TELANGANA MALILA VISWAVIDLAYAM

(WOMEN'S UNIVERSITY), KOTI,

HYDERABAD – 500 095.

FORMERLY UNIVERSITY COLLEGE FOR WOMEN, O.U.

ACCREDITED BY NAAC WITH 'A' GRADE

DEPARTMENT OF ZOOLOGY

M.Sc. SYLLABUS – CBCS

SEMESTER – IV

Paper – I, II, III & IV (PROJECT)

(with effect from 2023 – 2024)

M.Sc. Semester IV Credit Distribution Pattern			
Paper Code	**Semester - IV**	**Paper**	**Credits**
Zoo_401 T	**Core Paper - I**	**Animal Bio-technology (ABT)**	**5**
Zoo_402 T	**Core Paper - II (Specialization)**	**Parasitology - II (PS-II)**	**5**
Zoo_403 TEZ	**Paper - III (Elective - III)**	**Economic Zoology - II / Fisheries – II - II**	**4**
Zoo_403 TF			
Zoo_404	**Paper - IV (Project)**	**Project**	**6**
		Total Credits	**20**

Scheme of evaluation :

Theory - 75 Marks (3 Credits)
- 60 Marks External Exam
- 10 Marks Internal Exam
- 5 Marks Theory Assignment

Practicals - 50 Marks (2 Credits)
- 30 Marks Continuous assessment
- 20 Marks External Exam

Elective Practical - 25 Marks (1 Credit) 15 – C.A. & 10 E.E.

Code ZOO_401 T

M.Sc. Zoology (SYLLABUS)
Semester – IV
Core Paper – I – Animal Biotechnology (ABT)

Unit – I – Biotechnology and Animal Improvement

1.1 Introduction to biotechnology-scope, importance, and its application; Role of Biotechnology in the improvement of livestock herds and breeding selected traits.

1.2 *In vitro fertilization* and embryo transfer; ICSI, sperm sexing; Cryopreservation, cry protection and gamete banking; Super ovulation; Stem cells – their applications.

1.3 Cell culture – Basic requirement of cell culture; Animal cell, tissue, organ, and embryo culture; merits and demerits; Principle of sterile techniques and cell propagation.

1.4 In vitro cell culture techniques; disaggregating of tissue; Primary, secondary and suspension culture; cell lines; mammalian cell lines, characteristics and their maintenance; Primary, secondary and suspension culture; cell lines; mammalian cell lines, characteristics and their maintenance; Primary and established cell line cultures.

1.5 Scaling up of animal cell culture, cell synchronization, cell separation, cell cloning, micromanipulation, cell transformation.

Unit – II Production of Recombinant Organisms and Transgenic Animals

2.1 Cloning of mammals; cloning from embryonic cells and adult cells.

2.2 transgenic animals; creation of transgenic mice, retroviral vector method, Microinjection, embryonic stem cell method-shot gun, electroporation, lipofection, microinjection.

2.3 Production of transgenic animals – cattle, sheep, pigs and fish; transgenic animals as model for human disease or disorders.

2.4 Large scale culture and production from genetically engineered animal cell culture.

2.5 Large scale culture and production from recombinant microorganisms – downstream processing.

Unit – III – Application of Biotechnology

3.1 Medical biotechnology – Application of RFLP in forensic science, DNA finger printing, hybridoma technology and production of monoclonal antibodies.

3.2 Environmental Biotechnology – Bioassay, biosensors in ecotoxicological screening; Bioleaching of metals by mircroorganisms; Bioabsorption of metals by bacteria.

3.3 Insecticide development – biopesticides; Bacillus thuringiensis – mode of action of toxin, toxin gene isolation and engineering of B. thuringiensis.

