



# **PERIYAR UNIVERSITY**

**PERIYAR PALKALAI NAGAR**

**SALEM – 636011**

**DEGREE OF MASTER OF SCIENCE  
CHOICE BASED CREDIT SYSTEM**

**SYLLABUS FOR  
M.SC. ZOOLOGY  
( SEMESTER PATTERN )**

**( For Candidates admitted in the Colleges affiliated to  
Periyar University from 2017-2018 onwards )**



## **REGULATIONS**

### **AIM & SCOPE**

1. To Educate Knowledge across different area of Zoology.
2. There is also scope for self employment.
3. Practical's include in a syllabus will improve all skills of students in microscopy observation, Drawing and laboratory technique.

### **1. ELGIBILITY:**

A candidate who have passed the three year B.Sc., Examination with Zoology will be eligible for admission to this course.

### **2. DURATION OF THE COURSE:**

The course for the Degree of Master of Science shall consist of two years divided into four semesters, over a total of 2500 marks. Each semester consist of 90 working days.

### **3. PASSING MINIMUM:**

The candidate shall be declared to have, passed the Examination if he/she secured not loss than 50 marks.

4. A candidate shall eligible for appearing examination provided he/she secure percentage of attendance as specified by the university.
5. Examination would be held for completion of curriculum at the end of the each semester practical examination would be held end of the each year.
6. A candidate should obtain at least 50% in each of the theory are practical course to qualified in each semester.

## COURSE OF STUDY AND SCHEME OF EXAMINATION

Course	Course Code	Subject Title	Hrs/W		Credits	Exam Hrs	University Examination		
			L	P			Internal (25%)	External (75%)	Total
<b>I SEMESTER</b>									
Core I		Animal Taxonomy, Phylogeny and Biology of Invertebrates and Chordates	5	0	3	3	25	75	100
Core II		Cell and Molecular Biology	5	0	3	3	25	75	100
Core III		Molecular Genetics	5	0	3	3	25	75	100
Core IV		Microbiology and Immunology	5	0	3	3	25	75	100
Core Practical I		Practical I	0	5	6	4	40	60	100
Elective I		Nutrition and Dietetics	5	0	3	3	25	75	100
		<b>TOTAL</b>	<b>25</b>	<b>5</b>	<b>21</b>				<b>600</b>
<b>II SEMESTER</b>									
Core V		Biostatistics, Computer Application and Research Methodology	5	0	3	3	25	75	100
Core VI		Biochemistry and Biophysics	5	0	3	3	25	75	100
Core VII		Environmental Biology and Toxicology	5	0	3	3	25	75	100
Core Practical II		Practical II	0	5	6	4	40	60	100
Elective II		Parasitology	4	0	4	3	25	75	100
Choice Based EDC		Choose any one of the following: Fishery Biology Aquaculture / Poultry Farming							
Common Paper		Human Rights	1	0	2	3	25	75	100
		<b>TOTAL</b>	<b>25</b>	<b>5</b>	<b>24</b>				<b>700</b>

Course	Course Code	Subject Title	Hrs/W		Credits	Exam Hrs	University Examination		
			L	P			Internal (25%)	External (75%)	Total
<b>III SEMESTER</b>									
Core VIII		Developmental Biology	5	0	3	3	25	75	100
Core XI		Basic Concepts of Biotechnology	5	0	3	3	25	75	100
Core X		Animal Physiology	5	0	3	3	25	75	100
Core XI		Optional Subject- I – General and Applied Entomology	5	0	3	3	25	75	100
Core Practical III		Practical III	0	5	6	4	40	60	100
Elective III		Endocrinology	5	0	3	3	25	75	100
		<b>TOTAL</b>	<b>25</b>	<b>5</b>	<b>21</b>				<b>600</b>
<b>IV SEMESTER</b>									
Core XII		Evolution	5	0	3	3	25	75	100
Core XIII		Medical Laboratory Techniques	5	0	3	3	25	75	100
Core XIV		Optional Subject - II - Sericulture	5	0	3	3	25	75	100
Core Practical IV		Practical IV	0	5	6	4	40	60	100
Core Project		Dissertation							
		Report Evaluation - 75	0	5	6	-	-	-	100
		Viva voce - 25							
Elective IV		Economic Zoology	5	0	3	3	25	75	100
		<b>TOTAL</b>	<b>20</b>	<b>10</b>	<b>24</b>				<b>600</b>
		<b>GRAND TOTAL</b>	<b>95</b>	<b>25</b>	<b>90</b>				<b>2500</b>

**COURSE COMPONENT**

<b>Course</b>	<b>Number of the Course</b>	<b>Credit per Course</b>	<b>Total Creditors</b>	<b>Total Marks</b>
Core Courses	14	3	42	1400
Elective Course	4	3	12	400
Practical	4	6	24	400
Dissertation	1	6	6	100
EDC	1	4	4	100
Human Rights	1	2	2	100
		Total	90	2500

**M.Sc. ZOOLOGY**  
**SEMESTER - I**  
**CORE I – ANIMAL TAXONOMY, PHYLOGENY AND BIOLOGY**  
**OF INVERTEBRATES AND CHORDATES**

**UNIT I**

Introduction to Taxonomy – Stages in Taxonomy – Importance of Taxonomy. Aims and tasks of a Taxonomist – identification by using taxonomic keys. Zoological classification: kinds of classification. Concepts of species.

Zoological Nomenclature: Nature of scientific names – Synonyms and Homonyms – Meanings of Authors in Brackets – Types: Holotypes, Paratype, Lectotype, Syntype, Neotype and Allotype – ICZN and its rules.

**UNIT II**

Phylogeny of Invertebrates: Protozoa – Phylogenetic origin and evolution of the class Metazoa. Theories and origin of metazoan. Coelomata – Coelom and its origin. Trilobites – structure and significance. Molluscan fossils and Echinoderm fossils.

**UNIT III**

Phylogeny of Vertebrates: Jawless vertebrates – characteristic features of lampreys. Earliest vertebrates: Ostracoderms – characteristic features and classification. Primitive jawed vertebrates – origin of jaws. Origin of Amphibia, Reptiles, Birds and Mammals.

**UNIT IV**

Respiration: Gills and Trachea in Arthropods.

Circulation: Circulation in Arthropods.

Excretion: Different types of excretory organs in Invertebrates – their structure and functions.

Nervous System: Annelids.

Reproduction: Reproductive system of Arthropods – Invertebrate Larval forms and their significance.

**UNIT V**

Comparative study: Structure and Function of the following system in vertebrates.

Digestive System: Alimentary Canal and Associated Glands in Amphibia and Mammals.

Respiratory System: Fishes and Birds.

Circulatory System: Arterial and Venous system of Reptiles and Birds.

Excretory system: Reptiles and Mammals.

Nervous System: Brain of Amphibia and Mammals.

Reproductive System: Reptiles and Mammals.

