Telangana Mahila Viswavidyalayam

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 – III

Paper – I, II, III & IV

With effect from 2023 – 2024

M.Sc. Semester – III Credit Distribution Pattern

Semester – I	Paper Title and Code	Credits
Core Paper – I	Research Methodology Code : ZOO_301T Code : ZOO_301P	3T + 2P = 5
Core Paper – II	Parasitology – I Code : ZOO_302T Code : ZOO_302P	3T + 2P = 5
Core Paper – IV Elective - I	System Biology Code : ZOO_303T SMB Code : ZOO_303P SMB	4
	Computational Biology Code : ZOO_303T CB Code : ZOO_303P CB	
Core Paper – III	Economic Zoology - I Code : ZOO_304T EZ Code : ZOO_304P EZ	4
	Fisheries - I Code : ZOO_304T F Code : ZOO_304P F	
Seminar	Zoo_305 T	2
	Total Credits :	**20**

MINUTES OF THE MEETING

Board of Studies meeting was convened in the Department of Zoology, Telangana Mahila Viswavidyalayam (Women's University), Koti, Hyderabad. On 20-09-2023 at 11 AM under the Chairpersonship of Dr. Y. Sunila Kumari, Head Department of Zoology, TMV, Koti, Hyderabad, to discuss the following agenda.

Agenda 1 : Review of M.Sc. II Year Semester III CBCS Syllabus.

Agenda 2 : Approval of panel of Examiners for the academic year 2023-24.

Agenda 3 : Any other matter with the permission of the chair.

MEMBER OF BOS COMMITTEE:

Sl. No.	Member of BOS	Designation	Signature
1	Dr. Y. Sunila Kumari, Assistant Professor	Head & CBOS	
2	Dr. G. Shamita, Professor	Subject Expert	
3	Dr. Venkateshwar Rao, Professor	Subject Expert	
4	Dr. M. Radha Krishna, Assistant Professor	Subject Expert	
5	Dr. K. Ashok Reddy	Industry Expert	
6	Dr. D. Priya Kumari, Assistant Professor, [C]	Faculty Member	
7	Dr. G. Shailaja, Assistant Professor, [C]	Faculty Member	
8	Dr. C. Sanat Kumar, Assistant Professor, [C]	Faculty Member	
9	Dr. S. Anuradha, Assistant Professor, [C]	Faculty Member	
10	Dr. P. Sunitha Assistant Professor, [C]	Faculty Member	
11	Ms. Nazia Jabeen, Assistant Professor, [PT]	Alumini Member	
12	Ms. Sherishma	Student Member	

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Code Zoo_301 T

Semester – III
Core Paper
Paper I : Research Methodology [RM]

UNIT I – Research Design and Methods **15 Hrs**

1.1 Research – definition and types ; Research design; General methods in biological research – 1) Natural observation, 2) Field study, and 3) Experimentations; Purpose Statement.

1.2 Experimental design – Basic principles & research hypotheses; Types of experimental design – 1) One - group & Two-group design, 2) Matched pair data analysis, 3) Factorial design, & 4) Randomized block design.

1.3 Data collections: Methods for primary data (observation, interview, questionnaire methods, and experiments) & secondary data (scientific journals, books, reports, databases).

1.4 Sampling method – Concept of population and sample; Sampling (random sampling and non-random sampling); Variables (random, independent and intervening variables).

1.5 Probability distribution – Definition & Types; Properties and applications of 1) Normal distribution, 2)Binomial distribution, and 3) Poisson distribution.

UNIT II – Computers in Research & Inferential Statistical Tools in Research **15 Hrs**

2.1 Statistical Inference, Statistical Model & Estimation; Hypothesis – types (null hypothesis, alternate hypothesis); Basic approach to hypothesis testing; Hypothesis testing (one-tailed & two-tailed hypothesis tests); Test of significance

2.2 Type I & Type II errors in hypothesis testing; Level of significance; Sample size estimation; Use of different Statistical estimations depending on the type of data.

2.3 Student's 't' test basic concepts; 1) Paired two sample for means, 2) Two-Sample assuming equal variances, & 3) Two-Sample assuming unequal variances.

2.4 Chi-square test – Concept and application of 1) Goodness of Fit and 2) Test for independence.

2.5 Correlation and regression – Concepts and their applications.

15 Hrs

UNIT III – Reporting Research

3.1 Literature collection – Need, review process, consulting source material, literature citation; Components of research report – Text, tables, figures, bibliography.

3.2 Writing of dissertations, project proposals, project reports, research papers.

3.3 Intellectual Property Rights – Biopiracy, copyrights, patent and traditional knowledge and plagiarism.

3.4 Laboratory safety – Biohazardous agents, biosafety levels, lab acquired infections, other hazards; Good Laboratory Practices.

3.5 Animal model systems; animal ethics- animal welfare guidelines for care and use of animals.

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Code Zoo_301 P

PRACTICALS

1 Preparation of charts (Frequency graphs, Scatter plots, Pie charts) using MS Excel.
2 Calculation of Mean and Standard Deviation, and preparation of the graph depicting mean and standard deviation using MS Excel.
3 Calculation of descriptive statistics of data in MS Excel.
4 Calculation of t-test for paired two samples for means using MS Excel.
5 Calculation of correlation for bivariate data using MS Excel.
6 Calculation of regression for bivariate data using MS Excel.
7 Calculation of one-factor ANOVA using MS Excel.
8 Calculation of two-factor ANOVA using MS Excel.
9 Computers and their applications in biology; Word Processing – Introduction to MSWord, typesetting, formatting, creating tables, inserting resources, and managing references.
10 Data Processing – formatting, data management, and understanding formulas and data analysis tool.
11 Single sample tests – Z test, Standard error of the mean, One-tailed and Two-tailed Z test and interpretation.
12 Hypothesis testing (one-tailed & two-tailed hypothesis tests); Test of significance
13 Literature review using online resources
14 Preparation and documentation of research publication/dissertation.
15 Preparation of MS PowerPoint presentation on a topic of your choice.

Suggested Books

1 Biostatistics by N. Gurumani
2 Research Methodology by N. Gurumani
3 Research Methodology by R C Kothari
4 Research Methodology – A Step by Step Guide by Ranjith Kumar
5 Practical Statistics using Microsoft Excel by Dibyojyoti Bhattacharjee
6 Next-generation Excel by I D Gottlieb
7 Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.) by John W. Creswell.
8 Fundamental of Research Methodology and Statistics by Yogesh Kumar Singh
9 Introduction to Research Methods by Catherine Dawson
10 Research Methods and Statistics by Sherri L Jackson

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Code Zoo_302 T

Semester – III
SPECILAZATION Core Paper
Paper II - Parasitology – I [PS-I]

UNIT I – Morphology, Anatomy and Classification **15 Hrs**

1.1 An overview and classification of Monogenea, Aspidogastrea, Digenea and Cestoda.
1.2 Ultrastructure and function of the tegument in Digenea and Cestoda.
1.3 Digestive system, Excretory system, Nervous system and senseorgans in Digenea & Cestoda.
1.4 Reproductive system and egg shell formation in Digena & Cestoda .
1.5 Helminth's host specificity and its breakdown.

UNIT II – Trematode and Cestode Diseases **15 Hrs**

2.1 Morphology, life cycle, pathogenicity, diagnosis, treatment, and control measures of Trematode parasites of human *Clonorchis sinensis, Fasciolopsis buski.*
2.2 Cestode parasites of human –*Diphyllobothrium latum* and *Echinococcus granulosus.*
2.3 Trematode & Cestode of livestock - *Fasciola hepatica* and *Moniezia expansa*.
2.4 Trematode Parasites of fish - *Dactylogyrus* spp and *Sanguinicola inermis*
2.5 Trematode & Cestode of wild animals *Dicrocoelium dendritcum* and *Echinococcus multilocularis.*