3.4 Biotechnology of aquaculture – sex reversal in fish and sterile fish culture.

3.5 Use of animals as bioreactors; knock out and knock in model systems and their utility; CRISPR technology.

Practicals : **Code ZOO_401 P**

1. Preparation of culture media: a) Bacteria and /or b) animal cells.
2. Methods of cultivating a) Bacteria and / or b) animal cells.
3. Isolation and characterization of microbes useful in fermentation.
4. Staining Techniques for microbes :
   a) Gram's staining; b) Spore & Capsule staining;
   c) Acid fast stain; d) Fungal stains
5. Determination of microbial growth curve.
6. Antibiotic sensitivity test.
7. Yield estimation in fermentations products :
   a) Aspergillus niger-ciric acid; b) Lactic acid from curd; and
   c) Saccharomyces servisae (Yeast) Alcohol
8. Microbial evaluation of stored foods from plant/animal origin for contaminants/toxins.
9. Detection of food borne pathogenic organism in vegetables, fruit using PCR.
10. Demonstration of DNA finger printing for identification of animal species.
11. Isolation of detection of plasmid DNA from given bacterial strain / plasmid DNA by using mini preparation method and using UV spectrophotometer.
12. Determination of viable cell count in the given culture of bacteria by dilution and spreading technique.
13. Preparation of single cell suspension from chicken liver (primary culture)
14. Visit to Quality Control Labs and submission of report.
15. Illumina Next Gen Sequencing studies (Virtual).
    (To be submitted at the time of examination – 6 Marks)

Suggested Books

1. Culture of Animal Cells. R. Ian Freshney, Wiley Liss.
2. Animal Cell culture – Practical Approach – Ed. John R. W. Masters, Oxford.
3. Animal Cell Biology, 1990 – Speir, RE and Griffith, JB, Academic Press.
4. Molecular Biotechnology – Glick & Pasternock.
5. Gene manipulation – Old & Primrose.
6. Biotechnology – S. Mitra.

Code ZOO_402 T

M.Sc. Zoology (SYLLABUS)
Semester – IV
Core Paper – II – PARASITOLOGY (Specialization)[PS-II]

UNIT – I **Taxonomy and Anatomy of Nematodes**

1.1 General characteristics, history, scope and significance of nematodes
1.2 Classification of Nematodes up to family level with examples.
1.3 Functional anatomy – structure of cuticle and cuticular modifications and pseudocoelom.
1.4 Digestive system with special reference to esophageal modifications and associated glands.
1.5 Reproductive system and types of eggs

UNIT – II **Life cycles and Pathology of Nematodes**

2.1 Life cycles, pathology, diagnosis treatment and epidemiology of gastrointestinal nematodes and tissue nematodes.
   a. *Ancyclostoma duodenale* b. *Dracunculus medinensis*
   c. *Wuchereria bancrofti* d. *Trichinella spiralis*
2.2 Visceral larva miglans, dermatitis and pulmonary bronchitis
2.3 Nematodes of livestock – *Ascaridia galli* and *Haemonchus contortus*
2.4 Host – parasite interactions and their immunological reactions – Immunity to filariasis and role of eosinophils and mast cells in helmintic infections.
2.5 Anthelmintic drug action and drug resistance.

UNIT – III Acanthocephalans and Nematodes

3.1 Medical Acanthocephalans – morphology, life cycle, clinical symptoms, pathogenicity, diagnosis, treatment and prophylaxis of *Macracanthorhynchus hirudinaceous* and *Moniliformis moniliformis.*
3.2 General account of entomophilic Nematodes – characteristics and classification. (*Heterorhabditis and Steinernema*)
3.3 General account of phytonematodes – life history and pathology of *Hirschmanniella* and *Meloidogyne*.
3.4 *Coenorhabditis elegans* genome and lifecycle.
3.5 *C. elegans* as model organism for research – Toxicity testing and longevity studies.