**TEXT BOOKS:**

1. Kotpal, R.L., Agarwal, S.K. and Khetarpal, R.P.R., 1989. Modern Text Book of Zoology, Rastogi Publications, Meerut

**REFERENCES:**

1. Hyman, G.H., 1940. The Invertebrates, Vol. I to VII, McGraw Hill Book Co., Inc., N.Y.
2. Weischert, C.K., 1965. Anatomy of Chordates, McGraw Hill Book Co., Inc., N.Y.
3. Romer, A.S., 1979. Hyman's Comparative Vertebrate Anatomy, 3rd Edition, The University of Chicago Press, London.
4. Barnes, R.D., 1974, Invertebrate Zoology, 4th Edition, Holt Saunders International Edition.



**M.Sc. ZOOLOGY**  
**SEMESTER - I**  
**CORE II – CELL AND MOLECULAR BIOLOGY**

**UNIT I**

Membrane Structure and Function: Structure of model membrane, lipid bilayer and membrane protein – diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

**UNIT II**

Structural organization and function of intracellular organelles: Mitochondria, Ribosome, Golgi bodies, Lysosomes, Endoplasmic reticulum, Peroxisomes, Nucleus.

**UNIT III**

Cell division and Cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle and control of cell cycle.

**UNIT IV**

Organization of Genome: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, heterochromatin, euchromatin, transposons. Structure, types of DNA and RNA, DNA replication and repair RNA Synthesis and processing; protein synthesis and processing: Control of gene expression at transcription and translation level in prokaryotes and eukaryotes.

**UNIT V**

Cell signaling: G-Protein coupled receptors, Signal transduction pathways, Regulation of signaling pathways.

Cellular communication: Principle, Cell adhesion, Gap junctions, extracellular matrix and integrins.

Cancer: Oncogenes, tumour suppressor genes, cancer and the cell cycle, Virus – induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis. Immune response to cancer.

**TEXT BOOKS:**

1. De Robertis, E.D.P and De Robertis E.M.E. 1987. Cell and Molecular Biology 8th Edition. Lea and Febiger, Philadelphia.
2. David Freifelder, 2008. Molecular Biology 2nd Edition. Narosha Publishing House, New Delhi.

**REFERENCE BOOKS:**

1. Powar, C.B. 2010. Cell Biology 3rd Edition, Himalayas Publishing House, Bombay.
2. Lewis J Kleinsmith and Valerie M Kish. 1988. Principles of Cell Biology, Harper and Row Publication, New York.
3. Prakash S. Lohar, 2009, Cell and Molecular Biology, MJP Publishers. Chennai.
4. Gupta M.L and Jangir M.L. 2009. Cell Biology: Fundamentals and Application, Agrobios Publishers, Jodhpur.

**M.Sc. ZOOLOGY**  
**SEMESTER - I**  
**CORE III - MOLECULAR GENETICS**

**UNIT I**

Molecular Gene concept: Fine structure of genes. Linkage and crossing over, Sex linkage, sex limited and sex influenced characters. Extra chromosomal inheritance of mitochondrial genes.

Gene mapping methods: Linkage maps, mapping with molecular markers.

**UNIT II**

Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex-duction.

Human genetics: Pedigree analysis, karyotypes, Genetic disorders: Chromosomal Syndromes, Gene based disorders, mitochondrial gene disorders.

**UNIT III**

Quantitative genetics: Polygenic inheritance.

Mutation: Types, causes and detection, mutant types – lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.

Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

**UNIT IV**

Population Genetics : Populations, gene pool, Hardy – Weinberg law – Genetic Equilibrium. Factors affecting Hardy – Weinberg equilibrium. Calculation of gene frequencies for Autosomal and Sex linked genes.

**UNIT V**

Genetic Engineering : Restriction enzymes and other enzyme tools used in rDNA technology, Recombinant DNA techniques. Application of rDNA technology

Applied Genetics : Application of genetic in Animal Breeding – Application of genetics in Crime and Law – DNA Finger Printing.

**TEXT BOOKS:**

1. Gardner E J, Simmons M, Snustad D P, 1991. Principles of Genetics 8th Edition, John Wiley & Sons, New Jersey.
2. Dobzhansky, Aval, F.J. Stebbins, G.L and Valentine, J.W. Surjeet Publications, Delhi.

**REFERENCES:**

1. Jenkins J.B, 1989. Human Genetic (The Benjamin/Cummins series in the life sciences), Harper Collins College Div
2. Benjamin Lewis 2007. Genes IX, Jones and Bartlett Publishers, U.S.A.
3. Monroe W Strickberger 2012. Genetics 3rd Edition, Prentice hall of India Pvt. Ltd.
4. John D. Hawkins 1996. Genes structure and expression 3rd Edition. Cambridge Univ. Press.
5. Mange E.J. and Mange A.P. 1997. Human genetics, Rastogi Publications, Meerut.

**M.Sc. ZOOLOGY**  
**SEMESTER - I**  
**CORE IV - MICROBIOLOGY AND IMMUNOLOGY**

**UNIT I**

General Microbiology: Bacteria – Taxonomy, Structure, Recombination, Growth, Nutrition, Culture – Types of Media and Conditions for Culturing.

Viruses – Taxonomy, Structure and life Cycle of Viruses – T4 Phage and HIV, Viroids and Prions.

**UNIT II**

Medical Microbiology: Infectious Diseases – Causative Agents, Modes of Transmission and control of Polio, Dengue, AIDS, Tuberculosis, Diphtheria, Typhoid, Syphilis and Gonorrhoea. Prevention and control of microorganisms – Physical and Chemical Methods. Antibiotics and Other Anti – microbial Agents and Mechanism of Drug Resistance.

**UNIT III**

Scope of Immunology – Types of Immunity - Innate and Acquired, Passive and Active. Primary and Secondary Lymphoid Organs – structure and Function of Bone Marrow, Thymus, Spleen, Bursa of Fabricius, GALT, BALT, MALT and Lymph Nodes. Cells of Immune System – Origin and Differentiation of T & B Cells and Macrophage. Antigens – Class Determinants – Reactive Sites and Receptor Sites.

**UNIT IV**

Antibody – Immunoglobulin – Primary Structure – Classes, Functions, Synthesis. Hybridoma technology Monoclonal Antibodies and their Applications. Genetic Mechanisms in Generation of Antibody Diversity – Regulation of antibody Diversity. Complement – Classical and Alternative Pathways and Immunological Significance – Antigen antibody reaction.

**UNIT V**

Major Histo-compatibility Complex (HLA) and its Products in Man. Transplantation Immunology, Tumour Immunology – Immune Deficiency Diseases – AIDS – Autoimmune Diseases – Examples – Concept and Mechanisms – Types of Hypersensitivity.

