

M. PHIL. ZOOLOGY (FULL TIME AND PART TIME)
Choice Based Credit System
COURSE PATTERN

To acquire knowledge on research problems, instrumentations related with research work, understanding publication ethics, gaining knowledge and application of statistical tools in research fields. To understand the basic principles of bioinformatics tools, immuno-techniques, molecular structure of cells, methods of biodiversity conservations and bioremediation.

Sem	Course	Title of the Course	Exam Hrs	Credits	CIA*	ESE#	Marks
I	Core Course I M19ZO1	Research Methodology	3	4	25	75	100
	Core Course II M19ZO2	Recent Advances In Zoology	3	4	25	75	100
	Core Course III M19ZO3	Teaching and learning skills	3	4	25	75	100
	Core Course IV M19ZO4	Aquaculture, Wildlife Biology Applied Entomology, Vermitechnology	3	4	25	75	100
II		Project Work	-	8			200
		Total		24			600

The following components shall be adopted for continuous internal evaluation / assessment.

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|----------------------------|-----------------|
| 1. Best 2 tests out of 3 - | 10 Marks |
| 2. Attendance | 05 Marks |
| 3. Seminar | 05 Marks |
| 4. Assignment | 05 Marks |
| Total | 25 Marks |

Question Paper Pattern for M.Phil. Programme

Section A : 10 Questions x 2 Marks = 20 Marks (Two Questions from each unit)

Section B : 5 Questions x 5 Marks = 25 Marks

(Internal Choice and on set of questions from each unit)

Section C : 3 Questions x 10 Marks = 30 Marks

(Answer any three out of 5 questions and one question from each unit)

- An open Viva-Voce examination** shall be conducted by both the external examiner and the supervisor and shall be attended by members of Department Research Committee members, all faculty members of the departments, other research scholars and other interested experts / researchers and evaluated jointly by the examiner and the Supervisor for the maximum of 50 marks.

COURSE I – RESEARCH METHODOLOGY

Unit I

Library and Research Documentation – Methods of literature collection, online - NCBI-PUBMED - other sources. Research Papers: Technical papers-Reviews, Monographs and Abstract services - Preparation of index cards- Information storage and retrieval. Identification, Selection and Scope of Research Problem – Proposing hypothesis. Experimental approach and Methods: Designing, Planning and Execution of problems – Preparation and presentation of research papers for Journals, (Symposia and Conferences) – refereed/ non-refereed journals – Impact factor – Citation index. Methods of Editing and Abstracting, Preparation of Manuscript and Proof Reading – Thesis Writing.

Unit II

pH meter – Principles and applications.
Centrifuge – Principles, types and applications
Spectrophotometry – Principles and applications UV-Vis spectrophotometer -
Atomic Absorption Spectrophotometer – Flame photometer.
Calorimetry – Wet combustion Bomb calorimeter.
Manometry – Respirometer – Warburg's apparatus – Oxygen analyser.

Unit III

Principles of Microtechniques – Fixatives and Histological stains – Fixation, Tissue processing and Staining – Freezing Microtomy (Cryostat).
Histochemistry – Fixatives, Histochemical stains – Principles involved in identification of Carbohydrates, Proteins, and Lipids.
Electron Microscopy – Principles and applications – Histological preparations of tissues for Scanning Electron Microscope & Transmission Electron Microscope.
Photography: Photomicrography – Image analyzer- Principles and applications.

Unit IV

Chromatography – Principles, Types and Applications: – Paper, Column, Ion – exchange, Thin Layer Chromatography, High Performance Liquid Chromatography, Gas Liquid Chromatography, Gas Chromatography – Mass Spectrometry, Nuclear Magnetic Resonance.
Electrophoresis : Principles, Types and Applications – Agar Gel, sodium dodecyl sulfate polyacrylamide gel electrophoresis - 2D electrophoresis. Immunological Techniques : Antigen - Antibody preparation and Purification – Immunodiffusion – Immuno electrophoresis. Tracer techniques – Autoradiography and its applications – Radiation measuring devices – Geiger Muller Counter, Scintillation Counter – Principle and applications.

