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.

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<th>Sem</th>
<th>Course</th>
<th>Title of the Course</th>
<th>Exam Hrs</th>
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<td>Aquaculture, Wildlife Biology, Applied Entomology, Vermitechnology</td>
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The following components shall be adopted for continuous internal evaluation / assessment.

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

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.

Unit III
Principles of Microtechniques – Fixatives and Histological stains – Fixation, Tissue processing and Staining – Freezing Microtomy (Cryostat).
Photography: Photomicrography – Image analyzer- Principles and applications.

Unit IV

Unit V

Reference Books:


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.
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.
Methods involved in the production of Protein- transgenic animals and their uses. Production of recombinant protein, insulin and growth hormone.

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, immunoflouresence, 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

Reference Books :
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

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
3. Don Skinner (2005), Teacher Training, Edinburgh University Press Ltd., Edinburgh

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

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
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

UNIT – IV: Wildlife census techniques

UNIT – V: Conservation projects

References
UNIT – I: Insects Taxonomy and Morphology

UNIT – II: Physiology of Insects

UNIT – III: Physiology of Insects
Excretory system: Malpighian tubules and their functions
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

References
VERMITECHNOLOGY


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 trails – Economics of production of Earthworm protein – Earthworms as human food – Medicinal values of Earthworms for humans.


List of Reference Books: