane structure and function, various types of absorption.Intracellular organelles and their functions, briefly on cytoskeleton.

14. Muscle Contraction -
Contractile elements in muscle, briefly on the process of muscle contraction, Energy for muscle contraction.

15. Biochemistry of Connective tissue -
Introduction, various connective tissue proteins: Collagen, elastin - Structure and associated disorders. Glycoproteins, Proteoglycans.

16. Hormone Action -
Definition, classification, Mechanism of hormone action. Receptors, signal transduction, second messengers and cell function.

17. Acid-Base balance -
Acids, bases and buffers, pH. Buffer systems of the body, bicarbonate buffer system Role of lungs and kidneys in acid base balance, Acid base imbalance.

18. Water balance –
Water distribution in the body, Body water, water turnover, Regulation of water balance:role of ADH and thirst centre.

19. Electrolyte balance -
Osmolarity. Distribution of electrolytes. Electrolyte balance: Role of aldosterone, rennin angiotensin system and ANF.

20. Clinical Biochemistry -
Normal levels of blood and urine constituents, Relevance of blood and urine levels of Glucose, Urea, Uric acid, Creatinine, Calcium, Phosphates, pH and Bicarbonate. Liver function tests, Renal function tests.

Suggested Readings
1. Murray RK, Garnner K, Mayes PA, Rodwell VW: Harper‟s Biochemistry. 26th Ed, Appleton & Lange, Connecticut, 1993.

2. Montgomery, Conway, Spector, Chappell: Biochemistry - A Case Oriented Approach. 6th Ed, Mosby Publishers, Missouri, 1996.

3. Devlin TM: Textbook of Biochemistry with clinical correlation. 5th Ed, Wiley-Liss, New York, 2002.
4. Nelson DL, Cox MM: Lehinger Principles of Biochemistry. 4th Ed, W.H.Freeman, New York, 2005.

5. Apps DK, Cohen BB, Steel CM: Biochemistry – A concise textbook for medical students, 5th Ed, ELBS with BailliereTindall, London, 1992.

6. Deb AC: Fundamentals of Biochemistry. 8th Ed, New Central Book Agency, Kolkata, 2004.

7. Satyanarayana U, Chakrapani U: Biochemistry. 3rd Ed, Arunabhasen Books & Allied (P) Ltd, Kolkata, 2006.

8. Dandekar SP: Prep manual for Under Graduate Medical Biochemistry. 2nd Ed, Urban &Schwarzenberg P Ltd, New Delhi, 2002.

9. Vasudevan DM, Sreekumari S: Textbook of Biochemistry for Medical Students. 5th Ed, Jaypee Brothers, New Delhi, 2007.

10. Chatterjee MN &Shinde R: Textbook of Biochemistry. 2nd Ed, Jaypee Brothers, New Delhi, 1995.

Exercise Therapy (I)

M. Marks: 200
Theory: 100
Practical: 100

Course Description-
In this course, the students will learn the principles and effects of exercise as a therapeutic modality and will learn the techniques in the restoration of physical functions.

Section – I **40hrs**

1. Introduction to Exercise therapy, Principles, techniques and general areas of its application, Assessment & its importance,
2. **Mechanics:** Force, Gravity, line of gravity, center of gravity in human body, Base, Equilibrium, Axes and Planes, mechanica1 principles of Lever, order of lever, examples in human body, Pendulum, Spring.
3. Descriptions of fundamental starting positions and derive position including joint positions, muscle work, stability, effects and uses.
4. Introduction to Movements including analysis of joint motion, muscle work and neuromuscular coordination.
5. **Classification of movements**: Describe the types, technique of application, indications, Contraindications, effects and uses of the following:
    a. Active Movement
    b. Relaxed passive movements, basic knowledge of classification of relaxed passive movements, definition, technique, effects and uses of relaxed passive movements
    c. Active assisted movement
    d. Resisted exercises- Techniques and types of resistance, Oxford method, Delorm method, Mc queen method, Zinoviff Method, DAPRE Method, SAID Principle
    e. **Suspension Therapy**: To study the principles, techniques of application indication at various joints of the upper limbs and lower limbs, Contraindication, Indications, Precautions, effects and uses
    f. **Assisted Exercises:** Technique and uses
    g. **Free exercises**: Classification, technique, Effects of frequent exercises on various systems
    h. **Posture:** Types, factors responsible for good posture, factors for poor posture, principles of development of good posture
    i. Bed Rest Complications

Section – II

Manual Muscle Testing **10 hrs**

a) Principles and application techniques of Manual muscle testing.

b) Testing position, procedure and grading of muscles of the upper limb, lower limb and trunk etc.

Section – III

Goniometry: **10 hrs**

Goniometers and its types

a) Principles, techniques and application of Goniometry.

b) Testing position, procedure and measurement of R.O.M. of the joints of upper limbs, lower limbs and trunk

c) Causes of restriction of joint movement, prevention of restriction of joint range of motion etc

Section – IV

Soft Tissue Manipulation (Therapeutic Massage) **20hrs**

a) History, various types of soft tissue manipulation techniques.

b) Physiological effects of soft tissue manipulation on the following systems of the body; Circulatory, Nervous, Musculoskeletal, Excretory, Respiratory, Integumentary system and Metabolism.

c) Classify, define and describe: - effleurage, stroking, kneading, petrissage, deep friction, vibration and shaking etc.

d) Preparation of patient: Therapeutic Effects, uses, indications and contraindications of the above manipulation

Section – V

Relaxation & Therapeutic Gymnasium **10 hrs**

Relaxation

1. Describe relaxation, muscle fatigue, muscle spasm and tension (mental & physical).
2. Factors contributing to fatigue & tension.
3. Techniques of relaxation (local and general)
4. Effects, uses & clinical application.
5. Indication & contraindication.

Therapeutic Gymnasium

Setup of a gymnasium & its importance various equipments in the gymnasium

Operational skills, effects & uses of each equipment

Section - VI Motor Learning: **10 hrs**

Introduction to motor learning:

i. Classification ofmotor skills.
ii. Measurement of motor performance.

Introduction to motor control

i. Theories of motor control.
ii. Applications.

Learning Environment

i. Learning of Skill.
ii. Instruction & augmented feedback.
iii. Practice conditions.

Exercise Therapy - I (Practical)

1) To practice the entire soft tissue manipulative techniques region wise – upper limb, lower limb, neck, back and face.
2) To practice the measurement of ROM of joints – upper limb, lower limb & trunk.
3) To practice the grading of muscle strength region wise – upper limb, lower limb and trunk.
4) To study the position of joints, muscle work, and stability of various fundamental and derived positions.
5) To study the different types of muscle contraction, muscle work, group action of muscles and coordinated movements.
6) To practice the various types of suspension therapy and its application on various parts of body – region wise.
7) To study & practice local & general relaxation techniques.
8) To study the structure & function along with application of various equipment in a Gymnasium.

Electrotherapy (I)

M. Marks: 200
Theory: 100
Practical: 100

Course Description -
In this course the student will learn the Principles, Techniques, Effects, Indication,Contra-Indication and the dosage parameter for various indications of electro therapeutic modalities in the restoration of physical function. The objective of this course is that after 240hrs of lectures, demonstration, practical and clinics the student will be able to list the indications, contra indications, dosages of electro therapy modalities, demonstrates the different techniques, and describe their effects on various conditions.

Section I- **20 hrs**

1. Electrical Fundamentals

Physical Principles-Structure and properties of matter" molecular atom, proton, neutron, electron, ion, etc. Electrical Energy: Nature of electricity-Current Static Electricity Current - Electric potentials generated by cell-Ohm's Law, Joule's Law.

2. Magnetic Energy: Nature and property of a magnet, magnetic induction snow rule, Mexwel corkscrew rule, Electromagnetic induction, Principle of working of choke coil-transformer-rectification of A.C to D.C. Metal Oxide Rectifier, Semi-conductor-Diode and Triode.

3. Valves-Principle working-condenser-principle-Details of charging and discharging, etc. Transistors, measurement of current intensity, EMS and power-moving coil millimeter and voltmeter.

Section II- **5 hrs**

Electrical supply:

a) Brief outline of main supply of electric current.
b) Dangers – short circuits, electric shocks.
c) Precautions – safety devices, earthling, fuses etc.
d) First aid & initial management of electric shock.

Section III - **20 hrs**

Low Frequency Currents:

a. Introduction to direct, alternating & modified currents.

b. Production of direct current – Physiological and therapeutic effects of constant current, anodal and cathodal Galvanism, Ionization and their application in various conditions.
c. Iontophoresis – Principles of clinical application, indication, contraindication, precaution, operational skills of equipment & patient preparation.
d. Modified direct current – various pulses, duration and frequency and their effect on Nerve and Muscle tissue. Production of interrupted and surged current & their effects
e. Modified direct current – Physiological and therapeutic effects, principles of clinical application, indications, contra indications, precautions, operational skills of equipment & patient preparation.
f. High Voltage Pulsed Galvanic Stimulation, Diadynamic Currents
g. Transcutaneous Electrical Nerve Stimulations (TENS):
a) Types of Low Frequency, pulse widths, frequencies & intensities used as TENS applications.
b) Theories of pain relief by TENS.
c) Principle of clinical application effects & uses, indications, contraindications, precautions, operational skills of equipment & patient preparation.

Section IV - **20 hrs**

Electrical Reactions and Electro – diagnostic tests: 10 hrs
- Electrical Stimuli and normal behavior of Nerve and muscle tissue.
- Types of lesion and development of reaction of degeneration.
- Faradic – Intermittent direct current test.
- S.D. Curve and its application.
- Chronaxie, Rheobase, F.G.Testetc

Section V - **20 hrs**

Infra red rays – Wavelength, frequency, types & sources of IRR generation, techniques of irradiation, physiological & therapeutic effects, indications, contraindications, precautions, operational skills of equipment & patient preparation.

Ultraviolet rays (UVR):
a) Wavelength, frequency, types & sources of UVR generation, techniques of irradiation, physiological & therapeutic effects, indications, contraindications, precautions, operational skills of equipment & patient preparation.
b) Dosimetry of UVR.

Section VI - **10 hrs**
Superficial heat - Paraffin wax bath, moist heat, electrical heating pads, Contrast bath, Whirl pool bath, Fluido therapy

a) Mechanism of production.
b) Mode of heat transfer.
c) Physiological & therapeutic effects.
d) Indications, contraindications, precautions, operational skills of equipment & patient preparation.

Electrotherapy I - (Practical)

1. To study the basic operation of electric supply to the equipment & safety devices.
2. To experience sensory and motor stimulation of nerves and muscles by various types of low frequency currents on self.
3. To locate and stimulate different motor points region wise, including the upper & lower limb, trunk
4. Therapeutic application of different low frequency currents Faradic foot bath, Faradism under pressure, Ionotophoresis.
5. To study the reactions of degeneration of nerves, to plot strength duration curves.
6. To find chronaxie and Rheobase.
7. To study a hydrocollator unit, its operations and therapeutic application of Hot packs –region wise.
8. To study the various types of Infrared lamps and their application to body region wise.
9. To study a paraffin wax bath unit, its operation and different methods of application – region wise.
10. To study the different types of Ultra violet units, their operation, and assessment of test dose and application of U.V.R. – region wise.
11. To study a TENS Stimulator, its operation and application – region wise.
12. To study various forms of therapeutic cold application region wise including – ice, cold packs, vapocoolant sprays, etc.

COMPUTER APPLICATIONS

M. Marks: 50
Theory: 0
Practical: 50

Note : Only Practical examination will be conducted for this paper.

Basic computers and information science

The students will be able to appreciate the role of computer technology. The course has focus on computer organization, computer operating system and software, and MS windows, Word processing, Excel data worksheet and PowerPoint presentation.

Topics to be covered under the subject are as follows:

- To study the various components of a personnel computer.
- To have working knowledge of various hardware and software.
- To have working knowledge of Common Operating Systems.
- To practice the operational skills of common computer applications, including work processing and spread sheet software.
- To have a basic knowledge of utility of multi-media.
- To learn skills of web surfing - For literature, researches relevant to the field of medicine.

English

M. Marks: 50
Theory: 50
Practical: 0

Course Description: The Course is designed to enable students to enhance ability to comprehend spoken and written English (and use English) required for effective communication in their professional work. Students will practice their skills in verbal and written English during clinical and classroom experiences.

Unit	Time (Hrs)	Learning Objectives	Content	Teaching Learning activities	Assessment methods
1.	10	Speak and write grammatically correct English	❖ Review of Grammar ❖ Remedial study of grammar ❖ Building Vocabulary ❖ Phonetics ❖ Public Speaking	-Demonstrate use of dictionary -Class-room conversation -*Exercise on use* Of Grammar -practice in public speaking	Objective type -Fill in the blanks -Para Phrasing
11.	10	Develop ability to read, understand and express meaningfully, the prescribed text.	Read and comprehend passages Note Making	Exercise on : – Reading – Summarizing – Comprehension	Short Answers Essay Types
III	10	Develop writing skills	Various forms of composition — Letter writing – Precise writing – Notice writing -anecdotal records –Dairy writing	• Exercise on writing: — Letter writing — Precis - Diary –Health problems –Story writing –Resume / CV	Assessment of the skills based on the check list

			— Report on health	– Discussion	
IV	10	• Develop skill in spoken English	• Spoken English - Oral report - Discussion - Debate -Telephonic conversation	• Exercise on : — Debating -participating in seminar panel symposium, Telephonic conversation	Assessment of the skills based on the check list
V	10	• Develop skill in listening comprehension	• Listening Comprehension - Media, audio, video. speeches etc.	• Exercise on : — Listening to audio, video, tapes and identify the key points.	Assessment of the skills based on the check list

BACHELOR OF PHYSIOTHERAPY (BPT) SECOND YEAR

PATHOLOGY & MICROBIOLOGY

M. Marks: 200
Theory: 100
Practical:100

Pathology –
Subject Description
This subject follows the basic subjects of Anatomy, Physiology and Biochemistry and it forms a vital link between preclinical subjects and clinical subjects. Pathology involves the study of causes and mechanisms of diseases. Microbiology involves the study of common organisms causing diseases including nosocomial infections and precautionary measures to protect one from acquiring infections. The knowledge and understanding of Microbiology & Pathology of diseases is essential to institute appropriate treatment or suggest preventive measures to the patient.
Particular effort is made in this course to avoid burdening the student.

Theory – General Pathology

1. Introduction to Pathology.

2. Cell injuries -
   Aetiology and Pathogenesis with a brief recall of important aspects of normal cell structure. Reversible cell injury: Types, Sequential changes, Cellular swellings, vacuolation, Hyaline changes, Mucoid changes. Irreversible cell injury: Types of Necrosis & Gangrene, Autolysis. Pathologic calcification: Dystrophic and Metastatic. Intracellular
   Accumulations - Fatty changes, Protein accumulations, Glycogen accumulations,
   Pigments - Melanin / Hemosiderin.
   Extra cellular accumulations: Amyloidosis - Classification, Pathogenesis, Pathology including special stains.

3. Inflammation and Repair -

Acute inflammation: features, causes, vascular and cellular events.

Inflammatory cells and Mediators. Chronic inflammation: Causes, Types, Classification nonspecific and granulomatous with examples.

Repair, Wound healing by primary and secondary union, factors promoting and delaying the process.

Healing in specific site including bone healing.

4. Immunopathology -

Immune system: General concepts.

Hypersensitivity: type and examples, antibody and cell mediated tissue injury with examples. Secondary immunodeficiency including HIV infection. Auto-immune disorders: Basic concepts and classification, SLE.

AIDS-Aetiology, Modes of transmission, Diagnostic procedures, handling of infected material and health education.

5. Infectious diseases -

Mycobacterial diseases: Tuberculosis, Leprosy and Syphilis.

Bacterial disease: Pyogenic, Diphtheria, Gram negative infection, Bacillary dysentery.

Viral diseases: Poliomyelitis, Herpes, Rabies, Measles, Rickttsia, Chlamydial infection,

HIV infection.

Fungal disease and opportunistic infections.

Parasitic diseases: Malaria, Filaria, Amoebiasis, Kala-azar, Cysticercosis, Hydatid cyst.

6. Circulatory Disturbances -

Hyperemia/Ischemia and Haemorrhage Edema: Pathogenesis and types. Chronic venous congestion: Lung, Liver, Spleen, Systemic Pathology Thrombosis and Embolism:

Formation, Fate and Effects.

Infarction: Types, Common sites.

Shock: Pathogenesis, types, morphologic changes.

7. Growth Disturbances and Neoplasia

Atrophy, Hypertrophy, Hyperplasia, Aplasia, Hypoplasia, Metaplasia, Malformation, agenesis, dysplasia.

Precancerous lesions.

Neoplasia: Definition, classification, Biological behaviour: Benign and Malignant, Carcinoma and Sarcoma.

Malignant Neoplasia: Grades and Stages, Local & Distant spread.

Carcinogenesis: Environmental carcinogens, chemical, viral, occupational. Heredity and cellular oncogenes and prevention of cancer.

Benign & Malignant epithelial tumours Eg. Squamous papilloma, Squamous cell carcinoma, malignant melanoma. Benign & Malignant mesenchy maltumours Eg:

Fibroma, Lipoma, Neurofibroma, Fibrosarcoma, Liposarcoma, Rhabdo-myosarcoma,

Teratoma.

8. Nutritional Disorders -

Protein energy malnutrition: Marasmus, Kwashiorkor, and Vitamin deficiency disorders, classification with specific examples.

9. Genetic Disorders -

Basic concepts of genetic disorders and some common examples and congenital malformation.