Unit V

Statistical methods and application : Experimental designs – Sampling – Probability – Normal curve – Test of Significance – Student's 't' – test – Chi – Square test, 'F' test – Analysis of Variance – one way, two way and multiple way of analysis – Correlation coefficients – Simple, Linear and Multiple Correlations – Simple, Linear and Multiple regressions. Biological sequence analysis: Pair-wise sequence alignment (Dot matrix method), Dynamic programming (Optimal global alignment and optimal local alignment) – Word method. Multiple sequence alignment (dynamic programming, progressive method, and iterative method). Database - Drug Discovery.

Text Book : Ramakrishnan.S., Swamy, R (1995) Text book of clinical (Medical) Biochemistry & Immunology, TR. Publications, Madras.

Reference Books :

1. Allen, H.Benton., William, E.Verner, Jr. (1974) Field Biology and Ecology, McGraw Hill Book Co., New York.
2. Andersaon, Durston, Polle (1970) Thesis and Assignment Writing, Wiley Easter Limited.
3. King, B. (1986) Cell Biology. London, Allen and Unwin Boston, London.
4. Kumar, H.D. (1998) Modern concepts of Biotechnology. Vikas Publishing House Pvt. Ltd., New Delhi.
5. Sokal, R.R. and F.J. Rohlf (1981), Introduction to Biostatistics, WH Freeman & Co.
6. USA.
7. Zar, J.H. (1984), Biostatistical analysis, Prentice Hall, New Jersey, USA.
8. Anderson, T.W. (1983), An Introduction to Multivariate Analysis, John Wiley.
9. N. Gurumani (2006). Research Methodology for Biological Sciences MJP Publishers. Veerakumari, L. Bioinstrumentation.
10. Webster, J.G. (2004). Bioinstrumentation. Wiley, India.

COURSE II - RECENT ADVANCES IN ZOOLOGY

Unit I

Environmental Pollution (air, water and soil) – causes and remedies – environmental impact assessment – Environmental laws – Risk assessment.
Environmental Education, Planning and Management– Bioremediation.- Bio-Indicators.
Renewable and Non-renewable sources of energy, Conventional and Non-conventional, Solar & Tidal energy – Biogas production – Nuclear energy – Indian nuclear power plants.
Biodiversity – Types, measures of diversity – Bio – diversity conservation laws.
Remote sensing and GIS – Basic concepts.

Unit II

Molecular markers – Principles and Applications, DNA finger printing and DNA foot printing; RAPD, RFLP, DNA amplification, genomic and cDNA Library - DNA recombinant technology, screening and counseling – Gene therapy - Primary and established cell line - Stem cell therapy – DNA sequencing and human genome project.
Cloning technique and its application, knock out genes – Reproductive technologies related to human in vitro fertilization – Ethical issues.

Unit III

Somatic mutation and oncogenes – Induction of mutation by mutagens, teratogens and carcinogens.
Biofertilizers – composting – Biopesticides – SCP – Production and sources.
Methods involved in the production of Protein- transgenic animals and their uses. Production of recombinant protein, insulin and growth hormone.
Protein Engineering – Enzyme Technology – Terminator genes.

Unit IV

Organization and expression of immunoglobulin gene.
Vaccine – Whole organism vaccines, submit vaccines, recombinant vaccines, DNA vaccines, edible vaccines, synthetic peptide vaccine, multivalent submit vaccine, - development of AIDS and malaria vaccines.
Applications of RIA, immunofluorescence, Enzyme Linked Immuno Sorbent Assay, Western blot and monoclonal antibodies in diagnosis of various diseases.
Molecular Diagnostics: Karyotyping - FISH - HLA, tissue typing and organ transplantation.

Unit V

Environmental and Social issues in Coastal Aquaculture – Environmental Management of Shrimp farms – Induced breeding in fish and prawn –monosex - Sex reversal – Use of pituitary, HCG, LHRH, Synthetic hormones, their analogs – administration route – injection – feed – implants – Hybridization – Chromosome manipulations- Polyploids- Gynogenesis and Androgenesis – Environmental and Nutritional probiotics in the management of diseases, Cryopreservation of gametes and embryos.