UNIT III – Adult Metabolism and Immunology **15 Hrs**

3.1 Carbohydrate metabolism - Glycolysis (FMP-pathway), PK/PEPCK branch point, malate dismutation; role of TCA cycle, Fumarate Rductase PAthway
3.2 Protein composition and metabolism-Amino acid catabolism, transamination. Lipid composition and metabolism-fatty acid metabolism and the role of β oxidation.
3.3 Immunity to schistosomiasis and fascioliasis; evasion of immunity and molecular mimicry.
3.4 Role of arthropods and molluscs in spreading of helminth diseases. Role of helminths as vectors of microbial infection.
3.5 Anthelmintic drug action and Drug resistance

PRACTICALS **Code Zoo_302 P**

Collection, fixation, and staining techniques of permanent whole-mount preparations and identification of Trematodes and Cestodes form host fishes.
2 Collection and identification of Trematodes and Cestodes from birds (Chicken)
3 Collection and identification of Trematodes and Cestodes from host sheep / goat / cattle.
4 *Faecal smear preparation, staining and study of eggs of Trematodes and Cestodes*
5 Colelction and examination of infective larvae from intermediate hosts (Snails and fishes)
6 Estimation of total proteins in normal and infected host tissues / Helminth parasites
7 Estimation of Carbohydrates in normal and infected host tissues / Helminth parasites
8 Estimation of Lipids in normal and infected host tissues / Helminth parasites
9 Measurement of Helminth infection incidence, density, intensity and index of infection
10 Bio statistical representation of helminth infection by bar diagram and pie charts.
11 Biostatistical representation of helminth infection using ANOVA
12 Microtomy – fixation and sectioning of normal and helminth infected tissues of host chicken / sheep
13 Study of effect of chemical anthelmintic (albendazole) on Cestode parasites of poultry
14 Evaluation of anthelmintic activity of acqueous herbal extracts on Cestode parasites of poultry
15 Study of effect of Green synthesized sliver nano particles as anthelmintic on Cestode parasites of poultry

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Suggested Books

1 Animal parasitology – J. D. Smyth (Cambridge Univ. Press., 1976).
2 Foundations of parasitology 6 ed. – L. S. Roberts & J. Janovy Jr (McGraw Hill Publ., 2000).
3 Parasitism – A. O. Bush, J.C. Fernandez & J. R. Seed (Cambridge Univ. Press, 2000).
4 Helminthology – Eds. N. Chaudhury & I. Tada (Narosa Publg. House, 1994).
5 Helminthes, Arthropods, & Protozoa of domesticated animals 6 ed. – EJL Soulsby (ELBS, 1976).
6 Introduction to parasitology – B.E. Matthews (Cambridge Univ. Press. 1998).
7 The physiology of Trematodes – JD. Smyth & D. W. Halton (Cambridge Univ. Press, 1983).
8 The physiology and Biochemistry of Cestodes – J.D. Smyth & D.P. MEmanus, (Cambridge Univ. Press, 1989).
9 T.B.Fish Diseases – (Tr.) – D.A. Convoy & R.L. Herman (Narendra Publg. House, 1997).
10 Handbook of Medical Parasitology – V. Zaman & L. H. Keong (K.C. Ang Publishing Pvt. Ltd., 1989).
11 T.B. Medical parasitology – P. Chakraborty (New Central Book Agency, 2004).
12 Ecological Animal Parasitology – C. R. Kennedy (Black well Scientific Publ., 1975).
13 Infectious Diseases of fish – S. Egusa (Oxonian Pvt. Ltd., New Delhi, 1978).
14 A.T.B. of Parasitology 2 ed. – S. S. Kekar & R.S. Kelkar (Bombay popular Prakshan, 1993).
15 General Parasitology by Cheng Thomas C, Orlando, Academic press college Division
16 Parasitology – Proto Zoology and Helminthology by K.D. Chatterjee (2009), Thomson press, New Delhi
17 Textbook of Veterinary Parasitology by B.B. Bhatia, K.M.L. Pathak and D.P. Banerjee, Kalyani Publishers, New Delhi.

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M.Sc. SYLLABUS – CBCS

Code Zoo_303T SMB

Semester – III
Elective - I
Paper III – Systems Biology (SMB]

UNIT I – Systems Approach **15 Hrs**

2.1Mammalian biological clocks, neuronal and humeral network mechanism.
2.2Biochemical networks and metabolic cycles – Kreb's cycle, Electron Transport System.
2.3Sustainable pest and disease management – Quantitative and qualitative models.
2.4Apoptosis - Molecular modeling.
2.5Bioremediation - Hydrocarbon bioremediation, radionuclide biotransformation, metals bioimmobilization.

UNIT II – Predictive Modeling **15 Hrs**

3.1Continuous population models for single species.
3.2Insect outbreak model – A periodic Dynamics.
3.3Predictive ecology, game theory population models, predator-prey model.
3.4Kinetic models of the biochemical system – Metabolic control analysis.
3.5Data formats, simulation techniques, modelling tools.

UNIT III – Systems Biology Applications **15 Hrs**

4.1Networks in the nervous system: Integrative synaptic mechanism of the neural networks.
4.2*Caenorhabditis elegans* model system for neurotoxicity.
4.3Endobiogeny: An approach to systems biology, host-parasite interaction.
4.4Evolutionary systems biology; approach to molecular phylogeny.
4.5Nanoparticles in biological systems – Characterization and applications.

PRACTICALS **Zoo_303P SMB**

1Live-cell imaging through a fluorescent microscope.
2Estimation of predator-prey relationship using larvivorous fish.
3Temperature-dependent enzymatic activity in metabolites.
4*In silico* phylogenetic analysis.
5Estimation of parasitic load in infected fish/ chicken.
6Bioassay of neurotoxicity.
7Estimation of population growth under different environmental conditions.
8Protein expression profiling using 2D electrophoresis.

(with effect from 2022-23 academic year onwards)

Suggested Books

1. An Introduction to Systems Biology: Design Principles of Biological Circuits by Uri Alon.
2. Systems biology: A Text Book by Edda Klipp.
3. Mathematical Biology: An Introduction by Murray J.
4. An Introduction to Mathematical Biology by Linda J.S. Allen.
5. Introduction to Systems Biology by Sangdun Choi.
6. Life: An Introduction to Complex Systems Biology, by Kaneko Kunihiko.
7. Systems biology, by Robert A. Meyer.
8. Systems biology: Principles methods and concepts by A. K. Konopka.
9. Systems biology: The challenges of complexity by Shigetada Nakashini.

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Code Zoo_303T CB

Semester – III

Elective – I

Paper III Computational Biology – I (CB)

UNIT –I INTRODUCTION TO COMPUTATIONAL BIOLOGY **15 Hrs**

1.1 Basic principles and concepts of computational biology
1.2 Introduction to Biological Databases
1.3 DNA databanks, NCBI, GENBANK
1.4 Protein Databanks, Swissport and PDB
1.5 Metabolic Pathway DB KEGG and BIOCYC, database

UNIT –II SEQUENCE ANALYSIS **15 Hrs**

2.1 Concepts of DNA/Protein sequence Analysis
2.2 Importance of sequence alignments, Heuristic methods BLAST, FASTA
2.3 Pair wise sequence alignment – Local alignment and Global alignment
2.4 Multiple sequence alignment, Tree of life, Phylogeny and Molecular evolution
2.5 Computational methods for Phylogenetic analysis

UNIT –III GENOMICS AND PROTEOMICS **15 Hrs**

3.1 Large scale genome sequencing strategies.,HGP
3.2 Prediction of genes, promoters, splice sites, regulatory regions: basic principles, application of methods to prokaryotic and eukaryotic genomes and interpretation of results.
3.3 Secondary structure prediction: Algorithms viz. Chou Fasman, GOR methods; analysis of results
3.4 Computational methods for protein 3D structure prediction
3.5 Identification of SNPs, SNP database (DbSNP).Role of SNP in Pharmacogenomics