**TEXT BOOKS:**

1. Powar, C.B. and Daginawala, H.F. 1982. General Microbiology Volume I & II, Himalayas Publishing House, Mumbai.
2. Anadanarayanan, T and Jayram Paniker, C.K, 2000. Textbook of Microbiology, 6th Ed. Orient Longman Ltd. Chennai.
3. Kannan, I. 2011. Immunology, MJP Publishers, Chennai.
4. Nandhini Shetty, 1996. Immunology Introduction Text Book New Age International Pvt. Ltd. New Delhi.

**REFERENCES:**

1. Pelczar, M.J., Reid R.D and Chan E.C.S. 2002. Microbiology, 5th Ed. Tata McGraw Hill Publishing Co. Ltd. New Delhi.
2. Barbara J. Howard. 1994. Clinical and pathogenic Microbiology. The C V Mosby Company.
3. Kuby J. 1994. Immunology, W.H. Freeman & Co. New York.
4. Roitt, M.I. 1994. Essential Immunology, Blackwell Science Lyd. Uk
5. Sells, S. 1987. Basic Immunology, Elsevier Science Publishing Co. New York.

**M.Sc. ZOOLOGY****SEMESTER - I****CORE - PRACTICAL - I****ANIMAL TAXONOMY, PHYLOGENY AND BIOLOGY OF INVERTEBRATES AND CHORDATES, CELL AND MOLECULAR BIOLOGY, MOLECULAR GENETICS AND MICROBIOLOGY AND IMMUNOLOGY****I. Animal Taxonomy, Phylogeny and Biology of Invertebrates and Chordates****Invertebrates**

1. Identification and study of selected Protozoan and Helminthes of medical importance
2. Identification and study of Trochophore larva, Nauplius larva, Zoea larva and Bipinnaria larva.
3. Dissection of nervous system of Prawn.
4. Mounting of mouth parts of Honey bee, House fly, Mosquito and Placoid scales.

**Chordates**

Demonstration – Dissections: Arterial System & Cranial nerves – Shark, Frog, Calotes & Rat using video clippings (Demo Only). A student can make use of material available in any search web site for online dissection using Apple quick time software.

**II. Cell and Molecular Biology**

1. Micrometry – Simple measurements of cells ( any prepared slides) by micrometry
2. Study of Mitosis in the cells of Onion root tip.
3. Observing the Giant Chromosomes in the salivary glands of larva of Chironomus sp.
4. Histochemical localization of proteins, carbohydrates and lipids.

**III. Molecular Genetics**

1. Drosophila – Identification of Mutant Wings and Eyes.
2. Localization of Barr body in the buccal smear (Squamous epithelial cells of man)
3. Spotters: Normal Human Karyotype, Down's syndrome, Klinefelter's syndrome, Turner's syndrome.

**IV. Microbiology and Immunology**

1. Study of clinical and veterinary protozoans.
2. Study of bacterial diseases of man with reference to gastro – intestinal, respiratory, nervous, genital systems with any two examples for each.
3. Tour report of the visit to Food Preservation/Food Fermentation industries and Dairy.
4. Demonstration – Culture of bacteria, Preparation of smear, Simple staining & Gram Staining (Demo Only).
5. Identification of Lymphoid organs of Rat/Mouse.
6. Determination of Human Blood Group & Rh typing by haemagglutination test.

**M.Sc. ZOOLOGY**  
**SEMESTER - I**  
**ELECTIVE – I – NUTRITION AND DIETETICS**

**UNIT I**

Introduction – Food as a sources of Nutrition - Food intake and its regulations - Food is more than nutrients - population and food production. Food and Future.

**UNIT II**

Well balanced diet, Nutritive value of some common foods. Nutrition – Diet in nutritional deficiency diseases – Modification of normal diet in protein malnutrition – anemia and vitamin deficiency.

**UNIT III**

Therapeutic diets – Obesity and Under weight. Diabetes mellitus – diagnostic tests – Diet in Infectious diseases – Typhoid, Tuberculosis, Malaria and Pneumonia.

**UNIT IV**

Therapeutic diets – Nutrition during pregnancy, Diet in allergy – definition, common food allergies – dietetic treatment. Nutrition for aged.

**UNIT V**

Therapeutic diets – Modifications and objectives based on causative factors – Diseases of the heart and circulatory systems – Atherosclerosis, coronary heart disease, congestive heart failure, hypertension, different – sodium restricted diets.

**REFERENCE**

1. B. Srilakshmi, 2005. Food Science 3rd Edition, New age International Publication.
2. William C.Frazier and C. Dennis Westhaf, 1995. Food Microbiology 4th Edition, Tata McGraw Hill Publ. Co .Ltd.
3. N. Sakuntala Mary, 2005. Foods facts and principles 2nd Edition, New Age International Publication
4. Robbins, Basic Pathology 7th Edition, Elsevier India Pvt. Ltd., New Delhi, India.



**M.Sc. ZOOLOGY**  
**SEMESTER - II**

**CORE – V –BIostatistics, Computer Application and  
RESEARCH METHODOLOGY**

**BIostatistics**

**UNIT I**

Variables in Biology, Collection, classification and tabulation of data. Frequency distribution, Diagrammatic and Graphical presentation of statistical data, Sampling techniques. Measures of Central Tendency: Mean, Median and Mode. Measures of Deviation: Standard Deviation and Standard Error.

**UNIT II**

Hypothesis Testing and estimation: Measures of Relationship: Correlation and its types. Regression analysis. Definitions and applications of Chi-square test, 't' test. Analysis of variance (ANOVA)-One way and two way. Application of SPSS in biology.

**Computer Application**

**UNIT III**

Introduction to Computers – Characteristics of Computers – Classification of Digital Computer Systems – Anatomy of Digital Computer – Memory units. Using MS Word, Excel and Power Point Presentation.

**UNIT IV**

Computer Software : Programming, Languages (BASIC, COBOL, FORTRAN and C only – Basic concept). Data processing and Database Management – Internet – E-Mail – Computer applications in Science and Technology.

**Research Methodology**

**UNIT V**

Meaning of Research in Biological Sciences, Objectives, Types, - Methods of Research (Survey, Observation, case study, experimental, historical and comparative methods) – Steps in Research Process: Formulating the Research Problem, Extensive Literature Review, Developing the Objectives, Preparing the Research Design, Collecting the Data, Analysis of Data, Generalization and Interpretation. Preparation and Presentation of Research Report.

**TEXT BOOK :**

1. Basotia G.R. and Sharma. K.K., Research Methodology,
2. Gurumani, 2006. Research Methodology, MJP Publishers, Chennai.
3. Chaudhary, C.H. Research Methodology- RBSA Publication,
4. Palanichamy, S. and Manoharan, M. 1991. Statistical Methods for Biologists, Palani Paramount Publications.
5. Gurumani, N. 2005. An Introduction to Biostatistics 2nd Edition, MJP Publishers, Chennai.
6. Sharma, A.K 2005. Text book of Biostatistics, Discovery publishers House, New Delhi.
7. Arora P.N and Malhan P.K., 2007. Biostatistics – Himalaya publishers House, Mumbai.
8. Alexis Leon and Mathews Leon 1998. Fundamentals of Computer Science and Communication Engineering, Leon Tech word Chennai.
9. Rajaraman, V., 1992. Fundamentals of Computers 8th edition, Prentice – Hall of India Private Limited, New Delhi.
10. Pradeep K. Sinha and Prite Sinha 2005. Computer Fundamentals BPB Publications – New Delhi.