Reference Books :

1. Abbas, A.K., Lichtman, A.K., Pober, J.S. (1998) Cellular and Molecular Immunology. III Edition W.B.Saunders Company, U.S.A.
2. Benjamin Lewin. (1999) Genes VII. Oxford University Press, New York.
3. Branden, C., Tooze, J. (1999) Introduction to protein structure. II Edition, Garland Publishing, Inc., New York.

4. Desmond, S.T., Nicholl. (1994) An introduction to genetic engineering Cambridge University Press, New York.
5. Jonathan Graves, Dungan Reavey (1996) Global Environmental Change. Plant, Animal and Communities. Long man.
6. Hawkins, J.D. (1996) Gene structure and expression. III Edition. Cambridge University Press, New York.

COURSE III Teaching and Learning Skills Course

Objectives:

- Acquaint different parts of computer system and their functions.
- Understand the operations and use of computers and common Accessories.
- Develop skills of ICT and apply them in teaching learning context and Research.
- Appreciate the role of ICT in teaching, learning and Research.
- Acquire the knowledge of communication skill with special reference to its elements, types, development and styles.
- Understand the terms communication Technology and Computer mediated
- teaching and develop multimedia /e- content in their respective subject. Understand the communication process through the web.
- Acquire the knowledge of Instructional Technology and its Applications.
- Develop different teaching skills for putting the content across to targeted audience.

Unit I : Computer Application Skills

Information and Communication Technology (ICT): Definition, Meaning, Features, Trends – Integration of ICT in teaching and learning – ICT applications: Using word processors, Spread sheets, Power point slides in the classroom – ICT for Research: On-line journals, e-books, Courseware, Tutorials, Technical reports, Theses and Dissertations-- ICT for Professional Development: Concept of professional development; institutional efforts for competency building; individual learning for professional development using professional networks, OERs, technology for action research, etc.

Unit II : Communications Skills Communication:

Definitions – Elements of Communication: Sender, Message, Channel, Receiver, Feedback and Noise – Types of Communication: Spoken and Written; Non-verbal communication – Intrapersonal, interpersonal, Group and Mass communication – Barriers to communication: Mechanical, Physical, Linguistic & Cultural – Skills of communication: Listening, Speaking, Reading and Writing – Methods of developing fluency in oral and written communication – Style, Diction and Vocabulary – Classroom communication and dynamics.

Unit III : Pedagogy

Instructional Technology: Definition, Objectives and Types – Difference between Teaching and Instruction – Lecture Technique: Steps, Planning of a Lecture, Delivery of a Lecture – Narration in tune with the nature of different disciplines – Lecture with power point presentation - Versatility of Lecture technique – Demonstration: Characteristics, Principles, planning Implementation and Evaluation – Teaching-learning Techniques: Team Teaching, Group discussion, Seminar, Workshop, Symposium and Panel Discussion.

Unit IV : E- Learning, Technology Integration and Academic Resources in India

Concept and types of e-learning (synchronous and asynchronous instructional delivery and means), m-learning (mobile apps); blended learning; flipped learning; E-learning tools (like LMS; software's for word processing, making presentations, online editing, etc.); subject specific tools for e-learning; awareness of e-learning standards- Concept of technology integration in teaching-learning processes; frameworks guiding technology integration (like TPACK; SAMR); Technology Integration Matrix- Academic Resources in India: MOOC, NMEICT; NPTEL; e-pathshala; SWAYAM, SWAYAM Prabha, National academic depository, National Digital Library; e-Sodh Sindhu; virtual labs; eYantra, Talk to a teacher, MOODLE, mobile apps, etc.

Unit V : Skills of Teaching and Technology based assessment Teaching skills:

Definition, Meaning and Nature- Types of Teaching Skills: Skill of Set Induction, Skill of Stimulus Variation, Skill of Explaining, Skill of Probing Questions, Skill of Black Board Writing and Skill of Closure – Integration of Teaching Skills – Evaluation of Teaching Skills- Technology for Assessment: Concept of assessment and paradigm shift in assessment; role of technology in assessment ‘for’ learning; tools for self & peer assessment (recording devices; erubrics, etc.); online assessment (open source software’s; e-portfolio; quiz makers; e- rubrics; survey tools); technology for assessment of collaborative learning like blogs, discussion forums; learning analytics.