PRACTICALS **Code Zoo_303P CB**

Hands-on -working on following software/modules

1. NCBI (Nucleotide, Gene, Protein, Pubmed, PubChem, etc.)
2. Expasy: UniprotKB/Swissprot, PROSITE
3. NCBI BLAST(different types) ,
4. EBI: BLAST, N-W, S-W
5. Clustal Omega
6. RCSB PDB
7. Chemi informatics tools
8. Protein Visualisation tools

Suggested Books

1. Baxevanis, A. D., & Davison, D. B. (2021). Current Protocols in Bioinformatics. John Wiley & Sons.
2. Lesk, A. (2019). Introduction to Bioinformatics (5th ed.). Oxford University Press.
3. David Mount (2018) Introduction to Bioinformatics

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Semester – III

Elective – II

Paper IV Economic Zoology – I (EZI)

UNIT –I SERICULTURE **15 Hrs**

1.1 Sericulture as cottage industry ;races of mulberry and Non mulberry Silkworms

1.2 Mulberry cultivation - Varieties of mulberry, Agroclimatic conditions for Moriculture, Agriculture practices, Harvesting and preservation of leaves

1.3 External morphology of Bombyx mori – Egg, Larva, Pupa & Adult; Morphology and anatomy of silk glands; properties and composition of silk

1.4 Rearing facilities, Rearing operations & Rearing methods- (Chawki Rearing)

1.5 Reeling technology and seed technology (Grainage)

UNIT –II APICULTURE & LAC CULTURE **15 Hrs**

2.1 Industrial status of Apiculture, Species of Honey bees

2.2 Social organization of Honey Bee, Life history, Hive, flora of apiculture, selection of Bees for apiculture

2.3 Methods of Bee keeping – Indigenous method, Modern method; appliances of Modern method – Advantages Products of Bee Keeping, Honey , Beewax & Bee enemies

2.4 Lac culture – Lac insect morphology & life cycle ; Cultivation of lac ;(Inoculation, swarming ,harvesting);
stick lac, Seed lac, Pure lac); Composition of lac and economic importance

2.5 Coral Culture – Possible future trends & Directions, Coral types, Coral Culture- exsitu ; Propagation techniques

UNIT –III MOLLUSCAN FISHERIES ; PEARL CULTURE, VERMICULTURE, PRAWN CULTURE& CRAB **15 Hrs**

3.1 Fisheries of Molluscs (Shell fishes) – Commercial edible species

3.2 Pearl culture – Pearl producing mollusces , Pearl formation, collection of oysters, Rearing of Oysters, Harvesting of Pearl, composition of pearl, problems of pearl industry

3.3 Vermiculture - Earthwarm sp's, method of culturing earthworms, Vermi composting technique for farmers

3.4 Prawn culture – Prawn sp's reared in India, Biology, Hatcheries and Nurseries, Culture of Freshwater Prawn, Culture of Marine Prawn, Methods of Prawn Fishing; Presentation & Processing of Prawn

3.5 Mud Crab Culture – Crab sp's , Biology, Culture practices; seed production , cost and return analysis

PRACTICALS

1. Study of Life history of Silkworm by rearing
2. Rearing appliances
3. Visit to cocoon market
4. Methods of Bee keeping –visit
5. Cultivation of Lac – Visit
6. Vermi composting techniques – To set up very composting unit at campus
7. Culture of Freshwater Prawn & Crab – Visit to Hatchery & Nursery.
8. Dissection of Silk glands of Silkworm larvae
9. Visit to Reeling centre & Grainage units

Suggested Books

1. G.S.Shukla ,V.B Upadhyay Economic Zoology, Rastogi Publications, 2003.
2. Manju Yadav Economic Zoology, Discovery Publishing House , 2003.
3. An introduction to Sericulture , G. Ganga & J. Sulochana Chetty, Oxford & 1BH Publishing Co. 2012.
4. Narsimham K.S Molluscan Fisheiries of India. Br. Publishing Corperation , 2005.
5. Khan A.A Encyclopedia of Economic Zoology, 2 vols, Anmol Publications , 2007.
6. Tomar B.S & Singh, Neera A Text book of Applied Zoology Emkay Publ. Delhi, 2004.