Systemic pathology

10. Hematology -

Constituents of blood and bone marrow, Regulation of hematopoiesis. Anemia: Classification, clinical features & lab diagnosis.
Nutritional anemias: Iron deficiency anemia, Folic acid, Vit. B 12 deficiency anemia including pernicious anemia. Hemolytic Anaemias: Classification and Investigations. Hereditary hemolytic
anaemias: Thalessemia, Sickle cell anemia, Spherocytosis and Enzyme deficiencies.
Acquired hemolytic anaemias
i. Alloimmune, Autoimmune
ii. Drug induced, Microangiopathic Pancytopenia - Aplastic anemia.
Hemostatic disorders, Vascular and Platelet disorders & lab diagnosis. Coagulopathies –
(i) Inherited (ii) Acquired with lab diagnosis.
Leukocytic disorders: Leukocytosis, Leukopenis, Leukemoid reaction.
Leukemia: Classification, clinical manifestation, pathology and Diagnosis. Multiple myeloma and disproteinemias.
Blood transfusion; Grouping and cross matching, untoward reactions, transmissible infections including HIV & hepatitis, Blood-components & plasma-pheresis.

11. Respiratory System

Pneumonia, Bronchitis, Bronchiectasis, Asthma, Tuberculosis, Carcinoma of lungs, Occupational lung diseases

12. Cardiovascular Pathology

Congenital Heart disease: Atrial septal defect, Ventricular septal defect, Fallot's tetralogy, Patentductusarteriosus.
Endocarditis.Rheumatic Heart disease.
Vascular diseases: Atherosclerosis, monckeberg's medial calcification, Aneurysm and Arteritis and tumours of Blood vessels.
Ischemic heart Disease: Myocardial infarction. Hypertension and hypertensive heart Disease.

13. Alimentary tract:

Oral Pathology: Ulcers, leukoplakia, Carcinoma, oral cavity diseases and tumour of salivary gland & esophagus and precancerous lesions, Esophagus inflammatory, functional disorders and tumours.
Stomach: Gastritis, Ulcer &Tumours.
Tumours and tumour like condition of the small and large Intestine: Polyps, carcinoid, carcinoma, Lymphoma.
Pancreatitis and pancreatic tumours: i) Exocrine, ii) Endocrine Salivary gland tumours : Mixed, Warthin's

14. Hepato – biliary pathology. Jaundice: Types, aetio-pathogenesis and diagnosis. Hepatitis:

Acute, Chronic, neonatal.
Alcoholic liver disease

Cirrhosis: Postnecrotic, Alcoholic, Metabolic and Portal hypertension Liver abscesses; Pyogenic, parasitic and Amoebic. Tumours of Liver

15. Lymphatic System

Diseases of the gall bladder: Cholecystitis, Cholelithiasis, Carcinoma. Lymphadenitis – Non-specific and granulomatous.Causes of Lymph Node enlargements. Reactive Hyperplasia,
Primary Tumours - Hodgkin's and Non hodgkin's Lymphomas, Metastatic Tumours.
Causes of Splenic Enlargements.

16. Musculoskeletal System

Osteomyelitis, acute, chronic, tuberculous, mycetoma
Metabolic diseases: Rickets/Osteomalacia, osteoporosis, Hyperparathyroidism, Paget's disease.
Tumours Classification: Benign, Malignant, Metastatic and synovial sarcoma. Arthritis:
Suppurative, Rheumatoid.Osteoarthritis, Gout, Tuberculous.

17. Endocrine pathology

Diabetes Mellitus: Types, Pathogenesis, Pathology, Laboratory diagnosis Non-neoplastic lesions of Thyroid: Iodine deficiency goiter, autoimmune Thyroiditis, Thyrotoxicosis, myxedema,
Hashimoto's thyroiditis.
Tumours of Thyroid: Adenoma, Carcinoma: Papillary, Follicular, Medullary, Anaplastic. Adrenal diseases: cortical hyperplasia, atrophy, tuberculosis, tumours of cortex and medulla.

18. Neuropathology

Inflammations and Infections: TB Meningitis, Pyogenic Meningitis, viral meningitis and Brain Abscess
Tuberculosis, Cysticercosis
CNS Tumors, Astrocytoma, Neuroblastoma, Meningioma, Medulloblastoma

19. Dermatopathology

Skin tumors: Squamos cell carcinoma, Basal cell carcinoma, Melanoma

Practical

Demonstration of Slides – The students may be demonstrated the common histopathological, hematological and cytological slides and specimens and charts and their interpretations.

MICROBIOLOGY

1. Immunology: Brief description of immune system, immunity, immune responses & immune deficiency Immunology, Hypersensitivity disorders

2. Infectious diseases: Brief description of classification of microorganisms, identification, Sterilization and disinfections with special reference to principles of antisepsis and prevention of communicable diseases in clinical practice

3. Brief description of identification of infectious diseases; principles of prevention of infectious diseases caused by common pathogens - streptococci, staphylococci, gonococci, Meningococci, salmonella, V. cholerae, E. coli, shigella, tetanus, Diphtheria, M. leprae, M. tuberculosis, Poliomyelitis, Rabies, Malaria, Amoebiasis, Helminthiasis, Scabies, ringworm, candidiasis

Suggested Readings:

S.No.	Author	Title	Publisher
1	Chakraborty, P.	Textbook of Microbiology	NCB, Calcutta
2	Ananth Narayan,	Text Book of Microbiology	Orient Longman, Madras
3	Chatterjee, K. D.	Parasitology: Protozoology and helminthology	Chatterjee, Calcutta
4	Cotran, Ramzi S	Pathologic Basis of Disease	W. B. Saunders, Singapo
5	Vinay Kumar	Basic Pathology	Harcourt
6	Nagalotimath, S.J.	Textbook of Pathology	CBS, New Delhi
7	Talib, V. H.	Essential Parasitology	Mehta, New Delhi

Pharmacology

M. Marks: 50
Theory: 50
Practical: 0

Course Description -
This course introduces the student to basic pharmacology of common drugs used, their importance in the overall treatment including Physiotherapy. The student after completing the course will be able to understand the general principles of drug action and the handling of drugs by the body. The student will be aware of the contribution of both drug and physiotherapy factors in the outcome of treatment.

1. General action of drugs.
2. Drug allergy and idiosyncrasy
3. Drug toxicity.
4. Metabolic fate of drug.
5. Methods of administration.
6. Chemical character of drugs.
7. Common Drugs acting on Central nervous system, Peripheral nervous system, neuromuscular junction and muscles.
8. Common Drugs acting on cardio-respiratory system.
9. Common Antibiotics & Chemotherapeutic agents.
10. Hormones, Vitamins and drugs affecting endocrine functions.

Exercise Therapy (II)

M. Marks: 200
Theory: 100
Practical: 100

Course Description-
In this course, the students will learn the principles and effects of exercise as a therapeutic modality and will learn the techniques in the restoration of physical functions.

Section - I
Therapeutic Exercises
1. Principle, classification, techniques, physiological & therapeutic effects, indications & contraindications of therapeutic exercises.
2. Assessment & evaluation of a patient (region wise) to plan a therapeutic exercise program.
3. **Joint Mobility** – Etiogenesis of Joint stiffness, general techniques of mobilization, effects, indications, contraindications & precautions.
4. **Muscle Insufficiency** – Etiogenesis of muscle insufficiency (strength, tone, power, Endurance & volume), general techniques of strengthening, effects, indication, Contraindications & precautions.
5. **Neuromuscular Inco-ordination** – Review normal neuromuscular coordination, Etiogenesis of neuromuscular in co-ordination & general therapeutic techniques, effects, indications, contraindications & precautions.
6. **Functional re-education** – General therapeutic techniques to re-educate ADL function.

Section – II
Posture, Balance, Gait:
1. Normal Posture – Overview of the mechanism of normal posture.
2. Abnormal Posture – Assessment, Types, etiogenesis, management, including therapeutic exercises.
3. Static and Dynamic Balance – Assessment & management including therapeutic exercises.
4. Gait – Overview of normal gait & its components.
5. Gait deviations - Assessment, Types, etiogenesis, management, including therapeutic exercises.
6. Types of walking aids, indications, effects & various training techniques

Section – III

Hydrotherapy:

1. Basic principles of fluid mechanics, as they relate to hydrotherapy.
2. Physiological & therapeutic effects of hydrotherapy, including joint mobility muscle Strengthening & wound care etc.
3. Types of Hydrotherapy equipment, indications, contraindications, operation skills & patient preparation.

Section – IV

Special Techniques:

1. Introduction to special mobilization & manipulation techniques, effects, indications & contraindications
2. Conceptual framework, principle of Proprioceptive Neuromuscular Facilitation (PNF) techniques, including indications, therapeutic effects and precautions.
3. Principles of traction, physiological & therapeutic effects classification, types, indications, contraindications, techniques of application, operational skills & precautions.
4. Review normal breathing mechanism, types, techniques, indications, contraindications, therapeutic effects & precautions of breathing exercises.
5. Group Therapy – Types, advantages & disadvantages.
6. Exercises for the normal person - Importance and effects of exercise to maintain optimal health & its role in the prevention of diseases. Types, advantages disadvantages, indications, contraindications precautions for all age groups.
7. Introduction to Yoga — Conceptual framework, various "asanas" the body — mind relationship effects & precautions.

Exercise Therapy – II (Practical)

1. To practice assessment & evaluative procedures, including motor, sensory, Neuromotor coordination, vital capacity, limb length & higher functions.
2. To study & practice the various techniques of mobilization of joints region wise.
3. To study & practice the various techniques of progressive strengthening exercises of muscles region wise.
4. To study & practice the use of various ambulation aids in gait training.
5. To assess & evaluate ADL's and practice various training techniques.
6. To study & practice Mat Exercises.
7. To assess & evaluate normal & abnormal posture & practice various corrective techniques.
8. To assess & evaluate equilibrium / balance & practice various techniques to improve balance.

9. To study the structure & functions of hydrotherapy equipments& their applications.
10. To study & practice various traction techniques, including manual, mechanical & electrical procedures.
11. To study & practice various group exercise therapies.
12. To practice & experience effects of basic Yoga “asanas”.
13. To study, plan & Practice exercise programmes for normal persons of various age groups.

Suggested Readings:

S. No.	Author	Title	Publisher	Year	Vol.
1	Hollis, M. and Cook, P.F.	Practical Exercise Therapy	Blackwell, Oxford	1999	
2	Gardiner, Dena M.	Principles of Exercise Therapy	CBS, New Delhi	1999	
3	Lippert, Lynn	Clinical Kinesiology for Physical Therapy	Jaypee, New Delhi	1996	
4	Paliarulo, M. A.	Introduction to Physical Therapy	Mosby, London	2001	
5	Jones and Barker,	Human Movement Explained	Butter worth- Heine	2000	
6	Thomson, Ann	Tidy’s Physiotherapy	Varghese, Mumbai	1991	
7	Hislop, H.J. and Montgomery, J.	Daniels and Worthingham’s Muscle Testing: Techniques of Manual Examination	W.B.Saunders, Philadelphia	2002	

8	Norkin	Measurement of Joint Motion			
9	Kisner, C. and Kolby, L.A.	Therapeutic Exercise Foundation and Technique	Jaypee, New Delhi	1996	
10	Holey, E. and Cook, E.	Therapeutic Massage	Harcourt, Singapore	1998	
11	Bates, Andrea and Hanson, Norm	Aquatic Exercise Therapy	W.B.Saunders, Philedelphia	1996	

Electrotherapy (II)

M. Marks: 200
Theory: 100
Practical: 100

Course Description -
In this course the student will learn the Principles, Techniques, and Effects, Indication, Contra-Indication and the dosage parameter for various indications of electro therapeutic modalities in the restoration of physical function. The objective of this course is that after 240hrs of lectures, demonstration, practical and clinics the student will be able to list the indications, contra indications, dosages of electro therapy modalities, demonstrates the different techniques, and describe their effects on various conditions.

Section – I **30hrs**

1. Review of Neuro muscular Physiology including effects of electrical stimulation.
2. Physiological responses to heat gain or loss on various tissues of the body.
3. Therapeutic effects of heat, cold and electrical currents.
4. Physical principles of Electro – magnetic radiation.
5. Physics of sound including characteristics and propagation.

Section – II **60hrs**

1. **High frequency currents (Short Wave Diathermy and Micro Wave Diathermy)** - Production, biophysical effects, types, therapeutic effects, techniques of application, indications, contraindications, precautions, operational skills and patient preparation.
2. **Medium frequency currents (Interferential Therapy and Russian Current)** - Conceptual framework of medium frequency current therapy, production, biophysical effects, types, therapeutic effects, techniques of application, indications, contraindications, precautions, operational skills and patient preparation.
3. **High frequency sound waves (Ultrasound)** - Production, biophysical effects, types, therapeutic effects, techniques of application, indications, contraindications, precautions, operational skills and patient preparation.

Section – III **40hrs**

1. **Therapeutic light in Physiotherapy (LASER)** – Definition, historical background, physical principles, biophysical effects, types, production, therapeutic effects, techniques of application, indications, contraindications, precautions, operational skills and patient preparation.
2. Therapeutic cold (Cryotherapy) - Sources, biophysical effects, types, therapeutic effects, indications, contraindications, precautions, application technique and patient preparation.
3. **Therapeutic mechanical pressure (Intermittent compression therapy)** – Principle, biophysical effects, types, therapeutic effects, indications, contraindications, precautions, operational skills and patient preparation.

4. **Extracorporeal Shock Wave Therapy**: Principles, Effects and Uses, Indications, Contraindications, Precautions and preparation of the patient

Section – IV **20hrs**

1. **Electro – diagnosis** – Instrumentation, definition & basic techniques of E.M.G. and Nerve Conduction Velocity Studies
2. **Bio–feedback** – Instrumentation, principles, therapeutic effects, indications, contraindications, limitations, precautions, operational skills and patient preparation.

Electrotherapy – II (Practical) **150hrs**

1. To study a Short Wave Diathermy unit, its operation and different methods of application – region wise.
2. To study a Micro Wave Diathermy unit, its operation unit, its operation and different methods of application – region wise.
3. To study an Ultrasound unit, its operation and different methods of application – region wise.
4. To study a Laser unit, its operation and different methods of application – region wise.
5. To study an Interferential therapy unit, its operation and different methods of application – region wise.
6. To study various forms of therapeutic cold application region wise including — ice, cold packs, vapor coolant sprays etc.
7. To study a Bio feedback unit, its operation and different methods of application - region wise.

Suggested Readings:

S.No.	Author	Title	Publisher	Year	Vol.
1	Froster, A. and Palastanga, N.	Clayton's Electrotherapy: Theory and Practice	AITBS, Delhi	1999	
2	Jhon, Low and Ann, Reed	Electrotherapy Explained: Principles	Butterworth Heine, Oxford	2000	
3	Nelson, R.M. and Currier, D.P.	Clinical Electrotherapy	Appleton and Lange	1987	
4	Chemeron, M.H.	Physical Agents in Rehabilitation	W B Saunders, London	1999	
5	Michlovitz, S L	Thermal Agents in Rehabilitation	F A Davis, Philadelphia	1996	

BIOMECHANICS

M. Marks: 200
Theory: 100
Practical: 100

Biomechanics -

Biomechanics involves the study of basic concepts of human movement, and application of various biomechanical principles in the evaluation and treatment of disorders of Muskuloskeletal system.

Students are taught to understand the various quantitative methods of movement. Mechanical principles of various treatment methodsare studied. Study of posture and gait are also included.

THEORY

1. Basic Concepts in Biomechanics: Kinematics and Kinetics **10hrs**

a) Types of Motion
b) Location of Motion
c) Direction of Motion
d) Magnitude of Motion
e) Definition of Forces
f) Force of Gravity
g) Reaction forces
h) Equilibrium
i) Objects in Motion
j) Force of friction
k) Concurrent force systems
l) Parallel force system
m) Work
n) Moment arm of force
o) Force components
p) Equilibrium of levers

2. Joint structure and Function - **20 hrs**

- Basic principles of Joint design and a human joint.
- Tissues present in has joint including fibrous tissue, bone cartilage and connective tissue.
- Classification of joints.
- Joint function, Kinematics chains and range of motion.

- Recall anatomy and study the biomechanics of the spine, shoulder girdle, joints of the upper extremity, pelvic girdle and the joints of the lower extremity.

3. Muscle structure and function - 15hrs

- Mobility and stability functions of muscle.
- Elements of muscle structure and its properties.
- Types of muscles contractions and muscle work.
- Classification of muscles and their functions.
- Group action of muscles, Co-ordinated movement.

4. Analysis of Posture and Gait – 30hrs

- Posture — Definition, factors responsible for posture, relationship of gravity on posture.
- Postural imbalance — factors responsible for imbalance in Static and dynamic positions including ergonomics.
- Description of Normal gait, determinants of gait, spatio temporal features and analysis.
- Gait deviations — Types, Causative factors and analysis.

Practical 75hrs

1. To study the effects of forces on objects
2. To identify axis and planes of motion at the joints, spine, shoulder, girdle, joints of upper extremity, Pelvic girdle and joints of lower extremity
3. To study the different types of muscle contraction, muscle work, group action of muscles of co- ordinated movements.
4. Analysis of Normal posture respect to L.O.G. and the optimal position of joints in Anterio-posterior and lateral views.
5. Analysis of normal gait and measurement of spatic temporal features.

Suggested Readings

1. Levangie PK, Norkins CC: Joint Structure and Function: A Comprehensive Analysis. 3rd Ed, Jaypee Brothers Medical Publishers, New Delhi, 2001.
2. Smith, Weiss, Lehmkuhl: Brunnstrom‟s Clinical Kinesiology. 5th Ed, Jaypee Brothers, New Delhi, 1998.
3. Hollis M, Cook PF: Practical Exercise Therapy. 4th Ed, Blackwell, Oxford, 1999.
4. Gardiner DM: Principles of Exercise Therapy. 4th Ed, CBS Publishers, New Delhi, 1999.
5. Lippert LS: Clinical Kinesiology for Physical Therapy Assistants. 3rd Ed, Jaypee Brothers, New Delhi, 2002.

6. Jones and Barker: Human Movement Explained.3rd Ed, Butterworth- Heine, London, 2000.

7. Norkin C, White JD: Measurement of Joint Motion: A Guide to Goniometry. 2nd Ed, Jaypee Brothers, Daryaganj, 1995.

8. Kisner C, Kolby LA: Therapeutic Exercise Foundation and Technique. 3rd Ed, Jaypee Brothers, New Delhi, 1996.

9. Campion MR: Hydrotherapy: Principles and Practice, 1st Ed, Butterworth, Oxford 2000.

10. Palastanga N, Field D, Soames R: Anatomy and Human movement – Structure & Function. 5th Ed, Elsevier LTd, Philadelphia, USA, 2006.

PSYCHOLOGY & SOCIOLOGY

M. Marks: 100
Theory: 100
Practical: 0

Course description -
Human Psychology involves the study of various behavioral patterns of individuals, theories of development, normal and abnormal aspects of motor, social, emotional and language development, communication and interaction skills appropriate to various age groups.
Sociology will introduce student to the basic sociology concepts, principles and social process, social institutions in relation to the individual, family and community and the various social factors affecting the family in rural and urban communities in India will be studied.
The study of these subjects will help the student to understand their clients while assessment and while planning appropriate treatment methods.

PSYCHOLOGY

1. **Introduction**
   - What is psychology?
   - Fields of application of psychology
   - Scope of psychology
2. **Learning**
   - Theories of learning
   - Principles of learning
   - Factors affecting learning
3. **Memory**
   - Forgetting
   - Theories of memory and forgetting
   - Methods to improve memory
4. **Intelligence**
   - Theories of intelligence
   - Influence of heredity and environment on the individual
   - Tests of intelligence
5. **Personality**
   - Theories of personality

- Factors influencing personality
- Assessments in personality
- Personality disorders

6. Behavior

- Normal and abnormal behavior
- Development and growth of behavior in infancy and childhood, adolescence, adulthood and old age

7. Thinking

- Definition
- Thinking process
- Problem solving
- Decision making
- Creative thinking

8. Motivation

- Theories
- Types of motivation

9. Emotions

- Theories of emotions
- Stress
- Conflicts
- Frustration

10. Attitudes

- Theories
- Attitudes and behavior
- Factors in attitude change

11. Emotional and behavioral disorders of childhood and adolescence (in brief)

- Disorders of under and over controlled behavior
- Eating disorders

12. Mental deficiency

- Mental retardation
- Learning disabilities
- Autistic behavior

13. Anxiety disorders

- Phobias, panic disorder
- Generalized anxiety disorder

- Obsessive compulsive disorder
- Post –traumatic stress disorder

14. Somatoform and dissociate disorders

- Conversion disorder
- Somatization disorder
- Dissociate amnesia & dissociate fugue

15. Patho-physiological disorders

- Stress and health

16. Severe psychological disorders

- Mood disorders
- Psychosis

17. Counseling

- Definition
- Aims and principles
- Quality of a good counselor

18. Psychotherapy

- Brief introduction to paradigms in psychopathology and therapy

19. Communication

- Effective and faulty
- Audiovisual aids and its effects on communication

20. Psychological need of pediatric and geriatric patients

SOCIOLOGY

1. Introduction

- Meaning-definition and scope of sociology
- Its relation with anthropology, psychology, social psychology and ethics
- Methods of sociology-case study, social survey, questionnaire, interview and opinion poll methods
- Importance of its study with special reference to health care professionals

2. Socialization

- Meaning and nature of socialization
- Primary, secondary, and anticipatory socialization
- Agencies of socialization

3. Social groups

- Concepts of social groups
- Influence of formal and informal groups on health and sickness
- The role of primary groups and secondary groups in the hospital and rehabilitation settings

4. Community

- Rural community – meaning and features – health hazards of rural population
- Urban community – meaning and features – health hazards of urban population

5. Family

- The family - meaning and definition, functions
- Changing family patterns
- Influence of family on the individual health, family, and nutrition
- The effects of sickness on family and psychosomatic disease and their importance to physiotherapy

6. Culture and health

- Concept of culture
- Cultures and behavior
- Cultural meaning of sickness
- Culture and health disorders

7. Social change

- Meaning of social changes & factors of social change
- Human adaptation and social change
- Social change and stress
- Social and deviance
- Social change and health program
- The role of social planning in the improvement of health and in rehabilitation

8. Social security

- Social security and social legislation in relation to the disabled

9. Social worker

- Meaning of social work
- The role of a medical social worker

10. Social Factors in health and disease

- The meaning of social factors
- The role of social factors and illness

11. Social problems of disabled

- Consequences of the following social problems in relation to sickness and disability, remedies to prevent these problems
- Population explosion

- Poverty and unemployment
- Beggary
- Juvenile delinquency
- Prostitution
- Alcoholism
- Problems of women in employment

Suggested Readings

Psychology & Sociology

1 Morgan CT, King RA, Weisz JR, Schopler J: Introduction to Psychology.7th Ed, Tata McGraw Hill, New Delhi, 1993.
2 Munn NL, Farnald LD, Fernald PS: Introduction to Psychology. 3rd Ed, Houghton Mifftin Company, Boston or Oxford & IBH Publishers, New Delhi, 1972.
3 Worchle S, Shebilske W: Principles and Applications - Psychology. 5th Ed, Prentice Hall, Englewood Cliffs, New Jersy, 1994.
4 Nolen HS: Abnormal Psychology. 2nd Ed, McGraw Hill Higher Education, New York, 2001.
5 Cushman LA, Scherer MJ: Psychological Assessment in Medical Rehabilitation. 1st Ed, American Psychological Association, USA, 1995.
6 Bond.J. &Bond.S: Sociology & Health Care – An Introduction for Nurses & other Health Professions. 2nd Ed, Churchill Livingstone, Edinburgh, 1994.
7 Taylor S & Field D: Sociology for Health & Health Care. 4th Ed, Blackwell Publishing, USA, 2007.
8 BhusanVidya, Sachdeva.DR: Introduction to Sociology. 3rd Ed, KitabMahal, Patna, 2004.
9 Dibyendunarayan B: Sociology for Physiotherapists. 1st Ed, Jaypee Brothers, New Delhi, 2006.

BACHELOR OF PHYSIOTHERAPY (BPT) THIRD YEAR

ORTHOPAEDICS

M. Marks: 200
Theory: 100
Practical: 100

Subject Description

This subject follows the basic science subjects to provide the knowledge about orthopedic conditions the therapist would encounter in their practice. The objective of this course is that after completion of the lectures and discussion the student will be able to demonstrate an understanding of orthopedic conditions causing disability, list the etiology, clinical features and methods of investigations and management.

Section — I **15 Hrs**

1. Introduction to Orthopaedics — Introduction to orthopaedic terminology. Types of pathology commonly dealt with, clinical examination, common investigations X-rays & imaging techniques and outline of non-operative management.

2. Principles of operative treatment Lift:

Indications, contraindication and briefly outline principles of: Athrodesis, Artluoplasty, Osteotomy, Bonegrafting Tendon — Transfers and Arhroplasty.

3. Sprains, Strains & Contractures: - List common sites of sprain, strains & contractures and describe the clinical manifestations and treatment. Viz. tennis elbow, golfer's elbow. Dequervan's disease, tenovaginitis, trigger, finger, carpal tunnel syndrome and plantar fasciitis etc.

4. Sports Injuries: - Injuries related to common sports their classification and management.

Section — II **30 Hrs**

1. **Fractures and Dislocations:**

General Principles, outline the following:

- Types of Fractures including patterns. Open & closed fractures and fracture dislocations.
- Differences between dislocation & sub location.
- General & Local signs & symptoms of fractures & dislocation.
- Principle of management of fractures & dislocations.
- Prevention & treatment of complication including. Fracture — disease, Volkmann's ischaemic contracture, Sudeek's Atrophy, Carpal Tunnel Syndrome, Myositis ossificans and shoulder — hand syndrome.
- Fracture healing.

2. Upper Limb Fractures & Dislocations

- Enumerate major long bone fractures and joint injuries.
- Briefly describe their clinical features, principles of management and complications.

3. Lower Limb Fractures & Dislocations

- Enumerate major long bone fractures and joint injuries.
- Briefly describe their clinical features, principles of management and complications.

4. Spinal fractures and dislocations

- Outline the mechanism, clinical features, and principles of management and complications of spinal injuries.

5. Recurrent Dislocations: Outline the mechanism, clinical features, principles of management and complications of recurrent dislocation of the shoulder and patella.

Section III **10 Hrs**

1. Amputations

- Classify amputations, List indication for surgery.
- Outlinepre-operative, operative and prosthetic management.
- Outline prevention and treatment of complications.

2. Bone & Joint Infections: Outline the etiology, clinical features, management and complications of septic arthritis osteomyelitis, Tuberculosis (including spinal T.B.).

3. Bones Joint Tumors: - Classify the outline the clinical features, management and complications of the following (benign / malignant bone and joint tumors, esteomas, osteosarcomas, osteoclastomas, Ewing's sarcoma, multipiemyeloma.

Section IV **20 Hrs**

1. Chronic Arthritis: - Outline of pathology clinical features, mechanism of deformities, management and complications of Rheumatoid arthritis. Osteoarthritis of major joints and spine, Ankylosing spondylitis.
2. Neck & Back Pain, Painful Arc Syndrome, Tendonitis, Fasciitis & Spasmodic Torticollis. Outline the above including clinical features and management.
3. Spinal Deformities: - Classify spinal deformities and outline the salient clinical features, management and complications of Scoliosis, Kyphosis and Lordosis.

Section — V **30 Hrs**

1. Poliomyelitis: Describe the pathology, microbiology, prevention, managements and complications of polio. Outline the treatment of residual paralysis including use of orthoses. Principles of muscle transfers and corrective surgery.
2. Congenital Deformities: - Outline the clinical features and management of CTEV, CDH, Flat foot, vertical talus, limb deficiency (radial club hand and femoral, tibial and tibula deficiencies meningomyelocoele, Arthrogryphosis multiplex congentia and Osteogenesis imperfect, Cerebral palsy.
3. Peripheral Nerve Injuries: - Outline the clinical features and management, including reconstructive surgery of:

- Radial, median and unlar nerve lesions.
- Sciatic and lateral popliteal lesions.
- Brachial Plexus injuries including Erbs, Klumpke's and crutch palsy.

4. Hand Injuries: - Outline of clinical features, management and complications of Skin and soft tissue injury, tendon injury, bone and joint injury.

5. Leprosy : Outline of clinical features, management and complications of neuritis, muscle paralysis, tropic ulceration and hand and feet deformities

Practical- Practical shall be conducted for all the relevant topics discussed in theory in the following forms:

1. Bedside case presentations and case discussions
2. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

GENERAL MEDICINE

M. Marks: 200
Theory: 100
Practical: 100

Subject Description
This subject follows the basic science subjects to provide the knowledge about relevant aspects of general medicine. The student will have a general understanding of the diseases the therapist would encounter in their practice. The objective of this course is that discussion the student will be able to list the etiology, pathology, clinical features and treatment methods for various medical conditions.

Section I: **25 hrs**

1. Introduction to modes of transfer of communicable diseases & general preventive measures.
2. Bacterial Diseases: Tuberculosis, Leprosy, Rheumatic fever, Tetanus, Typhoid fever, Diphtheria, Pneumonia, Bacillary Dysentery and Measles.
3. Viral Diseases: Herpes — simplex and zoster, Varicella, Measles, Mumps, Hepatitis B and C, AIDS and influenza.
4. Metabolic and Deficiency Diseases: Diabetes, Anemia, Vitamin & Nutritional Deficiency diseases, diseases of the endocrine glands.

Section II: **30 hrs**

1. **Common Diseases of Respiratory System :** Asthma, Bronchitis, Massive collapse of lungs, Bronchiectasis Bronchial Pneumonia, lung abscess, Emphysema, Empyema, Paralysis of diaphragm and vocal cords, chronic infection of larynx and trachea. Abnormalities of tracheal infract of lungs, chronic passive congestion, chronic obstructive pulmonary disease, chest wall deformities.
2. **Common Diseases of circulatory System:** Thrombosis, Embolism, Gangrene, Valvular disease, Hemorrhage, various diseases of arteries, diseases of blood forming organs, Anemia, Peripheral Vascular diseases, disease of the lymphatic systems : Diseases of the Heart — Hypertension, Hypotension, Aortic Aneurysm. Endocarditis, Pericarditis, Cardiac failure, coronary heart diseases, congenital heart malformation and its manifestation etc.
3. **Diseases of Digestive Systems:-**Pharyngitis, spasm of the Oesophagus, Diverticulum stenosis, Gastric ulcer, Hememesis, Pyloric stenosis, Dyspepsia, Vomiting, Diarrhoea, Duodenal ulcer etc.
4. **Diseases of Liver:-**Jaundice Cirrhosis of liver, Abscess of liver, Ascitis.

5. **Diseases of Kidney:** Polyuria, Hematuria, Uremia, Anuria, Nephritis, Urinary infections, Urinary calculi.

Section III: Diseases of Skin **15 Hrs**

1. Characteristics of normal skin, abnormal changes, types of skin lesions.
2. Conditions — Leprosy, Acne, Boil, Carbuncles, Impetigo, Infections of skin, Herpes, Urticaria. Skin disorders associated with circulatory disturbances, Warts, Corn, Defects in Pigmentation, Psoriasis, Leukoderma, Fungal infections, Alopecia, Dermatitis, Eczema, Skin-allergies, venereal disease.

Section IV: Paediatrics **15 Hrs**

1. Review normal foetal development & child birth, including assessment of a neonate.
2. Development of a normal child — neuromotor, physical growth, cognitive, intellectual, social etc.
3. The examination and assessment of a pediatric patient.
4. Congenital & acquired musculoskeletal disorders — etiogenesis, clinical manifestation & principles of management.
5. Congenital & acquired Cardio-pulmonary disorders — etiogenesis, clinical manifestation & principles of management.
6. Congenital & acquired neurological disorders (CNS & PNS) — etiogenesis, clinical manifestation & principles of management.
7. Hereditary disorders — etiogenesis, clinical manifestation & principles of management.
8. Nutritional Vitamins — Deficiency & development disorders — etiogenesis, clinical manifestation & principles of management.
9. Bums, Injuries & accident — Types & principles of management, including preventive case.
10. Surgical intervention—Indications & common surgical procedure.

Section V: Geriatrics **15 Hrs**

1. Normal aging — definition the anatomical, physiological and cognitive changes related to aging.
2. Epidemiology and socio-economic impact of aging.
3. The examination and assessment of a geriatric patient.
4. Musculoskeletal disorders — etiogenesis, clinical manifestation & principles of management.
5. Cardio — pulmonary disorders — etiogenesis, clinical manifestation & principles of management.
6. Neurological disorders (CNS & PNS) — etiogenesis, clinical manifestation & principles of management.
7. Diet & Nutritional requirement of the elderly. Nutritional disorders & their management.
8. Burns, Injuries & accident as related to the elderly & preventive care.
9. Dementia- Types and principles of management.

10. Overview of depressive disorders in the elderly.

Practical - Practical shall be conducted for all the relevant topics discussed in theory in the following forms:

1. Bedside case presentations and case discussions
2. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

Books Suggested:

1. Davidson's Principles and Practices of Medicine — Edward — Churchill Livingstone.
2 Hutchinson's Clinical Methods — Swash — Bailliere Tindall.
3. A Short Textbook of Medicine — Krishna Rao — Jaypee Brothers.
4. The Short Textbook of Paediatrics — Gupte — Jaypee.
5. A Short Textbook of Psychiatry — Ahuja Niraj — Jaypee Brothers.
6. Textbook of Paediatrics — Parsarthy — Jaypee.
7. Geriatric Physical Therapy — Guccione — Mosby.
8. Motor Assessment of the Developing infant — Piper & Davrah — W.B. Saunders

.

P.T. IN ORTHO CONDITION

M. Marks: 200
Theory: 100
Practical: 100

1. Brief review of the following surgical condition and various physiotherapeutic modalities, aims, means and technique of physiotherapy should be taught.
   10 Hrs
   a. Traumatology General physiotherapeutic approach for the following conditions: **40 hrs**
   I. Fracture and dislocations; Classification and type of displacement, method of immobilization, healing of fractures and factors affecting union, delayed union etc. common sites of fractures. **20 Hrs**
   a. Specific fractures and their complete physiotherapeutic management. **20 Hrs**
   - Upper Limb; Clavical, humerus, ulna, radius, crush injuries of land.
   - Lower Limb; fracture neck of femur, shaft of femur patella tibia fibula, pott's fracture, fracture of tarsal and metatarsals.
   - Spine: fracture and dislocations of cervical, thoracic and lumber vertebrate with and without neurological deficits.
2. Surgical procedures; Pre and post-operative management of common corrective procedure like arthroplasty, arthrodesis, osteotomy, tendon transplants, and soft tissue release grafting, including polio residual paralysis and leprosy deformities corrections **15 Hrs**
3. Injuries: Soft tissue injuries, synovitis, capsulitis volkman's ischemic contracture etc. tear of semilinar cartilage and cruciate ligaments of knee, menisectomy, patellectomy, internal derangement of knee. **10Hrs**
4. Amputation; level of amputation of upper limb and lower limb, stump care, stump bandaging, pre and post prosthetic management including check out of prosthesis, training etc. **10 Hrs**
5. Deformities:- congenital torticollis and cervical rib, CTEV, Pes cavus, pes planus and other common deformities.