**M.Sc. ZOOLOGY**  
**SEMESTER - II**  
**CORE VI – BIOCHEMISTRY AND BIOPHYSICS**

**UNIT I**

Structure of atoms, molecules and chemical bonds. Stabilizing interactions: Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction.

Classification, Composition, structure and function of biomolecules: carbohydrates, lipids, amino acids, proteins, nucleic acids and vitamins.

**UNIT II**

Principles of biophysical chemistry: pH, buffer, reaction kinetics, thermodynamics, colligative properties.

Metabolism of Carbohydrates : Glycolysis, TCA Cycle, Electron transport cycle, HMP Shunt, Glycogenesis, Glycogenolysis and Gluconeogenesis.

**UNIT III**

Classification of Enzymes, Principle and mechanism of enzyme action, Enzyme kinetics, Enzyme regulation, Factors affecting enzyme action. Metabolism of Protein: Deamination, Transamination and Decarboxylation. Urea cycle. Lipid Metabolism :  $\beta$  Oxidation.

**UNIT IV**

X-ray diffraction – Polymerization of organic molecules – Colloids - description, and properties. Thermodynamic principles – Membrane biophysics – diffusion, active transport. Tyndall effect, Surface tension, Brownian movement, filtration, osmosis, dialysis.

**UNIT V**

Photoelectric effect – Photodynamic sensitization – Effect of UV light and ionizing radiations – Detection – Disintegration – Measurement of radio activity – Gieger Muller counter – Isotopes as tracers - Free energy from electromagnetic waves - Natural radiations. Principles and application of chromatography – Paper – Thin layer – Column – Ion – exchange – filtration – Gas liquid – HPLC and Affinity. Principles and applications of electrophoresis – Agarose gel electrophoresis – PAGE – SDS-PAGE.

**TEXT BOOK :**

1. Nelson, D.L., Leninger, A.L. and Cox, M.M., 2008. Lehninger Principles of Biochemistry, W.H. Freeman Co.,
2. Ambika Shanmugam, 2003. Fundamentals of Biochemistry for Medical Students
3. Lehninger L. Albert, David. L. Nelson, Michael M. Cox., 1993. Principles of Biochemistry, Cbs Publishers and Distributors, Delhi.
4. Ramamurthy, V and S. Raveendran. 2010. Fundamentals of Biochemistry. Aruma Publications, Koradacherry.
5. Narayanan P, 2007. Essential of Biophysics. New Age International Publications, New Delhi.

**REFERENCES:**

1. Stryer, L., 1988. Biochemistry, W.H. Freeman & Co. New York.
2. Cooper, T.G., 1977. The Tools of Biochemistry, Wiley Interscience Publications, New York.
3. Murray, R.K. Granner, D.k. Mayes, P.A. and Rodwell, V.W., 1988. Harper's Biochemistry 21st Edition, Appleton & Lange, Medical Publications, California.
4. Bhagavan, N.V., 2004. Medical Biochemistry 4th Edition, Academic Press (Elsevier) California.
5. Frunton J.S. Simmonds, S. General, G. and Dol, R.H. 1987. Outlines of Biochemistry, John Wiley & Sons.
6. Baldwin, E. 1964. An Introduction to Comparative Biochemistry, CUP, London.
7. Jain, J.L. 2003. Fundamentals of Biochemistry, S. Chand & Company Ltd. New Delhi.
8. Freifelder, D. 1993. Physical Biochemistry. W.H. Freeman and Company. New York.
9. Mallikarjuna Rao, 2006. Medical biochemistry. New Age International Publishers, New Delhi.
10. Voet, G. 1989. Biochemistry. John Wiley and Sons.
11. Dubey, R.C. 1989. Biochemistry. MacMillan Publishing Company, New York.

**M.Sc. ZOOLOGY**  
**SEMESTER - II****CORE – VII – ENVIRONMENTAL BIOLOGY AND TOXICOLOGY****UNIT I**

Habitat Ecology and Niche: Lake, Marine – Rocky, Muddy and Sandy shore, Estuary, Terrestrial, Grassland, Forest and Desert ecosystem. Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource partitioning; character displacement.

**UNIT II**

Population Ecology: Characteristics of a population; population growth curves; population regulation. Species interactions: Types of interactions, interspecific competition, herbivorous, carnivorous, pollination, symbiosis.

Community Ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

**UNIT III**

Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine). Ecological succession: Types; mechanisms; changes involved in succession; concept of climax. Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

**UNIT IV**

Applied Ecology: Environmental pollution - Air, Water, Land, Thermal, Radiation and Noise; global environmental change; Biodiversity - status, monitoring and documentation; major drivers of biodiversity change; biodiversity management approaches.

Conservation Biology: Indian case studies on Conservation / management strategy (Project Tiger, Biosphere reserves)

Remote sensing and GIS: Methods and Applications in environmental management

**UNIT V**

Toxicology: Environmental Toxicants and their accumulation, biotransformation and biomagnification in ecosystem, Evaluation of Toxic residues, Toxicity – Factors affecting toxicity, Bioassay - concept of LC 50 and LD 50. Xenobiotics, Teratogens, Safety evaluation of toxicants.

**TEXT BOOK :**

1. Odum, E.P., 1966. Fundamentals of Ecology, W.B. Saunders Company.
2. Verma, P.S., Agarwal, N.K., Thyagi, B.S., 1980. Animal Physiology and Ecology, S.Chand & Co., New Delhi.
3. Subramanian, M.A., 2004. Toxicology Principles and Methods, MJP Publishers, Chennai.

**REFERENCES:**

1. Clark, G.L., 1954. Elements of Ecology, John Wiley & Sons.
2. Kormandy, E.J., 1986. Concepts of Ecology, Prentice Hall of India Private Ltd.
3. Kumarasamy, K, Moses, A.A, and Vasanthi, M., 2007. Environmental Studies, BDU, Trichy.
4. Sharma, P.D., 1999. Environmental Biology and Toxicology, Rastogi Publications Meerut.
5. Sharma, B.K., 2005. Environmental Biochemistry, Krishna Prakasham Media (P) Ltd., Meerut.
6. Bhattacharya, S, 2011. Environmental Toxicology, Books and Allied Pvt. Ltd. Kolkatta.