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Code Zoo_304

Semester – III

Elective - II

Paper IV – Principles of Fisheries – I (PF-1)

UNIT I – Fisheries and Ecology of Water Bodies **15Hrs**

1.1 History of fisheries; Present scenario of the fisheries sectors in India; Fisheries institures in India and their role in the augmentation of fish production.
1.2 Classification of fisheries; resources of fisheries in India; Role of fisheries in the economic development of the nation.
1.3 Ecology of lentic and lotic ecosystmes; Aquatic pollution and its impact on fisheries.
1.4 water quality: Physico-chemical parameters of freshwater, brackish water and marine; Ideal conditions of soil and water for shih culture.
1.5 Reservoir, riverine and estuarine fisheries and their management.

UNIT II – Culture Systems **15Hrs**

2.1 Culture systems: open, closed, semi-intensive and intensive culture systems.
2.2 Poultry-cum-fish culture; Analysis of cost-benefit ration.
2.3 Paddy and Horticulture-cum-fish culture; Analysis of cost-benefit ratio.
2.4 Sewage-fed fish culture – Opportunities and challanges.
2.5 Composite fish culture; Prawn-cum-fish culture.

UNIT III – Fish Harvesting Technology and Fish Biotechnology **15Hrs**

3.1 Types of Fishing Crafts: Non-mechanized and mechanized crafts.
3.2 Types Fishing Gears: Gear material, gear making, accessories.
3.3 Fish gear preservation methods and maintenance of crafts.
3.4 cryopreservation of gametes; Fish genomics; chromosomal mapping.
3.5 Fish transgenics for therapeutics; Vaccine development for fish diseases.

PRACTICALS

1. Water analysis and its relation with Aquaculture – pH, Dissolved oxygen, Total alkalinity, Salinity,, Calcium, Magnesium, Ntrates, Phosphates, total dissolved solids, Turbidity.
2. Soil analysis and its relation with Aquaculture – nitrogen, carbon, minerals.
3. Collection and identification of planktons & benthos.
4. Identification of fishing gear models & craft models
5. Identification of important fish parasites.
6. Determination of food & feeding habits of fishes through Gonado-Somatic Index.
7. Use of limnological equipment: Secchi disc, Elman's grab, water sampling bottle, plankton net, Sedgwick-Rafter counting cell.
8. Demonstration of fish breeding techniques.
9. Visit to fish-pounds, fish processing unit/fish seed farm/aquaculture farms and submit a report of your stydy.

Suggested Books

1. Water quality criteria for freshwater fish. Albastor, J.S. and Lloyd, R. Buttorvorth Scientific Pub.
2. Fish and Fisheries of India – Jhingran, V.G. Hindustan Pub,ishing Cooperation New Delhi.
3. The fishes of India – Francis. Day. Vol. I & II, New Delhi – CSIF.
4. The freshwater fishes of India Region – Jayaram, KC. Narendra Publishing house, New Delhi.
5. Prawns and prawn fisheries – Kurian, C.V. and Sebastian, V.O. Hindustan Publishing Cooperation.
6. A manual of freshwater – aquaculture – Santhanam, R. sukllnaran. N. Natarajan Oxford and IBH Pub. Comp.
7. Freshwater aquaculture – Rath, R.K. Scientific Publishers, Jodhpur.
8. Textbook of fish culture, breeding and cultivation of fish – MareelHuet, Fishing News Books.
9. Aquaculture development, processes and prospects – TVR Pillay Fishing news books.
10. Aquaculture – John, E. Bardach, John H. Ryther, W.O. Nclamey, John Willey and Sons, New York.
11. Fish Ecology – RJ. Wotton, Dalckie, Chapman and Hall, New York.
12. Environmental stress and fish diseases – Wedemeye, G.A. Narendra, Publishing House.
13. Diseases of fishes – C. Vandujn, Narendra Publishing House, New Delhi.
14. Aquaculture Principles and practices by T.V.R. Pillay.