Acquired — Scoliosis, kyphosis, lordosis, coax vara, genu valgum, genu varum and recurvatum. **10 hrs**

6. Degenerative and infective conditions : osteoarthritis of major joints, spondylosis, spondylitis spondylolisthesis, PIVD, Periarthritis of shoulder, Tuberculosis of spine, bone and major joint, perthes disease Rheumatoid arthiritis, Ankylosing spondylitis etc. and other miscellaneous orthopaedic conditions treated by physiotherapy. **15 Hrs**
7. Principles of sports physiotherapy — causes of sports injury, prevention of sports injuries, management of acute sports injury, common occurred injuries. Role of physiotherapist in sports, principle & advanced rehabilitation of the injured athlete. **15 Hrs**

Practical

150 hrs

Various physiotherapy modalities and treatment techniques for the above mentioned conditions to be demonstrated, practiced by the students in clinical setup.

Student must maintain a logbook**.** The duly completed logbook should be submitted during practical examination.

P.T. IN MEDICAL CONDITION- I

M. Marks: 200
Theory: 100
Practical: 100

THEORY

Section I: General Medicine

30 Hrs

Review of the Pathological and principles of management by Physiotherapy to the following conditions:

1. Inflammation — acute, chronic and supprative.
2. Oedema — Traumatic, obstructive, Paralytic, Oedema due to poor muscle and laxity of the fascia.
3. Arthiritis and Allied Conditions (in details) :
    - Osteo — arthiritis — generalized, Degenerative and traumatic, spondylosis and disorders.
    - Rheumatoid Arthritis, Still's disease, infective Arthiritis.
    - Spondylitis, Ankylising Spondylitis.
    - Nonarticular Rheumatism — Fibrositism,
    - Myalgia, bursitis, Periarthritis etc.
4. Common conditions of Skin Acne, Psoridsis, Alopcia, Leucoderma, Leprosy, Sexually transmitted diseases.
5. Deficiency diseases - Rickets, Diabetes, Obesity, Osteoporosis and other deficiency disorders related to Physiotherapy.
6. Psychiatric Disorders — Psychosis, Psychoneurosis, Senile dementia.

Section II Respiratory 25 Hrs

1. Review of mechanism of normal respiration.
2. Chest examination, including auscultation, percussion.
3. Knowledge of various investigative procedures (invasive and noninvasive) used in the diagnosis of various respiratory disorders.
4. Review of pathological changes and principle of management by physiotherapy of the following conditions:
    - Bronchitis, Asthma, Lung abscess, Bronchiectasis, Emphysema, COPD.
    - Pleurisy and Empyema, Pneumonia.
    - Bacterial Disease.
    - Rheumatic fever, carcinoma of respiratory tract.
    - Paralysis of diaphragm and vocal cords.
    - Chest wall deformities.

Section III: Cardiovascular 25 Hrs

1. Review of anatomy and physiology of the cardiovascular system.
2. Knowledge of various investigative procedures (invasive and noninvasive) used in the diagnosis of various cardiovascular disorders.
3. Review of the pathological changes and principle of management by physiotherapy of the following conditions :
    - Thrombosis, Embolism, Buerger's diseases, Arteriosclerosis, Thrombophlebitis, Phlebitis, Gangrene, Congestive Cardiac failure. Hypertension, Hypotension, aneurysm.

Section IV Paediatrics 25 Hrs

1. Review of the examination & assessment of a Paediatric patient.
2. Review of pathological changes and principle of management by physiotherapy of the following conditions. :
    - Common congenital & acquired musculoskeletal disorders.
    - Common congenital & acquired neurological disorders (CNS & PNS).
    - Common heredity disorders.
    - Common nutritional, metabolic & vitamin deficiency disorders.
    - Cerebral palsy, myopathy and muscular dystrophies.

Section V Geriatrics 20 Hrs

1. Review of the examination & assessment of a Geriatric patient.
2. Review of pathological changes and principle of management by physiotherapy of the following conditions :
    - Musclo skeletal disorders
    - Cardiopulmonary disorders.
    - Neurological disorders (CNS & PNS).
    - Injuries & accidents specific to the aged.

PRACTICAL

1. Practical demonstration of basic principles of physiotherapy assessment, functional assessment and application of physiotherapy in cardio – respiratory, OBG, Skin, and other medical conditions.

2. Student must maintain a logbook**.** The duly completed logbook should be submitted during practical examination.

Books Suggested:

l. Cash's Textbook of general medical and surgical conditions for Physiotherapists -Downie — Jaypee Brothers.
2. Essentials of Cardiopulmonary physical therapy — Hillegass & Sadowsky — W.B. Saunders.
3. Cash's Textbook of Chest, Heart and Vascular Disorders for Physiotherapists — Downie — J.F. Brothers.
4. The Brompton Guide to Chest Physical Therapy.
5. Cardiopulmonary Physlcal Therapy—and Tecklin — Mosby.
6. Cardiovascular / Respifatory Physiotherapy — Smith & Ball — Mosby.
7. ACSM Guideliness for Exercise testing and Prescription — ACSM — Williams and Wilkins.
8. ChestPhysiotherapy in Intensive Care Unit — Mackenzie et a1 — Williams and Wilkins.
9. Motor Assessment of Developing Infant — Piper & Darrah — W.B., Saunders.
10. Paediatric Physical Therapy — Tecklin — Lippincott.
11. Treatment of Cerebral Palsy and Motor Delay — Levitts — Blackwell Scientific Publications, London.
12. Physiotherapy in Paediatrics — Shephered — Butterwouh Heinmann.
13. Geriatric Physical Therapy — Gucciona — Mosby.

RESEARCH METHODOLOGY AND BIOSTATISTICS

M. Marks: 100
Theory: 100
Practical: 0

The objective of this module is to help the students understand the basic principles of research and methods applied to draw inferences from the research findings.

RESEARCH METHODOLOGY

1. Introduction to Research methodology: Meaning of research, objectives of research, Motivation in research, Types of research & research approaches, Research methods vs methodology, Criteria for good research.
2. Research problem: Statement of research problem, Statement of purpose and objectives of research problem, Necessity of defining the problem
3. Research design: Meaning of research design, Need for research design, Features for good design, Different research designs, Basic principles of research design.
4. Measurement & scaling techniques: Measurement in research- Measurement scales, sources of error in measurement, Technique of developing measurement tools, Meaning of scaling, its classification, important scaling techniques.
5. Methods of data collection: collection of primary data, collection data through questionnaires & schedules, Difference between questionnaires & schedules.
6. Computer technology: Introduction to Computers, computer application in research computers & researcher.

BIOSTATISTICS

1. **Introduction**: Meaning, definition, characteristics of statistics. Importance of the study of statistics, Branches of statistics, Statistics and health science ,

   Parameters and Estimates, Variables and their types, Measurement scales.
2. **Tabulation of Data**: Basic principles of graphical representation, Types of diagrams – histograms, frequency polygons, smooth frequency polygon, cumulative frequency curve, Normal probability curve.
3. **Measures of Central Tendency**: Need for measures of central Tendency,

   Definition and calculation of **Mean** – ungrouped and grouped, interpretation and calculation of Median-ungrouped and grouped, Meaning and calculation of Mode, Geometric mean & Hormonic mean, Guidelines for the use of various measures of central tendency.
4. **Measures of Dispersion**: Range, mean deviation, standard deviation & variance.

5. **Probability and Standard Distributions:** Meaning of probability of standard distribution, the binominal distribution, the normal distribution, Divergence from normality – skewness, kurtosis.
6. **Correlation & regression:** Significance, correlation coefficient, linear regression& regression equation.
7. **Testing of Hypotheses, Level of significance, Degrees of freedom.**
8. **Chi-square test, test of Goodness of fit & student t-test.**
9. **Analysis of variance & covariance:** Analysis of variance (ANOVA), what is ANOVA? Basic principle of ANOVA, ANOVA technique, Analysis of Co variance (ANACOVA)
10. **Sampling:** Definition, Types- simple, random, stratified, cluster and double sampling. Need for sampling - Criteria for good samples, Application of sampling in community, Procedures of sampling and sampling designs errors

Forth Year BPT

GENERAL SURGERY

M. Marks: 200
Theory: 100
Practical: 100

Section I: 10 Hrs

1. Introduction to principles of surgery and its procedure.
2. Shock — definition, types, clinical, feature, pathology & management.
3. Haemorrhage — common sites, complication, clinical features & management.
4. Blood Transfusion — Blood group matching, indication & complication.
5. Anaesthesia — Principles of anaesthesia, types &procedure.

Section II 20 Hrs

1. Wounds, Tissue repair, Classification—Acute Wounds, Chronic wounds, Scars& their Management.
2. Wound infections: Psychology & manifestation, Types of infections & their management.
3. Tumors and Ulcers:
   a) Tumors — Types of Management
   b) Ulcers — Types & Management.
4. Burns — Causes, Classification, Clinical features & Management.
5. Skin Grafting — Indications, Types & Procedures.
6. Hand Infections — Types & Management.
7. General Injuries — Types & Management.

Section III 10 Hrs

- Complications of Surgery.
- Abdominal Surgery — Types of Incisions & common surgical procedures.
- Thoracic and Cardiac Surgery — Types of incision and common surgical procedures.

Section IV 20 Hrs

Obstetrics & Gynecology

- Pregnancy, stages of labor and its complications, indications and types of surgical procedures.
- Gynecological disorders — Salpingitis, parameters, retro-uterus, prolapse of uterus, pelvic inflammatory diseases, urinary incontinence.

Section – V 20 Hrs

Ophthalmology

- Common conditions of eye: Cataract, Glaucoma, Diabetic complications of eye, injuries, inflammations and other infections of eye.
- Ptosis.
- Blindness — common causes & management.
- Refractions — testing, errors & remedies.
- Strabismus — types, features & corrective measures.

Section VI 20 Hrs

Ear, Nose & Throat (ENT)

- Introduction — Outline, mechanism of audition, olfaction & speech.
- Classify causes of hearing impairment, assessment techniques, conservative & surgical management.
- Hearing Aids — types & indications.
- Outline common ENT infections & lesions, which affect hearing, breathing, speech & their management.
- Outline the function of vestibular organ, its common disorders & their management.

Practical –

Practical shall be conducted for all the relevant topics discussed in theory in the following forms:
1. Bedside case presentations and case discussions
2. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

Suggested Readings:

S.No.	Author	Title	Publisher	Year	Vol.
1	Russell, R.C.G.	Short practice In Surgery	Arnold, London	2000	

2	Gupta, R. L.	Text Book of Surgery	Jaypee, New Delhi	1996	

NEUROLOGY

M. Marks: 200
Theory: 100
Practical: 100

Section I: 15 Hrs

1. **Neuroantomy:**

Review the basic anatomy of the brain and spinal cord lncluding Blood supply of the brain and spinal cord, anatomy of the visual pathway, connections of the cerebellum and extrapyramidal system, relationship of the spinal nerves to the spinal cord segments, long tracts of the spinal cord, the brachial and lumbar plexus and cranial nerves.

2. **Neurophysiology**

Review in brief the Neurophysiological basis of tone and disorders of the tone and posture, bladder control, muscle contraction, movement and pain.

3. Assessment and evaluate procedures for the neurological patient.
4. Review of the principles of the management of a neurological patient. '

Section II 25 Hrs

Briefly outline the etiogenesis, clinical features and management of the following Neurological disorders

1. Congenital and childhood disorders — Cerebral palsy, Hydrocephalus and Spina Bifida.
2. Cerebrovascular accidents — General classification, thrombotic, embolie, harmorrhagic and inflammatory, strokes, gross localization and sequelae.
3. Trauma — localization, first aid and management of sequelae of head injury and spinal cord injury.
4. Diseases of the spinal cord — Craniovertebral junction anomalies, Syringomyelin, Cervical and lumbar disc lesions, Tumors and Spinal arachnoiditis.
5. Demyelinating diseases (central and peripheral) — Guillain — Bane syndrome, Acute disseminated encephalomyelitis, Transverse myelitis and Multiple sclerosis.

Section III 25 Hrs

Briefly outline the etiogenesis, clinical features and management of the following Neurological disorders:

1. Degenerative disorders — Parkinson's disease and dementia.
2. Infections — Pyogenic Meningitis sequelae, Tuberculous infection of central nervous system and Poliomyelitis.
3. Diseases of the muscle — Classification, signs, symptoms, progression and management.
4. Peripheral nerve disorders — Peripheral nerve injuries, Entrapment neuropathies and Peripheral neuropathies.

Section — IV 20 Hrs

1. Epilepsy — Definition, classification and ' management.
2. Myasthenia Gravis — Definition, course and management.
3. Intracranial Tumors — Broad classifications, signs and symptoms.
4. Motor neuron disease — Definition, classification and management.
5. Cranial nerve — Types of Disorders, clinical manifestation & management.

Section V: Psychiatry 15 Hrs

1. Introduction to neuropsychology: Definition, defense mechanism, symptomatology, types, causes, assessment of mental disorders, psychosomatic disorders.
2. Disorders:

- Psychosis — Schizophernia (including paranoid) maniac depressive psychosis, involvement psychosis.
- Psychoneurosis — Anxiety, hysteria, anxiety states, neurasthesis, reactive depression, obsessive compulsive neurosis.
- Organic reaction to — toxins. Trauma & infection.
- Senile dementia.

3. Mental retardation — definition, causes manifestation and management.
4. Therapies:
    - Psychotherapy—Group therapy, Psychodrama, behavior, modification, family therapy, play therapy, psychoanalysis, hypnosis.
    - Drug therapy.
    - Electro convulsive therapy.

Practical

Practical shall be conducted for all the relevant topics discussed in theory in the following forms:
1. Bedside case presentations and case discussions
2. Lab sessions consisting of evaluation and assessment methods on student models, treatment techniques and practice sessions.

Suggested Readings:

.

S. No.	Author	Title	Publisher	Year	Vol.

1	Bannister, R.	Brain and Bannister Clinical Neurology	Oxford university press, oxford	2002	
2	Chamberlain, E.N.	Symptoms and Signs in Clinical Medicine	John Wright, Bristol	1974	
3	Friedman, H.H.	Problem-Oriented Medical Diagnosis	Little Browne, Boston	1979	3V
4	Swash, Michael	Hutchison's Clinical Method	W B Saunders, London	2000	
5	Rees, Lingford	New Short Text Book Of Psychiatry	Arnold, New Delhi	1988	
6	Walton, John	Brain's Disease of the Nervous System	Oxford university press, Delhi	1998	
7	Haerer, A.F.	Neurological Examination	Lippincott, Philedelphia	1999	
8	Ahuja, Neeraj	Short Text Book Of psychiatry	Jaypee, New Delhi	1999	
9	Haslett, C.	Davidson's Principal and Practice of Medicine	Churchill Living stone, London	1999	
10	Kasper, D.L	Harrison 's Principles of Internal Medicine	Mc-Graw Hill, New York	2005	2V

Physiotherapy in Neurological Conditions

M. Marks: 200
Theory: 100
Practical: 100

THEORY

1) Review of basic Neuro - Anatomy and Physiology
2) Physiotherapy evaluation of a neurological patient, electro diagnostic procedures, interpretations and prognosis in different neurological conditions, Upper and Lower motor neuron lesions.
3) Principles of physiotherapy programs, reeducation and retraining techniques in neurological conditions, approaches like: Bobath's / neuro developmental therapy, Rood's approach, PNF, Vojta techniques, biofeedback, Brunnstorm movement therapy, Motor Relearning

programming, sensory integration therapy.

4) Disturbance of speech and aphasia
5) Spinal cord injury:
   Review of anatomy and physiology, Physiotherapy Assessment of Spinal cord injury, Principles of Physiotherapy at various stages of Spinal cord injury Rehabilitation goals and ADL training

6) Assessment and principles of therapeutic management of following neurological conditions:
   - Stroke, meningitis, encephalitis, Parkinson's disease, Cerebral palsy, cerebellar lesions, Brain tumors, Multiple Sclerosis, facial palsy.
   - Hemiplegia, Paraplegia, Tabes doraslis, cerebellar ataxia, extra pyramidal lesions, Gulllan Barre Syndrome, Parkinsonism.
   - Motor neuron disease, disseminated sclerosis, transverse myelitis, polio, syringomyelia, spina bifida, Amyotrophic lateral sclerosis, Symgomyela subacute combined degeneration of cord motor neuron disease.
   - Neuropathies, neuromuscular junction disorders and myopathies

7) Peripheral nerve injuries, surgical resection & repair:
   - Classification & types
   - Functional assessment, investigation, diagnosis & prognosis
   - Physiotherapeutic management
   - Poly neuropathy

8) Traumatic brain injury & spinal cord injuries.
   - Types and Mechanisms
   - Clinical features, potential complications
   - Physiotherapy principles of immediate and postoperative therapeutic management

PRACTICAL

1. Practical demonstration of basic principles of physiotherapy assessment, functional assessment and application of physiotherapy in neurology conditions.
2. Student must maintain a logbook**.** The duly completed logbook should be submitted during practical examination.

Books Suggested:

1. Cash's textbook of neurology & physiotherapists — Downi — J.P. Brothers.
2. Adult Hemiplegia — Evaluation & treatment — Bobath— Oxford Butterworth Heinmann.
3. Neurological Rehabilitation — Carr & Shepherd —Butterworth Heinmann.
4. Tetraplegia & Paraplegia — A guide for physiotherapist — Bromley — Churchill Livingstone.
5. Neurological Physiotherapy — A problem solving ! Approach — Susan Edwards — Churchill Livingstone. ,
6. Neurological Rehabilitation — Umpherd- Mosby.
7. Motor Assessment of Developing Infant — Piper & Darrah — W.B., Saunders.
8. Treatment of Cerebral Palsy and Motor Delay— Levitts — Blackwell Scientific Publications, London.