Code ZOO_402 P

PRACTICALS :

1. Collection, fixation, preparation of permanent slides and identification of nematode parasites from cockroaches.
2. Collection, fixation, preparation of permanent slides and identification of nematode parasites from carpfishes and catfishes.
3. Collection, fixation, preparation of permanent slides and identification of nematode parasites from chicken viscera
4. Collection, fixation, preparation of permanent slides and identification of nematode parasites from Sheep / goat Viscera
5. To study morphology and differences between female and male nematode parasites.
6. Identification of nematode eggs and larval stages
7. Ecology of parasites and biostatistical calculations of incidence, intensity, density and index of infection of nematode parasites.
8. Collection and examination of nematode infective larvae from soil and intermediate hosts.
9. Collection and identification of male and female acanthocephalan parasites from fishes.
10. Field studies and observations – visiting of slaughter houses in and around Hyderabad and submit report.
11. Study of effect of chemical nematicides on nematode parasites.
12. Effect of Herbal extracts (neem leaf) on nematode parasites.
13. Effect of green synthesized Silver /Copper nanoparticles on nematode parasites.
14. FTIR analysis of green synthesized silver/ copper nanoparticles.
15. UV absorption spectral studies of green synthesized silver/ copper nanoparticles.

Reference Books :

1. Principles of Nematology – by Chitwood B.G. Chitwood M.B.
2. Nematode parasites of domestic animals and of man – by Levine Norman D. Burgess publishing Co.
3. The natural history of Nematodes by Pionar G.O., Prentice-Hall, New Jersey.
4. The organization of nematodes by Croll N.A. Academic press.
5. The physiology of nematodes by Lee D.L. & Atkinson, Columbia University Press, New York.
6. Agricultural Helminthology – Filipjev I.N.
7. General Parasitology by Cheng T.C.
8. Introduction to animal Parasitology by J.D. Smith.
9. Entomophilic nematodes and their role as biological control of pest insects by George Poiner, Pub. INC ebgle Wood Cliffs, New Jersey.
10. Parasitology by Noble Noble.
11. Parasitology by K.D. Chatterjee.
12. Parasitology by Chandler.
13. Human Helminthology – by Faust.
14. Medical Zoology by Sobhit.

Code ZOO_403 TF

M.Sc. Zoology
Semester – IV
Elective – III
Elective Paper – III – Principles of Fisheries (F)

COURSE OUTCOMES

Unit – I – Introduction to fisheries

1.1 Definition, history, present status and future prospects of fisheries in India.
1.2 Criteria for selection of fish species of culture.
1.3 Advanced techniques in seed production – induced breeding methods in Fishes.
1.4 Types of Hatcheries : construction and management of hatcheries, and seed transportation methods.
1.5 Fishermen Cooperative societies – structures and functions.
1.6 Government policies and schemes in fishery sector.

Unit – II – Cultivable Fishes, Prawns and Crabs

2.1 Biology of Indian major carps – *Catla catla, Labeo rohita and Cirrhinus mrigala.*
2.2 Biology of exotic carps – *Hypophthalmichys molitrix, Ctenopharynodan idella and Cyprinus carpio.*
2.3 Biology of air-breathing fishes – *Channa punctatus, Channa marulius, Clariaus magur.*
2.4 Biology of cultivable prawns – *Macrobrachium rosenbergii, Macrobrachium malcolmsonii.*
2.5 Biology of cultivable crabs – *Barytelphusa cunicularis.*

Unit – III Pond, Disease and Post harvest Management

3.1 Site selection, design and construction of fish farms.
3.2 Pre-stocking and Nursery pond management:- Aquatic weeds predatory insects and their control, pond fertilization.
3.3 Stocking and Rearing pond Management, Natural fish food organisms, supplementary feeding and Brood pond Management – Monosex culture.
3.4 Infections diseases of fishes and prawn – prevention and control measures.
3.5 Processing and preservation of fishes; By-products and value-added products of fishes and prawns.

Practicals : **Code ZOO_403 TF (P)**

1. Identification of fishes through general characters and morphometry and meristic characters.
2. Identification of prawns through general characters and morphometry.
3. Identification of fish through developmental stages.
4. Separation of pituitary gland from fish.
5. Museum study of fishes, prawns, and crabs.
6. Dissection/demonstration digestive system of *Labeo / Catla / Tilapia.*
7. Identification of bacterial and viral diseases of fish and prawn.
8. Visits to local fish markets/seed producing units/processing and preservation units and submit a report,

Suggested Books :

