

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.
- Freifelder, 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. Essential 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: Sustainability & 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 Helminthology, 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)
- Abrial 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>