P.T. IN SURGICAL CONDITIONS

M. Marks: 200
Theory: 100
Practical: 100

Section I: General Surgery, Eye & ENT 20 Hrs

Review of pathological changes and principle of pre and post-operative management by physiotherapy of the following conditions:

1. Common abdominal surgeries, including GIT, liver, spleen, kidney, bladder & Endoscopy etc.
2. Common organ transplant surgeries — heart, liver, bone marrow etc.
3. Common operations of the ear, nose, throat & jaw as related to physiotherapy.

Section II: Thoracic Surgery 20 Hrs

Review of pathological changes and principle of pre and post-operative management by physiotherapy of the following conditions:

1. Lobectomy, Pneumonectomy, Thoracotomoy, Thoracoplasty & Key hole surgeries.
2. Corrective surgeries of congenital heart defects, angioplasties, blood vessel grafting, open heart surgeries & heart transplant.

Section III: Gynaecology and Obstetrics 20 Hrs

Common operation of reproductive system, including surgical intervention for child delivery Ante natal & postnatal, physiotherapy.

Section IV - Wounds, Burns & Plastic Surgery 20 Hrs

Review of pathological changes and principle of pre and post-operative management by physiotherapy of the following conditions:

- Wounds, ulcers, pressure sores.
- Bums & their complications.
- Common reconstructive surgical proceedings of the management of wounds, ulcers, burns & consequent contractures & deformities.

Section V - Neurosurgery 20 Hrs

Review of pathological changes and principle of pre and post-operative management by physiotherapy of the following conditions:

- Common surgeries of the cranium & brain.
- Common surgeries of vertebral column & spinal cord.
- Common surgeries of peripheral nerves.
- Surgical interventions in traumatic head injuries.

PRACTICAL

Demonstration of physiotherapy modalities and treatment techniques of above mentioned conditions.

Books Suggested:

1. Cash's Textbook of general medical and surgical conditions for physiotherapists — Downie — Jaypee Brothers.
2. Cash's textbook of heart, chest and vascular disorders for physiotherapists — Downie — Jaypee Brothers.
3. Principles and practices of cardiopulmonary physical therapy — Frown Felter — Mosby.
4. Chest physiotherapy in intensive care unit —
5. Mackanzie — Williams & Wilkins.
6. Restoration of Motor Functions in stroke patient A Physiotherapist Approach — Johnstone Churchill Livingstone.
7. Physiotherapy in obstetrics and gynaecology-Polden — F.A. Davis.

APPLIED THERAPEUTICS

M. Marks: 200
Theory: 100
Practical: 100

THEORY

1. Pre-exercise evaluation
2. Diet and nutrition

   Measurement of fitness components and sports skills - Measurement of muscular strength, Measurement of muscular endurance, Measurement of flexibility, Determination exercise endurance,

3. Physiological effects of exercise on body systems - Muscular system, Endocrine system, Cardio-respiratory system, Nervous system

4. Sports injuries - Spine – PIVD, Kissing spine, cervical whiplash injuries, facet joint syndrome, SI joint dysfunction, Hip – muscle strain, piriformis syndrome, ITB syndrome, osteitis pubis, Knee – menisci, cruciate, collateral, osteochondritis, chondromalacia patellae, biceps femoris tendonitis, swimmers knee, patello-femoral pain syndrome, Leg & ankle – shin splint, achillis tendonitis & rupture, TA bursitis, ankle sprain, plantar fascitis, turf toe syndrome, Head & face – maxillo-facial injuries, helmet compression syndrome**.**
5. Sports injuries

   Shoulder – instability, rotator cuff injury, biceps tendonitis and rupture, pectoralis major rupture, scapular dyskinesis and acromio-clavicular joint injuries, Elbow – tennis elbow, golfer's elbow, Wrist and hand – carpal tunnel syndrome, gamekeeper's thumb.
6. Principles of injury prevention.
7. Principles of training & Rehabilitation in sports injuries.

8. Sports in Special age groups: Female athletic triad, Younger athlete- Musculo-skeletal problems, management, children with chronic illness and nutrition. Older athlete- Physiological changes with aging, benefits, risks of exercise in elderly, exercise prescription guidelines for elderly.

PRACTICAL

1. Practical demonstration of basic principles of physiotherapy assessment, functional assessment and application of sports physiotherapy
2. Student must maintain a logbook**.** The duly completed logbook should be submitted during practical examination.

PHYSIOTHERAPY ETHICS, ADMINISTRATION & REHABILITATION

M. Marks: 100
Theory: 100
Practical: 0

Subject Description
The subject serves to integrate the knowledge gained by the students in community medicine and other areas with skills to apply these in clinical situations of health and disease and its prevention.

The objective of the course is that after the specified hours of lectures and demonstrations the student will be able to be masters in Physiotherapy Ethics, Administration & also rehabilitation methods to prevent disabilities and dysfunctions due to various disease conditions and plan and set treatment goals and apply the skills gained in rehabilitating and restoring functions.

Section I: Physiotherapy Ethics 20 Hrs

1. History of Physiotherapy.
2. Philosophy and Philosophical statements.
3. Major Ethical principles applied to moral issue in health care.
4. Rules of Professional conduct.
5. Scope of practice.
6. Relationships with patients.
7. Relationships with medical colleagues.
8. Relationships between professionals.
9. Relationships with in the profession.
10. Sale of goods.
11. Personnel and professional standard.
12. Professional standard.

Section II: Physiotherapy Administration 10 Hrs

1. Responsibility and Confidentially.
2. Provision of services and advertising.
3. Professional and government licensing, Accreditation and Education standards.

4. Laws and Legal concepts:

- Protection from Malpractice claims, Consumer Protection Act
- Liability and Documentations.

Section III Principles of Rehabilitation

Section III A 20 Hrs

1. Conceptual framework of rehabilitation, roles of rehabilitation team members, definitions and various models of rehabilitation.

2. Epidemiology of disability with emphasis on locomotor disability, its implications — individual, family, social, economic and the state.

3. Preventive aspects of disability and organizational skills to manage it.

4. Community Based Rehabilitation and outreach programmes to rehabilitate persons with disabilities living in rural areas.

5. Statutory provisions, Schemes of assistance to persons with disability.

6. Role of NGOs in rehabilitation of the persons with disabilities.

7. Basic principles of administration and finance including personnel management and budget preparation and procurement etc.

Section — III B 15 Hrs

l. Principles of Orthotics — types, indications, contra- indications, assessment (check out) uses and fitting — region wise.

2. Fabrication of simple splints and self-help devices for upper and lower extremity — indications and application.

3. Principles of Prosthetics — types, indications, contra- indications, assessment (check out), uses and fittings upper and lower extremity.

Section III C 10 Hrs

1. Principles and mechanisms of Communication including speech and hearing.

2. Common disorders of speech and hearing etiogenesis, clinical features, assessment and principles of management.

3. Principles in the management of vocational problems, including evaluation and vocational goals for people with disability.

4. Principles of rehabilitation nursing, including function of Nursing personnel and Nursing practice in rehabilitation.

Section — III D 10 Hrs

1. Identification, assessment and classification of mentally subnormal.

2. Etiogenesis and principles of management including prevention.

3. Rehabilitation of the mentally subnormal, including vocational training & home education programme.

Section — III E 15 Hrs

1. Definition, scope & importance of Activities of Daily Living (ADLs).

2. The teaching and training of (a) wheel chair activities, (b) bed activities (c) transfer activities (d) Locomotor activities (e) Self-care activities, such as toilet, eating, dressing etc.

Practical

1. Introduction, Identification & Indications for the application of various aids & appliances like common splints; orthotics & prosthetic devices.
2. Visit to some NGO's dealing with persons with disabilities.
3. Learning basic principles of pre-vocational evaluation & occupational therapy.
4. Learning basic principles of vocational training.

Books Suggested:

1. Physical Rehabilitation — assessment & Treatment — Sullivan & Schmitz — F.A. Davis.
2. Occupational Therapy and Physical dysfunction Principles, Skills & Practices — Turner, Foster & Johnson — Churchill Livingstone.
3. Hand Splitting — Wilson — W.B. Saunders.
4. Orthotics in Rehabilitation: Splinting the hand and the body — Mckee & Morgan — F.A. DaVlS.
5. Atlas of Limb Prosthetics — American Academy of Orthopaedic Surgeon - Mosby.
6. Atlas of Orthotics—American Academy of Orthopaedic Surgeon — Mosby.
7. Knisen's Handbook of Physical Medicine & Rehabilitation — Kottke & Lehmarin — W.B.Saunders.

STUDY AND EVALUATION SCHEME

BACHELOR OF SCIENCE
IN
MEDICAL LAB
TECHNOLOGY (BSC-MLT)

ABHILASHI UNIVERSITY
CHAILCHOWK, MANDI (H.P.)

Study & Evaluation Scheme
Of
Bachelor of Science in Medical Laboratory Technology (B.Sc. MLT)

Programme: Bachelor of Science in Medical Laboratory Technology (B. Sc. MLT)

Duration: Three years (06 Semesters) full time.

Medium: English

Minimum Attendance Required: 75%

Total Credits: 156

Total Marks: 3900

Assessment:

	Internal	External	Total
Theory	40	60	100
Practical	20	30	50

Internal Evaluation (Theory papers):

Mid Term-I	Mid Term-II	Attendance	Assignment / work book assignments &viva	Total
10	10	10	10	40

Evaluation Practical's/Dissertations/Project Reports:

Internal	External	Total
20	30	50

Duration of Examinations:

Internal	External
2 Hrs	03Hrs

Internal Practical Evaluation (20 marks)

The Internal evaluation done by the Internal Examiner is based on the experiment performed during the internal examination.

Experiment	Attendance	Viva+Record	Total Internal
(10 MARKS)	(05 MARKS)	(05 MARKS)	(20 MARKS)

External Practical Evaluation (30 marks)

The external evaluation done by the External Examiner is based on the experiment performed during the external examination.

Experiment	File work	Viva	Total External
10 Marks	10 Marks	10 Marks	30 Marks

Internal Theory Assessment: 40

MST	Attendance	Assignments	Total
20Marks	10 marks	10 Marks	40 marks

Question Paper Structure (Theory External Examination):

Max. Marks in each theory paper will be of 60 marks. The question paper shall consist of nine questions. Out of which first question shall be of short answer type/ MCQ/ Fill in the blank/ True False (not exceeding 50 words) and will be compulsory of 20 marks. Question No. 1 shall contain 10 parts representing all units of the syllabus weightage 2 marks each. Out of the remaining eight questions divided in four sections, the student will attempt any one question from each section carrying 10 marks each.

Admission to the Next Semester: As per the university norms.

Internship Time Period:

For evaluation of Professional Training, out of 650 marks, 250 will be awarded by the healthcare industry/ Hospital where the candidate has taken training. After taking 3 months, training from healthcare industry the candidate shall report to parent University where he/she will submit his/her project report and will attend the institute for rest of the semester period. Then at the end of the semester, he/she will appear for the Practical examinations in the presence of Internal & external Examiners.

Study & Evaluation Scheme

B.Sc. MLT- I Semester (I Year)

S.No.	Course Code	Subject	Period			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1.	BSCMLT- 101	Human Anatomy	4	0	0	4	40	60	100
2.	BSCMLT- 102	Human Physiology-I	4	0	0	4	40	60	100
3.	BSCMLT- 103	Basic Haematology & Clinical Pathology	4	0	0	4	40	60	100
4.	BSCMLT- 104	Fundamentals of Biochemistry-I	4	0	0	4	40	60	100
5.	BSCMLT- 105	Preventive Medicine & Community Health Care	4	0	0	4	40	60	100
6.	BSCMLT- 151	Practical: Human Anatomy	0	0	4	2	20	30	50
7.	BSCMLT- 152	Practical: Human Physiology	0	0	4	2	20	30	50
8.	BSCMLT- 153	Practical: Basic Haematology & Clinical Pathology-I	0	0	4	2	20	30	50
		Total	**20**	**00**	**12**	**26**	**260**	**390**	**650**

B.Sc. MLT- II Semester (I Year)

S.No.	Course Code	Subject	Period			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1.	BSCMLT-201	Diagnostic Molecular Biology	4	0	0	4	40	60	100
2.	BSCMLT-202	Human Physiology-II	4	0	0	4	40	60	100
3.	BSCMLT-203	Clinical Endocrinology & Toxicology	4	0	0	4	40	60	100
4.	BSCMLT-204	Fundamentals of Biochemistry-II	4	0	0	4	40	60	100
5.	BSCMLT-205	Fundamentals of Computer	4	0	0	4	40	60	100
6.	BSCMLT-251	Practical: Basic Haematology & Clinical Pathology-II	0	0	4	2	20	30	50
7.	BSCMLT-252	Practical: Fundamentals of Biochemistry	0	0	4	2	20	30	50
8.	BSCMLT-253	Practical: Fundamentals of Computer	0	0	4	2	20	30	50
		Total	**20**	**00**	**12**	**26**	**260**	**390**	**650**

B.Sc. MLT- III Semester (2 Year)

S.No.	Course Code	Subject	Period			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1.	BSCMLT-301	Clinical Haematology	4	0	0	4	40	60	100
2.	BSCMLT-302	Fundamentals of Microbiology-I	4	0	0	4	40	60	100
3.	BSCMLT-303	Immunology & Serology	4	0	0	4	40	60	100
4.	BSCMLT-304	Histopathology & Histotechniques -I	4	0	0	4	40	60	100
5.	BSCMLT-305	Environmental Sciences	4	0	0	4	40	60	100
6.	BSCMLT-351	Practical: Clinical Haematology	0	0	4	2	20	30	50
7.	BSCMLT-352	Practical: Fundamentals of Microbiology-I	0	0	4	2	20	30	50
8.	BSCMLT-353	Practical: Histopathology & Histotechniques	0	0	4	2	20	30	50
		Total	**20**	**00**	**12**	**26**	**260**	**390**	**650**

B.Sc. MLT- IV Semester (II Year)

S.No.	Course Code	Subject	Period			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1.	BSCMLT-401	Clinical Biochemistry	4	0	0	4	40	60	100
2.	BSCMLT-402	Fundamentals of Microbiology-II	4	0	0	4	40	60	100
3.	BSCMLT-403	Advance Diagnostic Techniques	4	0	0	4	40	60	100
4.	BSCMLT-404	Histopathology & Histotechniques -II	4	0	0	4	40	60	100
5.	BSCMLT-405	General Pathology	4	0	0	4	40	60	100
6.	BSCMLT-451	Practical: Clinical Biochemistry	0	0	4	2	20	30	50
7.	BSCMLT-452	Practical: Fundamentals of Microbiology-II	0	0	4	2	20	30	50
8.	BSCMLT-453	Practical: Immunology & Serology	0	0	4	2	20	30	50
		Total	**20**	**00**	**12**	**26**	**260**	**390**	**650**

B.Sc. MLT- V Semester (III Year)

S.No.	Course Code	Subject	Period			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1.	BSCMLT-501	Immunohematology & Blood Banking	4	0	0	4	40	60	100
2.	BSCMLT-502	Clinical Enzymology & Automation	4	0	0	4	40	60	100
3.	BSCMLT-503	Parasitology	4	0	0	4	40	60	100
4.	BSCMLT-504	Diagnostic Cytology	4	0	0	4	40	60	100
5.	BSCMLT-505	Principles of Laboratory Management	4	0	0	4	40	60	100
6.	BSCMLT-551	Practical: Immunohematology & Blood Banking	0	0	4	2	20	30	50
7.	BSCMLT-552	Practical: Clinical Enzymology	0	0	4	2	20	30	50
8.	BSCMLT-553	Practical: Parasitology	0	0	4	2	20	30	50
		Total	**20**	**00**	**12**	**26**	**260**	**390**	**650**

B.Sc. MLT- VI Semester (III Year)

S.No.	Course Code	Subject	Period			Credit	Evaluation Scheme		
			L	T	P		Internal	External	Total
1.	BSCMLT-601	Clinical Virology	4	0	0	4	40	60	100
2.	BSCMLT-602	Biostatistics & Research Methodology	4	0	0	4	40	60	100
3.	BSCMLT-651	Practical: Advance Techniques in Clinical Diagnosis	0	0	4	2	20	30	50
4.	BSCMLT-652	Practical: Clinical Virology	0	0	4	2	20	30	50
5.	BSCMLT-653	Professional Training (Three Months)	0	0	0	10	00	250	250
6.	BSCMLT-654	Project/ Training report and Presentation	0	0	0	4	00	100	100
		Total	**20**	**00**	**12**	**26**	**120**	**530**	**650**

B.Sc. MLT- I Semester (I Year)

Course Name: Human Anatomy

Course Code: BSCMLT-101

L	T	P	C
4	0	0	4

Unit -I

Human body parts, Structure, Terminology and General Plan of the Body,Terms of Location and Position, Body Cavities and Their Membranes, Dorsal cavity, Ventral cavity, Planes and Sections.

Cells: Structure, function and location, Prokaryotic and eukaryotic cells, Cell organelles, Cell division.

Tissues: Types, Structure, Location and Function of Epithelial Tissue, Connective Tissue, Muscle Tissue, Nerve Tissue, Membranes, Glandular tissue.

Unit-II

The Integumentary System: structure and function of The Skin, Subcutaneous Tissue.
Musculoskeletal System: Basic anatomy of important muscles and bones and their functions.

Respiratory system: Basic anatomy of nose, larynx, trachea, bronchi and lungs.

Digestive system: basic anatomy of esophagus, stomach, small intestine, large intestine, liver, gall bladder, pancreas.

Unit-III

Cardiovascular system: Basic anatomy of heart and important blood vessels Brief introduction about Lymphatic System.