1. Water quality criteria for freshwater fish. Albastor, J.S. and Lloyd, R. Buttorvarth Scientific. London.
2. Fish and Fisheries of India – Jhingran, V.G. Hindustan Publishing Corporation New Delhi.
3. The Fishes of India – Francis. Day. Vol. I & II New Delhi – CSIR.
4. The freshwater fishes of Indian Region – Jayaram, KC. Narendera Publishing house, New Delhi.
5. Prawns and prawn fisheries – Kurian, C.V. and Sebastian, V.O. Hindustan Publishing Corporation.
6. A manual of fresh water aquaculture – Santhanam, R. Sukllnaran. N. Natrajan Oxford and IB Pub. Comp.
7. Freshwater aquaculture – Rath, R.K. Scientific Publishers, Jodhpur.
8. Textbook of fish culture, breeding and cultivation of fish – Mareel Huet, Fishing New Delhi.
9. Aquaculture – John, E. Bardach, John H. Ryther, W.O. Mclamey, John Willey and Sons, New York.
10. Fish Ecology – RJ. Wotton, Dalckie, Chapman and Hall, New Yrk.
11. Prevention and control of fish & prawn diseases, 2nd edition. By K. P. Biswas.
12. Diseases of fishes – C. Vandujn, Narendra Publishing House, New Delhi.
13. Aquaculture Principles and Practices by T.V. R. Pillay.
14. A textbook of fish, fisheries and technology by K.P. Biswa.
15. Fisheries and Aquaculture by Ravishankar Piska.

Code Zoo_403 TEZ

M.Sc. Zoology
SEMESTER - IV
(Elective) - Paper – III Economic Zoology (EZ-II)

Unit I - Aquaculture and Vermiculture

1.1 Aquaculture in India: An overview, scope and present status. Types of fisheries - freshwater, marine and brackish water, Reservoir fisheries.
1.2 Hatchery - induced breeding; Techniques, design, construction, and management of hatcheries.
1.3 Fish diseases & control measures; by products of fishes.
1.4 Site selection, design and construction of fish farms.
1.5 Fishermen Cooperative societies – structure and functions.

Unit II - Poultry Farming

1.1 Classification of Fowls: Boilers and Commercial layers, their rearing methods and breeding.
1.2 Management of breeding stock; Processing of broiler and preservation of eggs.
1.3 Feed formulation of chicks; nutritive value of eggs; and Meat management in modern poultry farm.
1.4 Poultry diseases: Viral, Bacterial, Fungal, Protozoan - their control and management.
1.5 Progressive plans to promote poultry as a self – employment venture.

Unit – III – Animal Husbandry

3.1 Animal Husbandry – Introduction, preservation of semen, artificial insemination of cattle.
3.2 Induction of early puberty and synchronization of estrus in cattle.
3.3 Dairy farming: advantages & disadvantages of dairy farming; Integrated live stock farming.
3.4 Establishment, Management; cattle diseases; Economic importance of live stock farming.
3.5 Piggery – establishment, management and economic importance of pig farming.

PRACTICALS :

1. Identification and study of important cultivable and edible fishes.
2. Estimation of quality of milk from different dairy farm units – specific gravity, fat content, pH, viscosity.
3. Estimation and comparison of protein and lipid content in poultry and country chicken using standard methods.
4. Setting up of an aquarium and maintenance.
5. Study of Common Freshwater Ornamental Fishes.
6. Field visits to a fisheries farm and submission of visit report.
7. Field visits to a poultry farm and submission of visit report.
8. Field visits to a dairy farm and submission of visit report.

Suggested Books :

1. Text Book of Applied Zoology, Vermiculture, Apiculture, Sericulture, Lac-Culture Agricultural Pests and their controls by P.V. Jabde.
2. Applied and Economic Zoology by Shukla G.S. and Upadhyay, V.B
3. Applied Zoology by Murlidhar Hyalij and Sanjay Kumbhar
4. Applied Zoology by Nagendra S. Pawar
5. Applied and Economic Zoology by A.K. Rathoure, D. Kumar, N.Z. Deshmukh and Rachana Goswami.
6. Applied Entomology by Metcalf, C.L. and Luckmann, W.P.