**M.Sc. ZOOLOGY**

**SEMESTER - II**

**CORE PRACTICAL – II**

**BIostatISTICS AND COMPUTER APPLICATIONS, BIOCHEMISTRY, BIOPHYSICS,  
ENVIRONMENTAL BIOLOGY AND TOXICOLOGY**

**Subject Code: 17PZOP02**

**I. Biostatistics**

Problems related to

1. Mean
2. Standard Deviation
3. Students 't' test
4. Chi – square test

**II. Computer applications**

Demonstration: computers accessories and their usages.

1. CPU
2. Monitor
3. Key board
4. Mouse

MS Word: Typing, Editing and formatting a document (Demonstration only).

MS Excel: Drawing Bar diagram, Histogram, Line diagram and Pie – Chart (Demonstration only).

**III. Biochemistry**

1. Qualitative detection of proteins, carbohydrates and lipids in tissue samples
2. Quantitative estimation of total proteins, carbohydrates (glycogen) in tissue samples (Demo only).
3. Enzyme Kinetics: Influence of pH, temperature, substrate concentration and enzyme concentration on the Human salivary amylase activity.
4. Demonstration of amino acids in body fluid of Cockroach or grasshopper using paper chromatography.

**IV. BioPhysics**

Phase – contrast microscope, Spectrophotometer, pH meter, Agrose – gel electrophoresis.

**V. Environmental Biology & Toxicology**

1. Identification of Zoo planktons (fresh water/marine)(Any five).
2. Hydrobiological studies of water samples from Textile/ Paper Mill/ sewage effluent with special reference to pollution – O<sub>2</sub>, free CO<sub>2</sub> and Salinity.
3. Animal association – Parasitism and Mutualism.
4. Report on ecological collection representing different habitats – Sandy, Muddy and Rocky shores (Study tour/ Field trip may be arranged, report should be submitted).
5. Spotters: Secchi Disc, Maximum and Minimum Thermometer, Hygrometer and Rain gauge.

**VI. Record submission**



**M.Sc. ZOOLOGY**  
**SEMESTER - II**  
**ELECTIVE – II – PARASITOLOGY**

**UNIT I**

Types of parasites, types of hosts, inter relationship between host and parasite. Responses and hosts to parasitic infection, mode of transmission of parasite, host specificity and parasitic adaptation.

**UNIT II**

Vibrio cholerae – life cycle, mode of transmission , infection and treatment. Yersinia pestis – life cycle, mode of transmission, infection and treatment .Influenza and H1N1 viruses – life cycle, mode of transmission, infection and treatment. Dengue - life cycle, mode of transmission, infection and treatment.

**UNIT III**

Vectors - definition, types of vector. Arthropod vector of medical and veterinary importance – sand flies, mosquitoes, horse flies and Rat flea, ticks, mites and vector control.

**UNIT – IV**

Study of parasites from Protozoa & Cestoda

1. Trypanosoma of humans.
2. Intestinal flagellates Giardia.
3. General life cycle of cestodes :Taenia.

**UNIT V**

Study of parasites from Trematoda & Nematoda: Schistosomo, Fasciola. Nematodes: Wuchereria, Ancylostoma. Plant nematodes: Cyst nematode.

**REFERENCE BOOKS:**

1. Ramnik Sood, 1993. Parasitology, C.B.S. Publisher, New Delhi.
2. K.D. Chaterjee, 1987. Parasitology, Medical Publisher Calcutta.
3. Hobler, E.R., and Noble, G.A., 1982. Parasitology 2nd Edition, Lea & Febieger U.S.A
4. Smit. D.G., 1997. Introduction Animal Parasitology 2nd Edition, Johns Willey Sons New York.
5. Soulsby, E.J.L., 1969. Helminths, Arthropods & Protozoa of Domesticated Animals, ELBS Publication London Ed.

**M.Sc. ZOOLOGY**  
**SEMESTER - II**  
**EXTRA DISCIPLINARY COURSE (EDC)**  
**FISHERY BIOLOGY & AQUACULTURE**

**UNIT I**

Introduction – Importance of Inland fisheries principles and aim of fish culture  
Qualities of culturable fishes. Types of fish culture – mono culture – composite culture  
– paddy cum fish culture.

**UNIT II**

Fresh water Prawn culture – Preparation of farm – Reproduction – Seed collection and  
Transport. Management of production pond – stocking – supplementary feeding –  
methods of prawn fishing.

**UNIT III**

Construction and maintenance of fish farm – types of fish ponds – management of fish  
culture – breeding – types of breeding – Natural and Induced.

**UNIT IV**

Harvesting – methods of fishing – electric fishing. Transportation and marketing –  
structure of a fish market. Marketing system – Co – operative system – National Co –  
operative Development Corporation capital market.(NCDC).

**UNIT V**

Processing and Preservation – Fish spoilage – processing – Fish – Rigor mortis –  
spoilage. Principle and process of preservation - Methods of preservation. By  
products of fishing industries.

**TEXT BOOK:**

1. K. Shanmugam. 1992. Fishery Biology and Aquaculture, LEO Pathippagam. Chennai.

**REFERENCE BOOKS:**

1. Shukla, G.S, and Upadhyay V.B., 2000. Economic Zoology, Rastogi Publications Meerut.
2. Thingran V.G., 1983. Fish and Fisheries of India 2nd Edition, Hindustan Publications, Delhi.
3. Kamaleswar Pandey and Shukla, J.P., 2005. Fish and Fisheries, Rastogi Publications.
3. Hobler, E.R., and Noble, G.A., 1982. Parasitology 2nd Edition, Lea & Febieger U.S.A
4. Smit. D.G., 1997. Introduction Animal Parasitology 2nd Edition, Johns Willey Sons New York.
5. Soulsby, E.J.L., 1969. Helminths, Arthropods & Protozoa of Domesticated Animals, ELBS Publication London Ed.

**M.Sc. ZOOLOGY**  
**SEMESTER - II**  
**EXTRA DISCIPLINARY COURSE (EDC)**  
**POULTRY FARMING**

**UNIT I**

Introduction – Importance of Poultry Farming – Morphology of a Fowl. General anatomy – Skin – Skeletal System – Digestive System – Reproductive System – Endocrine System. Habitat of Fowl – Food and Feeding of Fowls.

**UNIT II**

Fowl house – Location. Kinds of Poultry house – Hatchery – Brooder house – Broiler house – Layer house. Equipments – Feeders – Catching equipment – Nests – Hatchery equipments.

**UNIT III**

Management of growers – Overcrowding – Culling of replacement pullets for egg production and breeding stock – feeding of growing broilers. Management of layers – Lighting – Culling of non – layer and poor layers. Management of broilers – Broiler industry – Broiler Chicks – Feeds and feeding management, Prevention of poultry diseases.

**UNIT IV**

Egg – Structure – Chemical composition – Nutritional value of eggs – grading – Preservation – Marketing of egg.

**UNIT V**

Poultry meat – production and Processing – Preservation of raw meat - Composition and nutritional value. Inspection and grading. Meat products. By products of poultry.