The Nervous System: Basic anatomy of brain and spinal cord, meninges and cerebrospinal fluid, Cranial Nerves

Unit-IV
Endocrine System: Brief anatomy of Pituitary, Thyroid, Parathyroid, Pancreas, Adrenal

Special Senses: Basic anatomy of eye, ear and nose

Genitourinary system: Basic anatomy of kidney and associated organs, male reproductive organs, female reproductive organs

Suggested Readings:

1. Chaurasia B D, (2016), Human Anatomy, 7th edition, CBS publishers
2. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition, Elsevier Publications
3. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley Publications

B.Sc. MLT- I Semester (I Year)

Course Name: Human Physiology-I

Course Code: BSCMLT-102

L	T	P	C
4	0	0	4

Unit-I

Cell physiology: Structure, membrane, transport across cell membrane, Active, Passive, Organization of the Body, Body Composition, Body Fluid Volumes and its measurement, Diffusion, Osmosis, Tonicity, Homeostasis.

Blood-composition, function, cellular component & their function, haemoglobin & anaemia, blood groups and coagulation.

Unit-II

Lymphatic system: Composition & function of lymph, lymphatic tissue, Immunity with the role of thymus.

Cardiovascular system: heart structure and function, arteries, veins and capillaries, cardiac cycle, heart sounds, heart rate, blood pressure, mechanism of circulation, definition of hypertension & shock.

Unit-III

Respiratory system: parts of respiratory system, mechanism of respiration, pulmonary function, pulmonary circulation, lungs volume, Gas transport between lungs and tissues.

Definition of hypoxia, dyspnoea, cyanosis, asphyxia and obstructive airways diseases.

Unit- IV

Gastrointestinal physiology: Organs of GIT, structure & function, secretion, digestion, absorption and assimilation, gastrointestinal hormones, physiology of digestion of carbohydrates, proteins & lipids, Structure & function of liver, spleen, gall bladder & pancreas, Jaundice, Cirrhosis & Pancreatitis.

Suggested Readings:

1. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition,Elsevier Publications
2. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA
3. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications
4. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier
5. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley publications

B.Sc. MLT- I Semester (I Year)

Course Name: Basic Haematology and Clinical Pathology Paper

Code: BSCMLT-103

L	T	P	C
4	0	0	4

Unit- I

Introduction to Haematology, Organization of laboratory and safety measures, Biomedical waste management, BMW – Segregation, collection, transportation, treatment and disposal (including colour coding), Personal Protective Equipment.
The Microscope and its parts, care and maintenance, monocular and binocular microscope, Corrective Actions in Light Microscopy, Important equipment used in haematology lab.

Unit-II

Haematopoiesis, Erythropoiesis, Leucopoiesis, Thrombopoiesis, Mechanism of hemopoiesis, stages of cell development, sites of hemopoiesis, Blood and its composition, plasma and its composition, RBC, WBC, Platelets, Anticoagulants, mechanism of action, types and uses, merits and demerits, effect of storage on blood cells.

Collection, Transport, Preservation, and Processing of various clinical Specimens, Blood collection for hematological investigations, Venipuncture, Capillary blood, Arterial blood, Vaccutainer, its type and uses, sample acceptance and rejection criteria.

Unit-III

Hemoglobin, structure ,function and types , Hemoglobinometry , Haemoglobin estimation by various methods, advantages and disadvantages, physiological and pathological variations on blood parameters.

Hemocytometry, visual and electronic method, neubauer counting chamber, RBC count, WBC count, Platelets count, absolute eosinophil count, principle, procedure, calculation , significance, precautions involved during counting, absolute count of various WBCs. Physiological and pathological changes in values. Complete blood count, determination by automated method and significance of each parameter,
Reticulocyte count, routine examination of CSF, semen, sputum and stool.

Unit-IV

Preparation of thin and thick smears, staining of smears, Romanowsky dyes, preparation and staining procedures of blood smears, Morphology of normal blood cells and their identifications, differential leucocytes count by manual and automated method, physiological and pathological variations in value.
Erythrocyte sedimentation rate, manual and automated method, factor affecting ESR, packed cell volume, red cell indices (MCV, MCH, MCHC), Physiological and pathological variations in value

Mechanism of coagulation, coagulation factors, Bleeding time, clotting time, platelet count, protamine sulphate test, clot retraction test

Suggested Readings:

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications
2. Singh Tejinder,(2014),Atlas & Textbook of Haematology,3rd edition,Avichal Publications
3. Ochei J & Kolhatkar A(2000),Medical Laboratory Science: Theory & Practice, 3rd edition,Mcgraw Hill Education
4. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill
5. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications

B.Sc. MLT- I Semester (I Year)

L	T	P	C
4	0	0	4

Course Name: Fundamentals of Biochemistry-I

Course Code: BSCMLT-104

Unit-I

Introduction to Clinical Biochemistry and role of Medical Lab Technologist , ethics, responsibility, safety measure and hazards in clinical biochemistry lab and first aid in laboratory accidents.
Glassware's & plastic-ware's used in lab, calibration of volumetric apparatus, cleaning& care and maintenance.
Weighing balance, Hotplate, Magnetic stirrer, Centrifuges, Incubator, Hot air oven, Colorimeter, Spectrophotometer, Water distillation plant, Deionizers Henderson Hassel balch equation, pH paper, pH meter, method of pH measurement.

Unit-II

Preparation of solution and reagents, normal solution, molar solutions, percent solution, buffer solution, dilutions, w/v, v/v, standard solution, aqueous solutions, concepts of acid and base.
Units of measurement: SI unit, reference range, conversion factor, units for measurement of bio metabolite, enzymes, protein, drugs, hormones, vitamins.

Unit-III

Specimen collection and processing of blood, urine & CSF, separation of serum and plasma, deproteinization of sample, Handling of specimens for testing, preservation of specimen, transport of specimen, factors affecting the clinical results, effect of storage on sample.

Unit- IV

Physical, chemical and microscopic examination of urine, Bence Jones Proteinuria and its clinical significance, qualitative test of urine for reducing sugars, protein, ketone bodies, bile Salt, bile pigments, urobilinogen, occult blood, uric acid, urea and Creatinine, quantitative estimation of 24 hrs urine for protein and their clinical significance.

Suggested Readings:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers

B.Sc. MLT- I Semester (I Year)

Course Name: Preventive Medicine & Community Health Care

Course Code: BSCMLT-105

L	T	P	C
4	0	0	4

Unit- I

Definition and concepts of health, important public health acts, health problems of developed and developing countries, environment and health, basic emergency care and first aid.

Epidemiology, aetiology, pathogenesis and control of communicable disease like malaria, cholera, tuberculosis, leprosy, diarrhoea, poliomyelitis, viral hepatitis, measles, dengue, rabies, AIDS.

Unit-II

National Health Policy and Programs, DOTS, National AIDS control programme, National cancer control programme, universal immunization programme etc.

Nutrition and major nutritional problems, etiology, manifestations and prevention, components of RCH care. Examination of water, food adulteration, role of regular exercise and yoga in prevention and management of various diseases.

Unit-III

Population, problems of population growth, birth rates, death rates, fertility rates, MMR.,CPR, Approaches and methods of contraception, Reproductive and child health. Hygiene and sanitation, sanitation barriers, excreta disposal.

Unit-IV

Immunization programme, various national immunization programs and vaccine schedules, Family welfare and planning, communicable and non-communicable disease.

Health planning in India including various committees, national health policy and health goals. Objectives and goals of WHO, UNICEF, Indian Red Cross Society, UNFPA, FAO, ILO.

Suggested Readings:

1. K.Parks & Sunder Lal, (2015),Textbook of Preventive Social Medicine ,3rd edition, Bhanot Publications
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications

B.Sc. MLT-I Semester (I Year)

BSCMLT-151 (Practical: Human Anatomy)

1. Demonstration of Major organs through models and permanent slides.
2. Demonstration of parts of circulatory system from models.
3. Demonstration of parts of respiratory system from models.
4. Demonstration of digestive system from models.
5. Demonstration of excretory system from models.
6. Demonstration of nervous system from models.
7. Structure of eye and ear
8. Demonstration of structural differences between skeletal, smooth and cardiac muscles.
9. Demonstration of various bones
10. Demonstration of various joints
11. Demonstration of various parts of male & female reproductive system from models

BSCMLT-152 (Practical: Human Physiology)

1. To measure pulse rate
2. To measure blood pressure
3. Demonstration of ECG
4. To perform Hemoglobin by Sahli's Method
5. To perform Hemoglobin by CMG method.
6. Haemoglobin by CMG method.
7. To perform Total RBC count.
8. To perform total leucocyte count.
9. To perform differential leucocyte count.
10. To perform PCV
11. To calculate Red cell indices.

BSCMLT-153 (Practical: Basic Haematology & Clinical Pathology-I)

1. To learn general laboratory safety rules.
2. To demonstrate glasswares, apparatus and plasticwares used in laboratory.
3. To prepare EDTA, Sod. Citrate & Sod. Fluoride anticoagulants and bulbs/vials used in laboratory.
4. Demonstration of Vaccutainer.
5. To demonstrate method of blood collection.
6. To separate serum and plasma.
7. Demonstration of microscope
8. Determination of Hemoglobin by various methods.
9. Determination of TLC
10. Preparation of thick and thin smear
11. Determination of DLC
12. Determination of Total RBC
13. Determination of total platelet count
14. Determination of absolute leucocyte count

B.Sc. MLT- II Semester (I Year)

Course Name: Diagnostic Molecular Biology

Paper Code: BSCMLT-201

L	T	P	C
4	0	0	4

Unit-I

Nucleic Acids, DNA, RNA, composition, structure, types, denaturation and renaturation of DNA, chemistry of DNA synthesis, general principles of replication, enzyme involved in DNA replication – DNA polymerases, DNA ligase, primase, telomerase and other accessory proteins.

Unit II

Basic transcription apparatus, Initiation, elongation and termination of transcription, Eukaryotic Transcription of mRNA, tRNA and rRNA, types of RNA polymerases, transcription factors Introduction of translation

Nucleic acid amplification testing, PCR, Principle, Types, applications, Thermal cycler, RT PCR, reverse transcriptase PCR, Nested PCR

Unit-III

Blotting techniques, southern blotting and Western blotting
Introduction to chromosomes, its structure and disorder, Karyotyping, Chromosomal studies in hematological disorders (PBLC and Bone marrow), FISH

Unit-IV

Radioisotopes and its application in measurement of blood volume, determination of red cell volume and plasma volume, red cell life span, platelet life span, radiation hazards and its prevention disposal of radioactive material
Introduction and applications of Flow cytometry, Stem cell banking, Prenatal Diagnosis

Suggested Readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman

B.Sc. MLT- II Semester (I Year)

L	T	P	C
4	0	0	4

Course Name: Human Physiology-II

Course Code: BSCMLT-202

Unit- I

Organs of Excretory System: Kidneys, Nephron, Mechanism of Excretion, Urine formation (Glomerular filtration and Tubular reabsorption), Electrolytes: their balances and imbalances Introduction of acidosis and alkalosis

Muscle nerve physiology, types of muscles, their gross structural and functional difference with reference to properties

Unit-II

Nervous system- general organization of CNS, function of important structure and spinal cord, neuron, nerve impulse, type of nerves according to function, Autonomic nervous system-organization & function

Special senses-general organization & functions

Unit- III

Endocrine System: Brief introduction about endocrine glands and their secretion, common endocrinological disorder such as diabetes mellitus, hyper & hypothyroidism, dwarfism, gigantism, tetany.

Unit-IV

Reproductive System: male & female reproductive organs, sex hormones, secondary sexual characteristics, puberty, spermatogenesis, oogenesis, menstrual cycle, pregnancy, menopause, contraceptive measures.

Suggested Readings:

1. Ross & Wilson,(2014),Anatomy & Physiology in health & illness,11th edition,Elsevier Publications
2. Sujit Chaudhury,(2011),Concise Medical Physiology,6th edition, NCBA
3. Sembulingam k,(2012),Essentials of Medical Physiology,6th edition, Jaypee Publications
4. Guyton and Hall,(2011) Textbook of Medical Physiology,12th Edition,Saunder/Elsevier
5. Gerard J. Tortora and Bryan H.Derrickson,(Principles of Anatomy and Physiology,14th edition,Wiley publications

B.Sc. MLT- II Semester (I Year)

Course Name: Clinical Endocrinology & Toxicology

Paper Code: BSCMLT-203

L	T	P	C
4	0	0	4

Unit-I

Hormones, Classification of hormones, organs of endocrine system their secretion and function, regulation of hormone secretion, Mechanism of action

Unit-II

Thyroid function test: Thyroid hormones, biological function, hypothyroidism, hyperthyroidism, Determination of T_3, T_4, TSH, FT_3, FT_4, TBG, Disorder associated with thyroid dysfunction.

Unit-III

Infertility profile: LH, FSH, TSH, Estrogen, Progesterone,Total Testosterone, Free testosterone,DHEA-S, 17- Ketosteroids, Prolactin, their estimation and clinical significance, reference range, hypo and hyper secretion, Triple Test

Unit-IV

Growth hormone, ACTH, Aldosterone, Cortisol their estimation and clinical significance, reference range, hypo and hyper secretion

Introduction of Toxicology, Alcohol poisoning, Lead poisoning, Zinc poisoning, Mercury poisoning drugs abuse, screening procedure for drug screening, Spot tests, hair and urine test, Immunoassay for drugs.

Suggested readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, WileyPublications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
4. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
5. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
6. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
7. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman

B.Sc. MLT- II Semester (I Year)

Course Name: Fundamentals of Biochemistry -II

Course Code: BSCMLT-204

L	T	P	C
4	0	0	4

Unit-I

Carbohydrates: Classification, function, importance, structure, digestion & absorption.
Proteins: Classification, function, importance, structure, digestion & absorption.
Amino acids: Classification, Structure, Properties and Biological functions.

Unit-II

Enzymes : Definition, Classification of enzyme, Cofactor & Coenzymes, Concept of active sites and general mode of action of enzymes, units for measuring enzyme activity, factor affecting enzyme activity, factor responsible for abnormal enzyme secretion

Unit-III

Lipids: Classification of lipids, Classification of fatty acids, Saturated & Unsaturated fatty acids, their biological functions, digestion and absorption, introduction of lipoproteins

Nucleic acids: Structure, Function and types of DNA and RNA, Nucleotides, Nucleosides, Nitrogen bases, purines and pyrimidines and role of Nucleic acid.

Unit-IV

Vitamins: classification, function and disease associated with vitamins.
Minerals and ions: Requirement, function and biological importance of Calcium, Iron, Iodine, Zinc, Phosphorus, Copper, Sodium and Potassium

Suggested Readings:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers

B.Sc. MLT- II Semester (I Year)

L	T	P	C
4	0	0	4

Course Name: Fundamentals of Computer

Course Code: BSCMLT-205

Unit-I

Introduction to computer: Introduction and characteristics of computer, block diagram of computer, generations of computer, computer languages. Input output devices: Input devices(keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices(monitors, pointers, plotters, screen image projector, voice response systems).

Processor and memory: The Central Processing Unit (CPU), main memory. Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices.

Unit-II

Introduction of windows: History, features, desktop, taskbar, icons on the desktop, operation with folder, creating shortcuts, operation with windows (opening, closing, moving, resizing, minimizing and maximizing, etc.).

Internet and its Applications: definition, brief history, basic services (E-Mail, File Transfer Protocol, telnet, the World Wide Web (WWW)), www browsers, use of the internet.

Application of Computers in clinical settings.

Unit-III

Introduction to MS-Word: introduction, components of a word window, creating, opening and inserting files, editing a document file, page setting and formatting the text, saving the document, spell checking, printing the document file, creating and editing of table, mail merge.

Introduction to Excel: introduction, about worksheet, entering information, saving workbooks and formatting, printing the worksheet, creating graphs.

Introduction to power-point: introduction, creating and manipulating presentation, views, formatting and enhancing text, slide with graphs.

Unit-IV

Introduction of Operating System: introduction, operating system concepts, types of operating system, Computer networks: introduction, types of network (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Electronic Payment Systems: Introduction, Types of Electronic Payment Systems, Digital Token-Based, Electronic Payment Systems, Smart Card and Electronic Payment Systems, Credit Card- Based Electronic Payment Systems, Risk and Electronic Payment Systems.

Suggested Readings:

1. P.K.Sinha,(2006), Fundamentals of Computers,6th edition SPB Publications
2. Sanders, D.H., Computers Today,4th edition, McGraw Hill.
3. Trainer, T.N., Computers, McGraw-Hill.
4. Anshuman Sharma,(2016), Information technology ,3rd edition,Lakhanpal Publishers

Practical syllabus

B.Sc. MLT-II Semester (I Year)

BSCMLT-251 (Practical: Basic Haematology & Clinical Pathology-II)

1. To perform ESR by Various methods.
2. To perform PCV
3. To determine red cell indices
4. To perform routine stool examination
5. To perform bleeding time
6. To perform clotting time
7. To perform blood grouping by slide method
8. To perform blood grouping by tube method
9. To demonstrate cell counter
10. To demonstrate coagulometer.

BSCMLT-252 (Practical: Fundamentals of Biochemistry)

1. To identify carbohydrates in given solution by various methods.
2. To determine protein by Biuret method.
3. To perform protein test by various methods.
4. Physical examination of urine
5. Urine sugar determination by Benedict's method.
6. Protein by heat and acetic method
7. Bile salt, Bile pigments and Urobilinogen determination
8. Determination of Ketone bodies
9. Determination of various parameters of urine by uristik method.
10. Preparation of hemolysate

BSCMLT-253 (Practical: Fundamentals of Computer)

1. Using basic DOS commands.
2. Using external DOS commands
3. Creating an email account
4. Using web browser for searching and surfing.
5. Creating and formatting a document in MS office
6. Using autocorrect, auto text and spell check operation in MS office.
7. Create tables in MS Word.
8. Inserting different kinds of object in MS word.
9. Use main merge options in MS office.
10. Create a Excel work sheet with following options rows and columns alignment.
11. Using excel formulas.
12. Create a graph with available data in MS excel.
13. Create a PPT presentation using auto content wizard.
14. Use Clip art animation effects and word art galleries in presentations.