References

1. Bela Rani Sharma (2007), Curriculum Reforms and Teaching Methods, Sarup and sons, New Delhi
2. Brandon Hall , E-learning, A research note by Namahn, found in: [www.namahn.com/resources/ .../note-e-learning.pdf](http://www.namahn.com/resources/.../note-e-learning.pdf), Retrieved on 05/08/2011
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh
4. Information and Communication Technology in Education: A Curriculum for schools and programmed of Teacher Development, Jonathan Anderson and Tom Van Weart, UNESCO, 2002.
5. Jereb, E., & Šmitek, B. (2006). Applying multimedia instruction in elearning. *Innovations in Education & Teaching International*, 43(1), 15-27.
6. Kumar, K.L. (2008) Educational Technology, New Age International Publishers, New Delhi.
7. Learning Management system : https://en.wikipedia.org/wiki/Learning_management_system , Retrieved on 05/01/2016
8. Mangal, S.K (2002) Essential of Teaching – Learning and Information Technology, Tandon Publications, Ludhiana.
9. Michael,D and William (2000), Integrating Technology into Teaching and Learning: Concepts and Applications, Prentice Hall, New york. 8
10. Pandey,S.K (2005) Teaching communication, Commonwealth Publishers, New Delhi.
11. Ram Babu,A abd Dandapani,S (2006), Microteaching (Vol.1 & 2), Neelkamal Publications, Hyderabad.
12. Singh,V.K and Sudarshan K.N. (1996), Computer Education, Discovery Publishing Company, New York.
13. Sharma,R.A., (2006) Fundamentals of Educational Technology, Surya Publications,Meerut
14. Vanaja,M and Rajasekar,S (2006), Computer Education, Neelkamal Publications, Hyderabad.

Course Outcomes After completing the course, the students will:

- Develop skills of ICT and apply them in Teaching Learning context and
- Research. Be able to use ICT for their professional development.
- Leverage OERs for their teaching and research.
- Appreciate the role of ICT in teaching, learning and Research.
- Develop communication skills with special reference to Listening, Speaking, Reading and Writing. Learn how to use instructional technology effectively in a classroom.
- Master the preparation and implementation of teaching techniques.
- Develop adequate skills and competencies to organize seminar / conference / workshop / symposium / panel discussion.
- Develop skills in e-learning and technology integration.
- Have the ability to utilize Academic resources in India for their teaching. Have the mastery over communication process through the web.
- Develop different teaching skills for putting the content across to targeted audience.
- Have the ability to use technology for assessment in a classroom. *****

COURSE –IV –Guide Paper

AQUACULTURE

UNIT – I: Introduction to Aquaculture

Scope of Aquaculture, Cultivable species of fishes and shrimps, Advantages of Aquaculture, Production trends - National and International Scenario.

UNIT – II: Hatchery and Farming Techniques

Hatchery techniques : Post Larval shrimps production.

Culture methods of various fresh water fishes and Marine shrimps, Selection of site, Selection of species, Types of farming : Traditional, Semi intensive, Intensive and Integrated farming.

UNIT – III: Ornamental fish and Pearl Oyster culture

Requirements for an aquarium – Aquarium fishes (Gold, Angel, Figher, Koi, Tiger Barb). Types of pearls - Pearl oyster culture.

UNIT – IV: Farm management

Farm management: Construction of semi intensive earthen ponds, Water source, daily management practices and Drainage system. Stocking of Post Larval shrimps in culture pond. Composition of feed: Types of feed: Live feed Wet and dry feeds. Harvesting, Processing, Preservation and marketing.

UNIT – V: Fish diseases and Government Organisations

Protozoan diseases (White spot, Whirling disease, Cryptobiosis.) - Fungal diseases (Fungal Gill Rot, Saprolegniasis) - Bacterial diseases (Bacterial Gill Rot, Erythroderma, Enteritis) - Viral Diseases (Epizootic Ulcerative Syndrome, Infectious Pancreatic Necrosis, Infectious Dropsy). Government organizations : MPEDA, CIBA, CIFA, NIOT, NIO and CMFRI.