B.Sc. MLT- III Semester (II Year)

L	T	P	C
4	0	0	4

Course Name: Clinical Haematology

Paper Code: BSCMLT-301

Unit –I

RBCs, formation, morphology, cytoskeleton, anisocytosis, poikilocytosis, metabolism, role of 2, 3-BPG and oxygen dissociation curve.

Anaemia and its classification, Morphological and etiological, pathogenesis, laboratory investigations and management,

Iron deficiency anaemia, metabolism of iron, pathogenesis, laboratory investigations and management, principle and procedure of special test

Megaloblastic anaemia, pernicious anaemia, pathogenesis, laboratory investigations

Unit-II

Haemoglobin, its synthesis and types, normal and abnormal hemoglobins, extravasccular and intravascular hemolysis.

Haemolytic anaemia, pathogenesis and laboratory investigations, principle and procedure of special test, G-6-PD

Unit –III

Leukopoiesis , Stages of Leukocyte Maturation, Features of Cell Identification, leucocytosis and leucocytopenia , neutrophilia , eosinophilia, basophilia, monocytosis, lymphocytosis, neutropenia, lymphopenia, causes and significance, toxic granulation, Morphological alterations in neutrophil, effect of HIV on blood cell parameter

Overview of hemostasis and coagulation, Stages of platelets development, Primary and Secondary hemostasis, Role of platelets, Role of coagulation factors, Coagulation inhibitory system, Fibrinolysis

Unit-IV

General blood picture, estimation of iron, TIBC, Transferrin, Ferritin, Plasma haemoglobin,Vit.B12, Folic acid, FIGLU test, Schiling test, Parietal cell antibodies,G-6-PD, Osmotic fragility test, Heinz bodies, Perls Prussian staining, Platelet count, Platelet aggregation test, PT, INR APTT, Mixing experiments in PT and APTT, Thrombin time.

Suggested Readings:

1. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill
2. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications
3. Wintrobe's Clinical Haematology,(2014),13th edition, Lippincott Williams & Wilkins
4. De Gruchy's Clinical Haematology in Medical Practice,(2012),Sixth edition, Wiley Publications
5. Dacie & Lewis Practical Haematology, (2011),11th edition, Elsevier Publications

B.Sc. MLT- IIIrd Semester (IInd Year)

L	T	P	C
4	0	0	4

Course Name: Fundamentals of Microbiology-I

Paper Code: BSCMLT-302

Unit-I

Development of microbiology as a discipline, Contributions of Anton von Leeuwenhoek, Louis Pasteur, Robert Koch, Joseph Lister, Alexander Fleming, Edward Jenner

Introduction to bacterial taxonomy, Classification of Bacteria, Morphology based on size, shape, arrangement, motility, flagella, spores, capsules, cell wall, plasma membrane, pili, ribosomes.

Unit-II

Microscopy: Study of compound microscope – magnification, numerical aperture, resolution and components of microscope. Dark ground illumination, care of microscope and common difficulties micrometry. Bright Field Microscope, Dark Field Microscope, Phase Contrast Microscope, Fluorescence Microscope, Transmission Electron Microscope, Scanning Electron Microscope

Unit-III

Cell size, shape and arrangement, cell-wall, composition and detailed structure of Gram-positive and Gram-negative cell walls, Cell Membrane: Structure, function and chemical composition of bacterial cell membranes. Cytoplasm: Ribosome, mesosomes, inclusion bodies, nucleoid, chromosome and plasmids, Endospore: Structure, formation

General safety measures used in Microbiology laboratory, Sterilization and disinfection: Various physical methods of sterilization – heat, UV radiation, ionizing radiation, filtration, characters affecting sterilization, auto clave control and sterilization indicators.

Unit-IV

Biomedical waste management in a Medical Microbiology laboratory: Types of the waste generated, Segregation, Treatment, Disposal. Antiseptics & Disinfectants: Definition, types and properties, mode of action, use, qualities of good disinfectants

Chemical disinfectants – phenol and its compounds, alcohol, halogen, heavy metals and quaternary ammonium compounds, aldehyde, gaseous compound. use and abuse of disinfectants. precautions while using the disinfectants.

Suggested Readings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education
6. Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.

B.Sc. MLT- III Semester (II Year)

Course Name: Immunology & Serology

Paper Code: BSCMLT-303

L	T	P	C
4	0	0	4

Unit-I

Immune system, innate and adaptive immunity; active and passive immunity; primary and secondary immune response. Cell and organs of immune system, Phagocytosis.

Antigens and haptens: Properties, foreignness, molecular size, heterogeneity, B and T cell epitopes; T dependent and T independent antigens.

Antibodies: Historical perspective of antibody structure; structure, function and properties of the antibodies; different classes, subclasses and biological activities of antibodies, Introduction of hybridoma technology, monoclonal antibodies, polyclonal antibody

Unit-II

Mechanism of humoral and cell mediated immune response, Major Histocompatibility Complex, organization of MHC and inheritance in humans; Antigen presenting cells, antigen processing and presentation, Complement system and complement fixation test.

Laboratory tests for demonstration of antigen – antibody reaction such as agglutination, precipitation, ELISA, RIA, Immunofluorescence, Rheumatological diseases, etiology and pathogenesis and lab investigations

Unit- III

Western blotting, Immunodiffusion, Immunoelectrophoresis, Hypersensitivity and its types Introduction to Allergy and its laboratory test

Introduction of transplant immunology, graft rejection, tissue typing for kidney and bone marrow transplant, Laboratory test for transplant.

Unit –IV

Autoimmune disorders, pathogenesis, parietal cell antibody, anti sperm antibody, lupus anticoagulants, anti mitochondrial antibody, ANA, ds DNA, HLA-B27, ASMA, anti CCP

Immunological disorders: primary and secondary immunodeficiency, SCID, AIDS,
Tumour, types of tumours, Various Tumour Markers, their significance and method of estimation.

Vaccines, classification and applications, Active and passive immunization, Immunoprophylaxis schedule in neonates, children and in pregnancy

Suggested Readings:

1. *Abbas AK, Lichtman AH, Pillai S. (2007). Cellular and Molecular Immunology. 6th edition Saunders Publication, Philadelphia.*
2. *Delves P, Martin S, Burton D, Roitt IM. (2006). Roitt's Essential Immunology.11th edition Wiley-Blackwell Scientific Publication, Oxford.*
3. *Goldsby RA, Kindt TJ, Osborne BA. (2007). Kuby's Immunology. 6th edition W.H. Freeman and Company, New York.*
4. *Murphy K, Travers P, Walport M. (2008). Janeway's Immunobiology. 7th edition Garland Science Publishers, New York.*
5. *Peakman M, and Vergani D. (2009). Basic and Clinical Immunology. 2nd edition Churchill Livingstone Publishers, Edinberg.*
6. *Richard C and Geiffrey S. (2009). Immunology. 6th edition. Wiley Blackwell Publication.*

B.Sc. MLT- III Semester (II Year)

Course Name: Histopathology & Histotechniques-I

Paper Code: BSCMLT-304

L	T	P	C
4	0	0	4

Unit-I

Introduction of histopathology, cytology & histotechniques, laboratory organization, care & maintenance of equipments used in histotechnology lab ,Safety measures in histotechnology lab Reception, Recording, Labelling and transportation of tissue specimens,Basic concepts of fixation and various types of fixative used in histopathology and cytopathology

Unit-II

Tissue and its types, Location and function,Grossing of tissues, whole mount, sections, smears, tissue processing and its steps, manual and automated method, components & principle of automatic tissue processor

Decalcification, decalcification methods, types of decalcifying fluid, Processing of bones and teeth, Embedding media, its type and properties

Unit-III

Microtome, its type and working, various type of microtome,Microtome knives, its type and knife sharpening,Section cutting, fault and remedies,Section adhesive

Cryostat, frozen sections of fresh, fixed and unfixed tissue, freeze drying, rapid frozen sections and staining for emergency diagnosis

Unit-IV

Dye chemistry, Stains and dyes, natural dye, acidic dye, basic dye, neutral dyes, fluorescence dye, mordant, accelerators, accentuators, metachromasia, metachromatic dyes

Progressive, regressive, vital, supravital staining, types of hematoxylin, Haematoxylin and eosin staining, use of control sections in tissue staining, mounting and mounting media, advantages & disadvantages, refractive index

Suggested Readings:

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications
4. C F A Culling,(1974),Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition,Butterworths Publishers

B.Sc. MLT- III Semester (II Year)

L	T	P	C
4	0	0	4

Course Name: Environmental Sciences

Course Code: BSCMLT-305

Unit-I

Ecology and Environment: Concept of an Ecosystem-its structure and functions, Energy Flow in an Ecosystem, Food Chain, Food Web, Ecological Pyramid& Ecological succession, Study of following ecosystems: Forest Ecosystem, Grass land Ecosystem & Aquatic Ecosystem & Desert Ecosystem.
Natural Resources: Renewable & Non-Renewable resources; Land resources and land use change; Land degradation, Soil erosion & desertification. **Deforestation**: Causes & impacts due to mining, Dam building on forest biodiversity & tribal population. **Energy Resources**: Renewable & Non-Renewable resources, Energy scenario & use of alternate energy sources, Case studies.

Unit-II
Biodiversity: Hot Spots of Biodiversity in India and World, Conservation, Importance and Factors Responsible for Loss of Biodiversity, Biogeographical Classification of India
Environmental Pollutions: Types, Causes, Effects & control; Air, Water, soil & noise pollution, Nuclear hazards & human health risks, Solid waste Management; Control measures of urban & industrial wastes, pollution case studies

Unit III

Environmental policies & practices: Climate change, Global Warming, Green house Effect, Ozone Layer, Photochemical Smog, Acid Rain.
Environmental laws: Environment protection Act; air prevention & control of pollution act, Water Prevention & Control of Pollution Act, Wild Life Protection Act, Forest Conservation Acts, International Acts; Montreal & Kyoto Protocols & Convention on biological diversity, Nature reserves, tribal population & Rights & human wild life conflicts in Indian context

Unit IV

Human Communities & Environment: Human population growth;impacts on environment, human health & welfare, Resettlement & rehabilitation of projects affected person: A case study, Disaster Management; Earthquake, Floods & Droughts, Cyclones & Landslides, Environmental Movements; Chipko, Silent Valley, Vishnoi's of Rajasthan, Environmental Ethics; Role of Indian & other regions & culture in environmental conservation, Environmental communication & public awareness; Casestudies.

Field Work:

1. Visit to an area to document environmental assets; river/forest/flora-fauna etc.
2. Visit to a local polluted site: urban/ rural/industrial/agricultural.
3. Study of common plants, insects, birds & basic principles of identification.
4. Study of simple ecosystem; pond, river etc.

Suggested Readings:

1. "Environmental Chemistry", De, A. K., New AgePublishers Pvt.Ltd.
2. "Introduction to Environmental Engineeringand Science", Masters, G. M., PrenticeHall India Pvt. Ltd.
3. "Fundamentals of Ecology",Odem, E. P., W. B. Sannders Co.
4. "BiodiversityandConservation",Bryant, P. J., Hypertext Book
5. "Textbook of Environment Studies", Tewari, Khulbe&Tewari,I.K. Publication

Practical syllabus

B.Sc. MLT- III Semester (II Year)

BSCMLT-351 (Practical: Clinical Haematology)

1. Determination of haemoglobin by various methods.
2. Determination of Total RBC count.
3. Determination of PCV
4. Determination of red cell indices
5. Demonstration of hypochromic microcytic slide.
6. General blood picture
7. Determination of G-6-PD
8. Differential Leucocute Count.
9. Absolute leucocyte count
10. Demonstration of toxic granulation of neutrophil
11. To perform PT and Calculate INR
12. To perform APTT
13. To perform sickling test
14. Determination of Plasma Hemoglobin
15. To perform reticulocyte count.

BSCMLT-352 (Practical: Fundamentals of Microbiology-I)

1. Demonstration of Microscope and its parts
2. Demonstration of glassware used in microbiology.
3. Demonstration of autoclave and sterilization of glass wares.
4. Demonstration of Hot air oven and sterilization of glass wares.
5. To perform Gram staining
6. To perform Acid fast staining (Zeihl Neelsen staining)
7. To perform Indian ink staining
8. To perform Hanging drop method
9. Demonstration of capsule
10. Staining of bacterial spores
11. To demonstrate agglutination reaction.
12. To perform RA test
13. To perform WIDAL test
14. To perform RPR test.
15. To perform CRP test.

BSCMLT-353 (Practical: Histopathology & Histotechniques)

1. Demonstration of glasswares and equipment used in histopathology lab.
2. To prepare alcohol of different concentration.
3. To prepare formalin from stock solution.
4. To sharp knife by honing and stropping.
5. Grossing of tissue
6. To perform tissue processing by manual method.
7. To perform section cutting of paraffin embedded tissue.
8. To fix the smear on glass slide.
9. To perform hematoxylin and eosin staining.
10. Mounting and preservation of slide.

B.Sc. MLT- IV Semester (II Year)

Course Name: Clinical Biochemistry

Paper Code: BSCMLT-401

L	T	P	C
4	0	0	4

Unit-I

Liver function tests: Introduction, bile pigment metabolism, jaundice and its types, Estimation of Bilirubin, Bile salt, Bile pigments, urobilinogen, SGPT/ALT, SGOT/AST, ALP, GGT, Viral Hepatitis

Unit-II

Renal Function Test: Introduction, Glomerular filtration rate, renal threshold, Urea, Creatinine, Uric Acid, Sodium, Potassium, Creatinine Clearance test, Urea clearance test, examination of renal calculi

Cardiac Function test: Introduction, myocardial infarction, CHD, Biochemical markers of Heart diseases, Role of laboratory in monitoring heart diseases

Unit-III

Gastric function Test: Introduction, gastric secretions, total and free acid, stimulation test, physical & chemical examination of gastric secretions.

Tumour markers: Introduction, types, applications

Unit-IV

Acid base balance, action of buffer system, Hb buffers, respiratory and metabolic acidosis, respiratory and metabolic alkalosis, arterial blood gas analysis, blood gas analyzer.

Suggested Readings:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications

B.Sc. MLT- IV Semester (II Year)

Course Name: Fundamentals of Microbiology-II

Paper Code: BSCMLT-402

L	T	P	C
4	0	0	4

Unit-I

Lab organization, management, recording of results and quality control in Medical Microbiology Lab. Safety measures in Microbiology Laboratory, Occurrence of lab infections, route of infections in laboratory, safety measures precaution in use of pathogens in teaching.

Host pathogen interaction: Definitions - Infection, Invasion, Pathogen, Pathogenicity, Virulence, Toxigenicity, Carriers and their types, Opportunistic infections, Nosocomial infections. Transmission of infection

Unit-II

Principle, working, use, care & maintenance of Laminar air flow, Centrifuge, Autoclave, hot air Oven, Incubator, Colony Counter, Muffle Furnace, Mac-intos Field-jar etc.
Sterility testing of I/v fluids, Collection, transportation and processing of I/v fluids for bacterial contamination, Recording the result and interpretation

Unit-III

Hospital acquired infection, Specimen collection from patients, clinics and hospitals, Specimen collection for epidemiological investigations, role of microbiology laboratory in control of nosocomial infection

Unit-IV

Antimicrobial agents and Antibiotics: Introduction, mechanism of action, classification and uses, Antibiotic susceptibility testing in bacteriology, Culture medium used for Antibiotic susceptibility testing, Preparation and standardization of inoculums, Control bacterial strains, Choice of antibiotics MIC and MBC: Concepts and methods for determinationVarious methods of Antibiotic susceptibility testing with special reference to Stokes and Kirby-Bauer method

Suggested Readings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

B.Sc. MLT- IV Semester (II Year)

Course Name: Advance Diagnostic Techniques

Paper Code: BSCMLT-403

L	T	P	C
4	0	0	4

Unit-I

Chromatography, its principle, types and applications.

Paper Chromatography, Thin layer chromatography, HPLC, Gas liquid chromatography, Ion exchange chromatography and their application in diagnosis.

Unit-II

Basic Principle of electrophoresis, Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE, Agarose gel electrophoresis, buffer systems in electrophoresis.

Electrophoresis of proteins and nucleic acids, haemoglobin, immunoglobulin's, isoenzymes Applications of electrophoresis in clinical diagnosis.

Unit-III

Centrifugation, fixed angle and swinging bucket rotors , RCF and sedimentation coefficient, differential centrifugation, density gradient centrifugation andUltracentrifugation.

Unit-IV

Radioisotopes, Radioactivity, instruments for radioactivity measurement, applications of radioisotopes in clinical biochemistry

Immunoassay: ELISA, RIA, FIA, FACS and their applications in clinical diagnosis.

Suggested Readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. Wilson & Walker, Practical Biochemistry,2nd edition

B.Sc. MLT- IV Semester (II Year)

L	T	P	C
4	0	0	4

Course Name: Histopathology & Histotechniques-II

Paper Code: BSCMLT-404

Unit-I

Staining of carbohydrates: preparation of Schiff reagent, PAS staining, Alcian blue, staining of glycogen, Amyloid, other staining method

Connective tissue & its staining: Trichrome staining, verhoeff stain, Weigert Resorcin stain, Gordon's and Sweet stain, Gomori's method, von Geison stain, PTAH stain

Unit-II

Demonstration of minerals and pigments in tissue sample, Demonstration and identification of lipids, Demonstration of enzymes, diagnostic application and the demonstration of phosphatases, dehydrogenases, oxidases and peroxidases, Demonstration of microorganism on tissue specimens, Bacteria, AFB, Actinomyces, spirochetes, fungi

Unit-III

Demonstration of nucleic acids, Processing and staining of bone marrow sample.
Fixation, Processing and section cutting of bones, eye ball, Techniques in neuropathology: Neurons staining, Myelin, Neuropathology lab specimen handling, Demonstration of sex chromatin, Museum techniques

Unit-IV

Electron microscopy: Principle and working, fixation, processing and staining of tissue,

Fluorescence Microscope: Principle and working, Immunohistochemistry: principle, types,

applications, antigen retrieval, APAAP, PAP Staining, Quality control in histopathology

Suggested Readings:

1. Bancroft's Theory and Practice of Histological Techniques, 7th Edition, Elsevier Publications
2. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications
3. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications
4. C F A Culling,(1974),Handbook of Histopathological and Histochemical Techniques: Including Museum Techniques,3rd edition,Butterworths Publishers

B.Sc. MLT- IV Semester (II Year)

L	T	P	C
4	0	0	4

Course Name: General Pathology

Paper Code: BSCMLT-405

Unit I

Introduction & History of pathology, Basic definitions and familiarization with the common terms used in pathology, Causes and mechanisms of cell injury, reversible and irreversible injury, Introduction of hyperplasia, hypoplasia, hypertrophy, atrophy, metaplasia, necrosis and apoptosis

Unit II

General features of acute and chronic inflammation: Vascular changes, cellular events, Cells and mediators of inflammation, Phagocytosis and its mechanism

Tissue Renewal and Repair, healing and fibrosis, cirrhosis, introduction of oedema, hyperaemia, congestion, haemorrhage, haemostasis, thrombosis, embolism, infarction, shock and hypertension.

Unit III

Protein energy malnutrition, deficiency diseases of vitamins and minerals, nutritional excess and imbalances. Role and effect of metals (Zinc, Iron and Calcium) and their deficiency diseases, Aetiology and pathophysiology of diabetes, arteriosclerosis, myocardial infarction, respiratory diseases (COPD), Parkinson disease

Unit IV

Infectious Diseases: pathogenesis & overview of modes of infections, prevention and control with suitable examples like Typhoid, Dengue

Cancer: Definitions, nomenclature, characteristics of benign and malignant neoplasm, metastasis, Carcinogens and cancer, concept of oncogenes, tumour suppressor genes, DNA repair genes and cancers stem cells.

Suggested Readings:

1. Harshmohan (2017), Textbook of Pathology,7th edition, Jaypee Publications
2. Robbins,(2012), Text book of Pathology, 3rd edition, Elsevier Publications

Practical syllabus

B.Sc. MLT- IV Semester (II Year)

BSCMLT-451 (Practical: Clinical Biochemistry)

1. To determine total, direct and indirect bilirubin.
2. To determine SGOT conc.
3. To determine SGPT conc.
4. To determine ALP Conc.
5. To determine total and free acidity.
6. To perform CPK test
7. To perform CK-MB test.
8. To determine serum sodium conc.
9. To determine serum potassium conc.
10. To determine uric acid conc.
11. To determine phosphorus conc.

BSCMLT-452 (Practical: Fundamentals of Microbiology-II)

1. Demonstration of Autoclave and sterilization of media
2. Demonstration of Laminar air flow and media preparation
3. Preparation of culture plates
4. Demonstration of Centrifuge.
5. Demonstration of hot air Oven and sterilization of glassware's
6. Demonstration of Incubator and preservation of cultures
7. Preparation of media
8. Antibiotic sensitivity test.
9. Microscopic examination of urine
10. Examination of urine
11. Examination of sputum

BSCMLT-453 (Practical: Immunology & Serology)

1. To perform HIV Tridot test.
2. To perform radial immunodiffusion test.
3. To perform immunoprecipitation method.
4. To perfrom HBsAg rapid test.
5. To perform ASO test
6. To perform ELISA test.
7. To perform TB IgG & IgM test
8. To perform Dengue IgG & IgM test
9. To perform typhidot test.
10. Introduction of Allergy panel
11. Montoux test

B.Sc. MLT- V Semester (III Year)

Course Name: Immunohematology & Blood Banking

Paper Code: BSCMLT-501

L	T	P	C
4	0	0	4

Unit-I

Basic Principles of Blood Banking, Antigen, Antibody, naturally occurring antibody, Complement, ABO & Rh blood group system, Methods of blood group determination, Forward and Reverse grouping, Slide & Tube method, Gel method,

Unit-II

Other blood group system such as Lewis, MNS, Kell Duffy etc. Anticoagulants and preservative used in blood bank, Donor selection criteria, Blood collection and processing

Transfusion transmissible infectious disease screen, Coomb'test, Cross matching, Compatibility testing, Antibody Screening & Identification, Grading of Reaction/Agglutination

Unit-IV

Blood components and its preparation, preservation, storage and transportation

Indications for different blood component transfusion, Blood transfusion reaction and its type, HDN

Introduction of stem cell banking and bone marrow transplantation.

Unit-V

Apheresis, indications of hemapheresis, plasmapheresis, plateletspheresis, plasmapheresis

Quality control of reagents, equipments, blood components used in transfusion medicine.

Role of NACO, Indian Red Cross Society, DGHS and blood transfusion services.

Suggested Readings:

1. Godkar.B. Praful,(2016) Textbook of MLT,3rd edition,Bhalani Publications
2. Ochei J & Kolhatkar A(2000),Medical Laboratory Science: Theory & Practice, 3rd edition,Mcgraw Hill Education
3. Mukherjee .L.K(2017), Medical Laboratory Technology,Vol.1-3,3rd edition, Tata Mcgraw Hill
4. Sood Ramnik,(2015), Text book of Medical Laboratory Technology,2nd edition, Jaypee Publications
5. Wintrobe's Clinical Hematology,(2014),13th edition, Lippincott Williams & Wilkins

B.Sc. MLT- V Semester (III Year)

Course Name: Clinical Enzymology & Automation

Paper Code: BSCMLT-502

L	T	P	C
4	0	0	4

Unit-I

Introduction to enzymes, Classification of Enzymes, Isoenzymes, Concept of lock and key and induced fit theory, concept of activation energy and binding energy. Factors affecting enzyme activity

Unit-II

Coenzyme: Classification, various types and function, structure of NAD+, NADP+, FAD and FMN, PPP

Units for measuring enzyme activity, factors affecting enzyme level in serum/ plasma. Clinical assay & its type, kinetic assay and end point assay for the enzymes

Unit-III

Enzyme kinetics, the Michaelis-Menten equation and its physiological significances, Enzyme Inhibition, types of inhibitors of enzyme

Isoenzymes, their tissue distribution and clinical significance: ALT, AST, ALP, GGT, CPK, CK-MB, LDH,Troponin, Myoglobin, Amylase, Lipase, ACP,

Unit-IV

Basic Concepts of Automation, principle, working and maintenance of various clinical chemistry analyzers, point of care testing, Hospital Laboratory Management

Suggested Readings:

1. D M Vasudevan, (2011),Text book of Medical Biochemistry,6th edition Jaypee Publishers
2. M N Chatterjea & Rana Shinde,(2012),Text book of Medical Biochemistry,8th edition,Jayppe Publications
3. Singh & Sahni,(2008),Introductory Practical Biochemistry,2nd edition, Alpha science
4. Lehninger,(2013),Principles of Biochemistry,6th edition, W H Freeman
5. U Satyanarayan,(2008), Essentials of Biochemistry,2nd edition, Standard Publishers
6. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition,Elsevier Publications
7. Bishop(2013),Clinical Chemistry,7th edition, WileyPublications

B.Sc. MLT- V Semester (III Year)

Course Name: Parasitology

Paper Code: BSCMLT-503

L	T	P	C
4	0	0	4

Unit-I

Introduction of parasites, host, zoonosis, host parasits relationship, sources of infection, mode of infection, pathogenesis, immunity in parasitic infection, lab diagnosis

Unit- II

Protozoalogy: Entamoeba histolytica, Malarial Parasites,Leishmania, Trypanosomes, their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Unit-III

Helminthology: Introduction and classification, Taenia solium, Taenia Saginata,Fasciola, Ascaris, Wuchereria bancrofti their morphology, life cycle, pathogenesis, clinical features and lab diagnosis. Hookworm, Trichuris. Dracunculus their morphology, life cycle, pathogenesis, clinical features and lab diagnosis.

Unit-IV

Diagnostic methods in Parasitology: Introduction, Examination of stool, urine, blood, Culture methods, Immunological diagnosis and serology

Suggested Readings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
3. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
4. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

B.Sc. MLT- V Semester (III Year)

Course Name: Diagnostic Cytology

Paper Code: BSCMLT-504

L	T	P	C
4	0	0	4

Unit-I

Cell: basic structure and function, cell organelles, cell cycle, Benign and Malignant tumors, Instruments used in cytology, preparation of buffers, stainsMicroscopy: Light, compound, phase contrast, fluorescence

Unit- II

Instruments and equipments used in cytology Fixation and Fixatives used in cytology, Adhesive and mounting media, Cell block and cytospin technique,

Staining such as PAP, Diff-quick, MGG, H&E, Shorr staining, significance of PAP-HPV, Destaining and restaining of slides, Cover slipping

Unit-III

Aspiration and exfoliative cytology, Patient preparation, Sample collection, Fixation, Processing and Staining FNAC, collection, processing of sample and staining, on site quick staining procedure

Pap staining, Progressive & Regressive, Hormonal cytology in different age groups,Collection and processing of sputum, BAL, CSF, Pleural, peritoneal and pericardial fluid, Gynaecologic sample

Unit-IV

Sex chromatin demonstration, Introduction of Immunocytochemistry, different markers and its applications, Automation in cytology, Liquid based preparation & automated screening device

Suggested Readings:

1. Bibbo, (1997),Comprehensive Cytopathology,2nd edition, Saunders Publishers
2. Koss's Diagnostic Cytology,Vol.1 & 2,(2006),5th edition, Lippincott

B.Sc. MLT- V Semester (III Year)

Course Name: Principles of Laboratory Management Paper

Code: BSCMLT-505

L	T	P	C
4	0	0	4

Unit-I

Ethical Principles and standards for a clinical laboratory professional duty to the patient, duty to colleagues and other professionals, Good Laboratory Practice (GLP) ,Introduction to Basics of GLP and Accreditation, Aims of GLP and Accreditation, Advantages of Accreditation, Brief knowledge about National and International Agencies for clinical laboratory accreditation
Awareness/Safety in a clinical laboratory, General safety precautions.

Unit-II

HIV: pre- and post-exposure guidelines, Hepatitis B & C: pre- and post-exposure guidelines, Drug Resistant Tuberculosis

Patient management for clinical samples collection, transportation and preservation, Sample accountability, Purpose of accountability, Methods of accountability

Sample analysis: Introduction, factors affecting sample analysis, reporting results, basic format of a test report, reported reference range, clinical alerts, abnormal results, results from referral laboratories, release of examination results, alteration in reports

Unit-III

Quality Management system: Introduction, Quality assurance, Quality control system, Internal and External quality control, quality control chart
Biomedical
Introduction and importance of calibration and Validation of Clinical Laboratory instrument
Ethics in Medical laboratory Practice, Ethics in relation to Pre-Examination procedures, Examination procedures, reporting of results, preserving medical records
Procurement of equipment and Inventory Control,

Unit-IV

Audit in a Medical Laboratory, Introduction and Importance, NABL & CAP, Responsibility, Planning, Horizontal, Vertical and Test audit, Frequency of audit, Documentation

Suggested readings:

1. Teitz,(2007),Fundamentals of Clinical Chemistry,6th edition, Elsevier Publications
2. Bishop(2013),Clinical Chemistry,7th edition, Wiley Publications
3. Henry's Clinical Diagnosis and Management by Laboratory Methods,(2011),22nd edition, Elsevier

Practical Syllabus

B.Sc. MLT- V Semester (III Year)

BSCMLT-551 (Practical: Immunohematology & Blood Banking)

1. Demonstration of apparatus and equipment's used in blood banking.
2. To prepare different percent of cell suspension.
3. To perform ABO & Rh blood grouping by slide and tube method.
4. To perform forward & reverse grouping.
5. To perform Cross match.
6. To perform Coomb's test.
7. To perform Rh titre
8. To perform Transfusion transmissible marker.
9. Preparation of various blood components and their quality control

BSCMLT-552 (Practical: Clinical Enzymology)

1. To perform enzyme estimation of LFT
2. To perform enzyme estimation of Cardiac profile
3. Determination of Troponin I
4. To perform enzyme estimation of Pancreatic disorder
5. To perform estimation of ACP.
6. Antenatal profile
7. Estimation of bicarbonate
8. Arterial blood gas analysis
9. Determination of Calcium
10. Creatinine and urea clearance test

BSCMLT- 553 (Practical Parasitology)

1. Leishman staining for malarial parasites
2. Demonstration of permanent slide of Trichuris, Ascaris and Hookworm
3. Saline wet mount for observing ova and eggs of parasites.
4. Iodine wet mount for observing ova and eggs of parasites.
5. Concentration of stool samples by floatation method
6. Zinc sulphate conc. Method for stool sample
7. Demonstration of various parasites by permanent slides.
8. Concentration of stool sample by sedimentation method
9. Serological diagnosis of Leishmania
10. Aldehyde Chopra test for Kala Azar
11. Malaria card test

B.Sc. MLT- VI Semester (III Year)

L	T	P	C
4	0	0	4

Course Name: Clinical Virology

Paper Code: BSCMLT- 601

Unit 1

Nature and Properties of Viruses

Introduction: Discovery of viruses, nature and definition of viruses, general properties, concept of viroids, virusoids, satellite viruses and Prions. Structure of Viruses: Capsid symmetry, enveloped and non-enveloped viruses

Unit-II

Isolation, purification and cultivation of viruses

Viral taxonomy: Classification and nomenclature of different groups of viruses

Modes of viral transmission: Persistent, non-persistent, vertical and horizontal

Viral multiplication and replication strategies: Interaction of viruses with cellular receptors and entry of viruses. Assembly, maturation and release of virions

Unit- III

Poxviruses, Herpesviruses, hepaptitis viruses, retroviruses-HIV, Picorna viruses, rhabdoviruses, orthomyxoviruses and paramyxo viruses, TORCH profile,Symptoms, mode of transmission, prophylaxis and control of Polio, Herpes, Hepatitis, Rabies, Dengue, HIV, Influenza with brief description of swine flu, Ebola, Chikungunya, Japanese Encephalitis

Unit-IV

Introduction to oncogenic viruses, Types of oncogenic DNA and RNA viruses, concepts of oncogenes and proto-oncogenes, prevention & control of viral diseases, antiviral compounds and their mode of action, interferon and their mode of action, General principles of viral vaccination

Suggested Readings:

1. Ananthanarayan R. and Paniker C.K.J. (2009) Textbook of Microbiology. 8th edition, University Press Publication
2. Brooks G.F., Carroll K.C., Butel J.S., Morse S.A. and Mietzner, T.A. (2013)
3. Adelberg's Medical Microbiology. 26th edition. McGraw Hill Publication
4. Goering R., Dockrell H., Zuckerman M. and Wakelin D. (2007) Mims' Medical Microbiology. 4th edition. Elsevier
5. Willey JM, Sherwood LM, and Woolverton CJ. (2013) Prescott, Harley and Klein's Microbiology. 9th edition. McGraw Hill Higher Education

B.Sc. MLT- VI Semester (III Year)

Course Name: Biostatics & Research Methodology

Paper Code: BSCMLT-602

L	T	P	C
4	0	0	4

Unit-I

Research Methodology – Definition of research, Characteristics of research, Steps involved in research process, Types of Research methods and methodology, Terminology used in quality control such as sensitivity, specificity, accuracy, precision, positive and negative predictive value.

Unit-II

Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical, Measures of central tendency, Arithmetic mean, mode, median; Measures of dispersion, Range, mean deviation, variation, standard deviation, Standard error, Chi-square test

Unit-III

Introduction and significance of Student's t-distribution: test for single mean, difference of means and paired t- test, F-distribution, one-way and two-way analysis of variance (ANOVA).
Small sample test based on t-test, Z- test and F test; Confidence Interval; Distribution-free test

Global Perspective in the field of Clinical Laboratory Science, Development, Training, Types of Laboratory, Concept of Lab Design, Organizational Set up of NABL, CAP

Unit-IV

Total Quality Management System

General Requirements for Standardization & Calibration of Clinical Laboratories: Introduction, Scope & Need of standardization,

Quality Management requirement: testing & Calibration Procedures, Total Quality Assurance, Quality Control Charts & Systems.

Quality Audit: Internal & External Audit, Accreditation & Certification NABL, ISO, CAP

Suggested Readings:

1. CR Kothari, (2004),Research Methodology & Biostatistics,2nd edition,New Age India Publishers
2. Rao S,(2012),Introduction to Biostatistics and Research Methods,5th edition, PHI Publishers
3. Biostatistical Analysis (2012) 4th edition, J.H. Pearson Publication U.S.A.

Practical Syllabus

B.Sc. MLT- VI Semester (III Year)

BSCMLT-651 (Practical: Advance Techniques in Clinical Diagnosis)

1. To perform separation of amino acids by paper chromatography
2. To perform separation of amino acids by thin layer chromatography
3. To perform separation of DNA by Agarose gel electrophoresis.
4. Separation of protein by PAGE
5. Separation of protein by paper electrophoresis
6. Separation of haemoglobin

BSCMLT-652 (Practical Clinical Virology)

1. To perform HBsAg/ Australia Ag by rapid method
2. To perform HBsAg by ELISA
3. To perform HIV Tridot method.
4. To perform HIV by ELISA
5. To perform Dengue IgG/IgM
6. To perform TORCH profile
7. Demonstration of PCR HBV
8. Demonstration of PCR HIV Viral load