References

1. Baradach, JE, JH Ryther and WO McLarney, 1972, Aquaculture. The farming and Husbandary of Fresh water and Marine Organisms. Wiley Interscience, New York.
2. Rath, R.,K. 2000. Freshwater Aquaculture. Scientific Publishers, PO No 91, Jodhpur. India.
3. Jhingran, AVG, 1991, Fish and Fisheries of India, Hindustan Publishing Co.
4. Arumugam.N. 2008. Aquaculture, Saras Publications.

WILDLIFE BIOLOGY

UNIT – I: Wildlife Conservation

Wildlife concept, Importance of Wildlife conservation:- ecological, ethical, educational, scientific, commercial, aesthetic, and recreational.

Conservation methods:- In situ conservation-sanctuaries, national parks, biosphere reserves, Ex situ conservation-captive breeding, modern zoo, safari, nocturnal zoo.

UNIT – II: Inventory studies of animals

Inventory studies:-Total species list, total genera or families list, parallel-line searches, encounter rates, documenting rarities, sample collection: labeling, preservatives, collection of plants, collection of fungi, collection of invertebrates, collection of fishes, collection of amphibians, collection of reptiles, collection of birds and collection of mammals.

UNIT – III: Conservation priorities

Conservation priorities: IUCN classification - extinct, critically endangered, endangered, vulnerable, conservation dependent, low risk, data deficient, not evaluated. Flagship species, Umbrella species, Hotspots, Important Bird Areas, Tiger Reserves. Protected areas of Tamilnadu.

UNIT – IV: Wildlife census techniques

Wildlife census techniques: Direct count: Line transects, Point counts. Mark-recapture. Indirect count: pellet count, calls, sent mark, camera trap, radio telemetry, remote sensing. Behavioural sampling: Events, States, Focal-sampling, Scan sampling,

UNIT – V: Conservation projects

Conservation project: A. Tiger project- Tiger species, distribution, threats, conservation action taken, B. Elephant project: Elephants species, distribution, threats, conservation action taken. C. Crocodile Project- crocodile species, distribution, threats, conservation action taken. D. Vulture crisis in India, Wildlife Laws.

References

1. Varadharajan Gokula. 2013. Elementary Wildlife Biology. Lap Lambert Academic Publishing.
2. Sutherland W.J. 2000. The conservation hand book: research, management and policy Blackwell Science Ltd
3. Andrawartha, H.C. and L.C. Birch. 1974. The distribution and abundance of animals. The University of Chicago press, London.
4. Agarwal, V.P. 1980. Forests in India. Oxford and IBH Publishing Co. New Delhi.
5. Giles, R.H. 1984. Wild life management techniques. The wild life society, Washington and Natraj Publishers, Dehra Dun.
6. Saharia, V.B. 1982. Wild life in India. Nataraj Publishers, Dehra Dun.

APPLIED ENTOMOLOGY

UNIT – I: Insects Taxonomy and Morphology

Basis of insect classification - Key characteristics with common South Indian examples - Morphology: Head, Thorax, Abdomen. Wings: Forms and Venation. Abdominal appendages of Apterygotes.

UNIT – II: Physiology of Insects

Integumentary system, Structure and chemistry, Physiology of moulting. Digestive system: Structure and physiology. Respiration (Aerial and Aquatic) - Circulatory system: Structure of heart, Mechanism of haemolymph circulation. Haemolymph and its composition: Haemocytes and their functions.

UNIT – III: Physiology of Insects

Excretory system: Malpighian tubules and their functions

Nervous system: Structure, Neurotransmitters, Structure and function of compound eye. Reproductive system: Male and female reproductive systems.

Endocrine system: Endocrine control of moulting and metamorphosis, Role of hormones in male and female reproduction. Neuroendocrine system of insects.

UNIT – IV: Economic importance of insects

Biology of honey bee, Silk moth and Lac insect. Culture methods (Apiculture, Sericulture, Lac culture) and problems related to their cultures.

Biology, damage caused and control methods of common insect pests of agricultural importance: Paddy, Sugarcane, Coconut, Brinjal and Pests of stored products.

UNIT – V: Pest Control Methods

Principles of Insect control: Prophylactic measures, Cultural, Mechanical, Physical and Biological methods. Parasites, Predators. Chemical methods: Pesticides, Classification, Mode of action, Toxicity, Insecticide resistance to environmental safety. Non conventional methods, use of insect growth regulators (IGR), Repellents, Antifeedants, Pheromones and Chemosterilants. Integrated Pest Management.

References

1. R. F. Chapman. 2013. The Insects: Structure and Function. Stephen J. Simpson, Angela E. Douglas. Cambridge University Press.
2. Snodgrass, R.F., 1985. Principles of Insect Morphology. McGraw Hill & Co. New York.
3. Wigglesworth, V.B. 1992, Physiology of Insects. IX Ed. Chapman and Hall London.
4. Nayar, K.K., Ananthakrishnan, T.N. and David, M., 1995. General and Applied Entomology. Tata McGraw Hill Pub. Co., Ltd., New York.
5. Vasantharaj David, B., 2001. Elements of Economic Entomology and Applied Entomology, Oxford and IBH Publishing Co., New Delhi.
6. Rathinaswamy, T.K., 1986. Medical Entomology, S. Viswanathan and co., Madras.
7. Mani, M.S. 1982. General Entomology, Oxford and IBH Publishing Co. New Delhi.

VERMITECHNOLOGY

UNIT-I: Diversity of Earthworms and their Geographical distribution: Systematic position – Classification of Earthworms at family, genera and species level in the Indian subcontinent – Brief account on the classification of Earthworms at the global level – Ecological classification of Earthworms – Epigeic, Endogeic and Anecic – Earthworms used in vermicomposting in India and at the global level – *Eudrilus eugeniae*, *Eisenia foetida*, *Perionyx excavatus* and *Lampito mauritii*.

UNIT-II: Morphology and Biology of Earthworms: External segmentation – External apertures – Clitellum and associated structures – Digestive and Reproductive systems – Life cycles – Reproduction – Spermatogenesis and Oogenesis – Copulation and Fertilization – Growth.

UNIT-III: Ecology of Earthworms: Estimation of populations – size of population – Numbers and Biomass – Population structure – Age distribution and Spatial Distributions – Horizontal and Vertical distribution – Structure of Earthworm Communities – Predators, Parasites and Pathogens of Earthworms. **Earthworms and Microorganisms** – Importance of Microorganisms as food for Earthworms – Dispersal of Microorganisms by Earthworms – Burrows and casts in soil – Effects of Earthworms on soil structure.

UNIT-IV: Earthworms as a source of Animal Protein: Food value of Earthworms – Production of Earthworm Feed Protein – Assessment of the value of worm protein as Animal Feed – Fish, Chicken, Pig and Shrimp Feeding trials – Economics of production of Earthworm protein – Earthworms as human food – Medicinal values of Earthworms for humans.

UNIT-V: Vermibiotechnology: Sources of organic wastes – Conversion of Sewage Sludges, Animals, Vegetable and Industrial of organic wastes into Vermicompost – Species of Earthworms suitable for Vermibiotechnology – Criteria used for species selection – Various methods of vermicomposting and vermiwash – Vermicast – Vermicompost – Macro and Micronutrients composition of vermicompost – Methods of application of vermicompost to various crops – Advantages of using vermicompost to crops. Other beneficial roles of Earthworms – Interaction with organisms that promote plant growth – production of plant growth promoting substances – Production of biologically active materials by Earthworms.

List of Reference Books:

1. Edwards, C.A. and Bohlen, P.J. 1996. Biology and Ecology of Earthworms. Chapman and Hall, London. 380p.
2. Lee, K.E. 1985. Earthworms: Their Ecology and Relationship with soils and Land use, Academic press, Sydney.
3. Ismail, S.A. 1997. Vermicology. The Biology of Earthworms. Orient Longman Limited. Hyderabad.
4. Bhatnagar, R.K. and Palta, R.K. 1996. Earthworm – Vermiculture and Vermicomposting. Kalyani Publishers, Ludhiana, India, 106p.
5. Gupta, P.K. 2005. Vermicomposting for Sustainable Agriculture (Second Edition). Agrobios (India), Jodhpur, India. 210p.