**TEXT BOOK:**

1. Singh, R. A. Poultry Production, Kalyan Publishers, New Delhi.

**Reference**

1. Shukla G.S. and Upadhyay V.B., 2000. Economic Zoology, Rastogi Publications, New Delhi.

**M.Sc. ZOOLOGY**  
**SEMESTER - III**  
**CORE VIII – DEVELOPMENTAL BIOLOGY**

**UNIT I**

Introduction to developmental biology. Gametogenesis – Spermatogenesis – Spermiogenesis, structure and types of sperm. Oogenesis – origin and growth of oocyte, maturation of egg, egg envelopes, vitellogenesis and organization of egg cytoplasm. Types of eggs – Egg cortex – polarity and symmetry of egg. Fertilization: Events of fertilization – Physiological changes in the organization of egg cytoplasm.

**UNIT II**

Cellular differentiation – cytodifferentiation and chemodifferentiation. Stem cells – totipotency and pluripotency. Embryonic stem cells and their applications. Cleavage – Patterns of cleavage – radial, spiral and bilateral; Types – meroblastic, holoblastic and superficial – factors affecting cleavage. Blastulation – Types of blastula. Fate maps. Presumptive organ forming areas in frog. Morphogenetic movements and gastrulation in frog.

**UNIT III**

Organogenesis – Ectodermal derivatives: formation of central nervous system – development of brain, eye in frog. Mesodermal derivatives: heart and kidney in frog. Extra embryonic membranes in Chicks – Placentation – its types and physiology in mammals.

**UNIT IV**

Organiser concept – embryonic induction – mechanism of induction. Regeneration: Types of regeneration – amphibian limb regeneration – stimulus and suppression of regeneration. Metamorphosis – types – amphibian metamorphosis – events and hormonal control. Insect metamorphosis: moulting, growth and hormonal control.

**UNIT V**

Precaution and health care during pregnancy and gestation. Impotency: Causes of Impotency and sterility male and infertility in female – Concept of test tube baby – Artificial Insemination in humans – In Vitro Fertilization (IVF) and Gamete – Intra – Fallopian Transfer (GIFT).

**TEXT BOOKS:**

1. Veer Bala Rastogi, Developmental Biology, Kedarnath Ramnath publishers, Meerut.
2. Arumugam N., 1998. Developmental Biology, Saras Publications.
3. Balinsky B.I., 1981. An Introduction to Embryology. W.B Saunders Company. Philadelphia.

**REFERENCE BOOKS:**

1. Berry A.K. 2007. An Introduction to Embryology, Emkay Publications, New Delhi 51.
2. Beril. N.J. 1986. Developmental Biology. Tata McGraw- Hill Publishing Ltd. New delhi
3. Banerjee S. Development Biology, Dominant Publishers, New Delhi.
4. Browder L.N. 1980 Developmental Biology, Saunders College, Philadelphia.
5. Deuchar, E.M 1976. Cellular Interaction in Animal Development, Chapman and Hall, London.
6. Verma P.S and Agarwal V.K., 2005. Chordate Embryology (Developmental Biology) S. Chand & Company Ltd, New Delhi.

**M.Sc. ZOOLOGY****SEMESTER - III****CORE IX – BASIC CONCEPTS OF BIOTECHNOLOGY****Subject Code: 17PZO09****UNIT I**

Tools and techniques of Genetic Engineering: Basic Principles of Genetic Engineering; Restriction enzymes, Linkers/Adaptors; Cloning Vectors – Salient Features and Types – Plasmids, Phages, Cosmids, Transposons, Shuttle and Expression Vectors; Techniques – Strategies of rDNA Technology, Gene Library, Insertion of a Foreign DNA into a Vector, Transfer of rDNA into a Bacterial Cell, Selection & Screening of Recombinants, Blotting Techniques.

**UNIT II**

Industrial & Environmental Biotechnology: Fermentation – Types, Fermenter Designs, Upstream and Down Stream Processing, Product Recovery and Purification; Production of Alcohol and Vitamins. Biofuels, Bioremediation, Biodegradation, Biomining and Biosorption.

**UNIT III**

Animal biotechnology: Cultivation of Animal Cells in a Bioreactor; Somatic Cell Fusion, Applications of Cell Culture – tPA Blood Factor VIII and Erythropoietin; Organ Culture; Transgenic Animals – Transgenic Goat.

**UNIT – IV**

Enzyme Biotechnology: Microbial Production of Enzymes, Immobilisation of Enzymes and its applications.

Agricultural Biotechnology: Agrobacterium as a natural genetic engineer; Single Cell Protein, Nitrogen fixation – nitrogen fixing organisms, mechanism and genetics of fixation; Bio-pesticides; Biofertilizers.

**UNIT V**

Medical Biotechnology: Production of Antibiotics, Hormones, Vaccines, Interferons, Diagnosis of Diseases MAbs, Molecular Markers in Forensic science. Gene Therapy – Germ Line Gene Therapy and Somatic cell Line Gene Therapy.

**TEXT BOOK**

1. Dubey, R.C. 2008. A Text Book of Biotechnology, S. Chand & Co, New Delhi.
2. Kumaresan, V., 2006. Biotechnology, Saras Publication, Nagercoil.

**REFERENCES:**

1. Gupta, P.K. 2006. Elements of Biotechnology, Rastogi Publications, Meerut.
2. Lewin, B. 2002. Gene XI, Oxford University Press, New York.

**M.Sc. ZOOLOGY**  
**SEMESTER - III**  
**CORE – X – ANIMAL PHYSIOLOGY**

**UNIT I**

Blood and circulation: Blood and its components, Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, haemoglobin, haemostasis.

Cardiovascular System: Structure of myogenic heart, ECG – its principle and significance, cardiac cycle, heart as a pump, blood pressure – neural and chemical regulation.

**UNIT II**

Digestive systems (Human): Digestion, absorption, energy balance, BMR.

Respiratory system (Human): Anatomical considerations, transport of gases, exchange of gases, neural and chemical regulation of respiration in man.

Excretory system (Human): Anatomy of excretory system, Physiology of urine formation, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance, Dialysis.

**UNIT III**

Nervous system (Human): Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.

Sense organs (Human): Vision, hearing and tactile response.

Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.

**UNIT IV**

Muscles: Structure and mechanism of Skeletal Muscle Contraction – physiochemical changes taking place during muscle contraction.

Physiology of Reproduction: Human Reproductive Physiology – Hormonal Control menstrual cycle in humans.

**UNIT V**

Endocrinology : Relationship between hypothalamus and pituitary gland. Hormones of hypothalamus, Adenohypophysis and Neurohypophysis. Hormones of Pineal gland, thyroid gland, parathyroid, thymus, adrenal and pancreas. Male and female Sex hormones – Hormones of Insects.



**TEXT BOOK**

1. Echert R and Randall D. 1987. Animal Physiology, CBS Publishers and Distributors, New Delhi.
2. Mariakuttikan A. 2011. Animal Physiology. Saras Publication, Nagerkoil.
3. Verma, P.S., Agarwal N.K. and Thyagi B.S. 1980. Animal Physiology. S. Chand & Co. New Delhi.

**REFERENCE BOOKS:**

1. Hoar W.S 1987. General and Comparative Physiology, Prentice Hall.
2. Turner C.D. and Bangara J.T. 1976. General Endocrinology, W.B. Saunders Co, Philadelphia.
3. Dawson H. 1964. General physiology, Little Brown Co. Boston.
4. Giese, A.C 1979. Cell Physiology and Biochemistry, Prentice Hall.
5. Hall J.E. 2013. Text Book of Medical Physiology, Elsevier Inc.

**M.Sc. ZOOLOGY**  
**SEMESTER - III**  
**CORE – XI – OPTIONAL SUBJECT – I**  
**GENERAL AND APPLIED ENTOMOLOGY**

**UNIT I Classification**

Classification of Insects up to order: Basis of classification – Classification of important pests up to order level (any five), Key characteristics with South Indian Examples.

External anatomy of a typical Insect – Exoskeleton, Head, Thorax and Abdomen. Mouth parts of Insects.

**UNIT II Physiology of Insects**

Digestive system, Excretory system, Respiratory system, Circulatory system, Nervous system, Sense organs, Reproductive system, Endocrine system and Pheromones.

**UNIT III**

**Medical Entomology**

Vectors: Mosquito and House fly - Vectors borne diseases and their control.

**Agricultural Entomology**

Insect Pest of Crops and their control measures: Paddy, Groundnut, Coconut, Cotton, Sugarcane, Brinjal, Lady's finger, Pests of Stored grains. Pest Control: Prophylactic, Mechanical, Chemical and Biological Control measures.

**UNIT IV Chemical Control & IPM**

Insecticidal formulations, Classification of the insecticide, Mode of action of insecticides, Drawback of chemical control.

Biological control, autocidal control, Integrated Pest Management (IPM), Nano – insecticide control

**UNIT V Methods of Pest Management**

Conventional Methods: Prophylactic – Curative – Cultural. Mechanical – Physical – legal & Biological method.

Non conventional methods: Plant products – Chemosterilants – Anti feedants – Pheromones – Insect repellants – Attractants.

**TEXT BOOKS**

1. Richards, O.W. and Davies, R. G., 1984. A General Text Book of Entomology Vol. I & II, 10th Edition, Chapman Hall, Lane London.
2. Vasantharaj David, B., Murali Rangan. M.C. and Meera Murali Rangan 1992. Harmful and Insects, Popular Book Depot, Chennai.
3. Vasantharaj David, B. 2001. Elements of economic Entomology, Popular Book Depot, Chennai.
4. D.B Tembhare, Modern Entomology, Himalaya Publishing House

**M.Sc. ZOOLOGY**  
**SEMESTER - III**  
**CORE PRACTICAL - III**  
**DEVELOPMENTAL BIOLOGY, BIOTECHNOLOGY, ANIMAL**  
**PHYSIOLOGY AND**  
**GENERAL AND APPLIED ENTOMOLOGY (OPTIONAL SUBJECT-I)**

**I. Developmental Biology**

1. Blastoderm Mounting of Chick/Duck embryo.
2. Preparation of sperm suspension and observation of Spermatozoa in Bulls Semen. Study of rate of motility of sperm in Bulls Semen (Demonstration Only).
3. Amphibia - identification of developmental stages.
4. Development of Frog: Eggs – Cleavage - Blastula - Gastrula.
5. Study of different types of placenta.

**II. Biotechnology**

Spotters: Single Cell Protein, Bio – reactor, Plasmid pBR322 and PCR.

**III. Animal physiology**

1. Qualitative study of digestive enzymes in Cockroach.
2. Determination of rate of salt loss and salt gain in Fish / Crab using different experimental media.
3. Determination of RQ in an aquatic animal in relation to light (Fish/Crab).
4. Qualitative analysis of excretory products.
5. Principles and application of sphygmomanometer and kymograph.
6. Kymographic recordings of simple muscle twitch, summation, treppe and tetanus.

**IV. Entomology**

1. Preparation of key for the identification of Insects
2. Collection, preservation and mounting of important pests of paddy, sugar cane, cotton, ladies finger, ground nut and stored products to understand the life history of insects in relation to the life history of plants
3. Mouth parts of insects (Mosquito, Honey bee and House fly).
4. Field study to understand the various methods of pest management: Pesticide formulation, Pesticide application, Safety measures, Hazardous and first aid.
5. Insect box submission.

**V. Record submission.**

**M.Sc. ZOOLOGY**  
**SEMESTER - III**  
**ELECTIVE – III – ENDOCRINOLOGY**

**UNIT I Introduction to Endocrinology**

Function and Classification of Hormones – Feedback control of hormone secretion – Organization and functions of Neuroendocrine systems – Hypothalamo –hypophyseal interaction – Bioactive peptides.

**UNIT II Pituitary and Parathyroid Gland**

Pituitary Gland – Characteristics, Structural Organization – Hormone Secretion and its functions. Thyroid – Structural Organizations, Metabolic effects of Thyroid – Effects on reproduction – Parathyroid its Structure and functions.

**UNIT III Pancreas and Adrenal Gland**

Structure of Pancreas, Pancreatic Hormones and their functions. Structural Organizations of Adrenals, functions of Cortical and Medullary hormones.

**UNIT IV Insects and Crustacean Endocrinology**

Concepts of Neurosecretions – Endocrine Systems in Crustaceans – Endocrine Control of Moulting and Metamorphosis – Neuroendocrine System in Insects – Endocrine Control of Moulting – Metamorphosis and Reproduction.

**UNIT V Reproductive Endocrinology**

Structure of Mammalian Testis and Ovary – Hormones of Testis and Ovary and Menstrual Cycle – Hormones of Pregnancy – Parturition – Hormonal Control of Lactation.

**REFERENCE BOOKS:**

1. Williams, R H. 1981. Text Book of Endocrinology, 6th Edition, W. B. Saunders Company, Philadelphia.
2. Haris, G.W. and Donovan, B.T. 1968. The Pituitary Gland, S. Chand and Co.,
3. Bentley, P.J. 1985. Comparative Vertebrate Endocrinology, 2nd Edition, Cambridge University Press.
4. Mac Hadley. 1992. Endocrinology, 3rd Edition, A Simon & Schuster Company, New Jersey. USA.
5. Ingleton, P.M. and Bangara, J.T. 1986. Fundamentals of Comparative Vertebrate Endocrinology, Kluwer Academic Publishers.
6. Turner, C.D. and Bangara, J.T. 1986. General Endocrinology. Saunders International, Tokyo.
7. Barrington, E.J.W. 1985. An Introduction to General and Comparative Endocrinology. Claredon Press Oxford.

**M.Sc. ZOOLOGY**  
**SEMESTER - IV**  
**CORE – XII – EVOLUTION**

**UNIT I Theories of Evolution**

Lamarckism, Neo-Lamarckism, Darwinism and Neo-Darwinism, Mutation Theory, Biogenetic Law. Genetic variability, Natural selection, Genetic drift, Isolation, Origin of new species.

**UNIT II Variations**

Nature and Kinds of Variation, Cytological basis of variations, Chromosomal aberrations, polyploidy, aneuploidy, Population genetics - Gene frequency, genetic equilibrium, Hardy Weinberg's Law of equilibrium.

**UNIT III Speciation**

Isolating mechanisms. Concept of Species, Migration and Gene flow, Darwin finches, Theories of Speciation, Micro and Macro evolution, Adaptive divergence, Radiation evolution. Monophyly and Polyphyly.

**UNIT IV Molecular Evolution**

Evolution of Haemoglobin, Cytochrome C, Molecular clocks, Regulatory genes and Evolution. Adaptation-Kinds, Osborn law of Radiation. Adaptive radiation in Mammals, Causes and Significance.

**UNIT V**

Evolution of Man, Origin of Man, Special features of primates, Compelling causes of evolution of Man, Evolutionary trends, Cultural evolution, Civilization, human races, future of man.

**TEXTBOOKS**

1. Arumugam, Evolution, Saras Publication

**REFERENCE BOOKS**

1. Dodson, E.V. 1960. Evolution process and product, East West Press, New Delhi.
2. Paulamos Moody, 1978. Introduction to Evolution. Kalyani Publishers, Ludhiana, New Delhi.

**M.Sc. ZOOLOGY**  
**SEMESTER - IV**  
**CORE XIII – MEDICAL LABORATORY TECHNIQUES**

**UNIT I Instrumentation**

The Laboratory : Accidents – Universal work precautions (UWP) for laboratory personnel.

Sterilization : Introduction – sterilization by heat – cold – ultra violet radiation – Ionizing radiations – Filtration – chemical sterilization – Glass preparation for use.

**UNIT II Haematological Techniques**

Knowledge and skill in collecting blood samples. Analysis of blood and basic haematological techniques. Blood cell morphology in health and disease – RBC, WBC, Total count and differential count, Haemoglobin estimation.

**UNIT III**

Haematocrit – packed cell volume, MCH, MCHC, MCV, Erythrocyte sedimentation rate, platelet count. Haemorrhagic disorders, clotting time, bleeding time.

**UNIT IV Clinical Analysis**

Knowledge and skill in the study and analysis of Urine – Physical parameter – Colour, Odour, pH, Density. Chemical parameters – Sugar, Albumin, Ketone bodies and their clinical significances Pregnancy tests.

**UNIT V Clinical Studies**

Analysis of faeces, semen, cerebrospinal fluid for clinical investigation. Techniques – RIA, ELISA, WESTERN BLOT and WIDAL TEST.

**TEXT BOOK :**

1. Sood, Ramnik, 1985. Medicinal Laboratory Technology, Jaypee brothers, New Delhi
2. Kanai. L Mukherjee 1988. Medical Laboratory Technology, vol. I, II and III, Tata McGraw Hill Publishing Company Ltd., New Delhi.

**M.Sc. ZOOLOGY****SEMESTER - IV****CORE XIV - OPTIONAL SUBJECT – II – SERICULTURE****UNIT I General Aspects of Silkworms**

Types of Silkworms – Mulberry, tasar, muga, eri – Morphology and life cycle of silkworms – Races of mulberry silkworms – Voltinism.

**UNIT II Mulberry Cultivation**

Selection of land and cultivation of mulberry – Mulberry varieties – Different methods of planting – Organic and Inorganic manure application – Pruning – Harvest and preservation of leaves – Pest and disease of mulberry and their control measures.

**UNIT III Silkworm Rearing**

Disinfection of rearing houses and appliances – Egg handling – Hatching – Brushing – Silkworm rearing techniques ; young age and late age – Rearing environmental conditions – Shoot harvest method of rearing – Spacing and leaf requirement in different stages – Pest and disease of silkworm and preventive measures – Spinning and mounting – Types of moutage – Harvesting of cocoon and cocoon assessment – Transportation and marketing.

**UNIT IV Grainage Techniques**

Egg production – Acid treatment of hibernating eggs – Loose egg production – Grainage techniques – Materials required for a grainage.

**UNIT V Silk Reeling**

Reeling methods – Re-reeling – Silk examination, cleaning, lacing, skeining, book making – Grainage of Silk.

**TEXT BOOKS**

1. Rangasamy, G. 1987. Manual on Sericulture FAO, Vol. I to IV, Agriculture service bulletin, CSB, Bangalore, India.
2. Dandin, S.B. 2004. Hand book of New Sericulture technologies, Central Silk Board, Bangalore.
1. Ganga G. and J. Sulochana Chetiy, 2005. An Introduction to Sericulture 2nd Edition, Oxford and IBH Publishers & Co. New Delhi.

**M.Sc. ZOOLOGY**  
**SEMESTER - IV**  
**CORE – PRACTICAL – IV**  
**(OPTIONAL SUBJECT - II)**  
**EVOLUTION, MEDICAL LABORATORY TECHNIQUES,**  
**SERICULTURE AND MICRO TECHNIQUE**

**I. Evolution**

Study of Fossils (Ammonoids, Nautiloids & Echinoderm fossils).

**II. Medical Laboratory Techniques**

1. Genetic and Immunological basis of human blood grouping (A, B, AB, O and Rh).
2. Estimation of Haemoglobin (Hb) and Erythrocyte Sedimentation Rate (ESR).
3. Blood – clotting time, bleeding time – Preparation of Haematin crystals.
4. Qualitative analysis of urine for proteins, glucose, acetone and ketone bodies.

**III. Optional subject – II – Sericulture**

1. Identification of common mulberry varieties and their features.
2. Identification of pests and diseases of mulberry.
3. Suitable mulberry leaves for young age silkworm rearing.
4. Identification of various types of silkworms and silk moths and their external morphology.
5. Various stages of larva and their identification in *Bombyx mori*.
6. Identification of important pest and diseases of silkworm *Bombyx mori*.
7. Dissection and display of silk gland of *Bombyx mori* (V instar larva).
8. Visit of silk farms and silk reeling weaving units in nearby areas and submission of tour report

**IV. Micro technique**

1. Spreading of serial sections.
2. Preparation of permanent mount of serial sections.
3. Comment on the Staining procedure for prepared slides.
4. Spotters: Microtome

**V. Submission of Record.**



**M.Sc. ZOOLOGY**  
**SEMESTER - IV**  
**ELECTIVE – IV – ECONOMIC ZOOLOGY**

**UNIT I Vermiculture**

Introduction to Vermiculture. Types of earthworm, Biology of *Eisenia foetida*. Rearing of earthworms , Equipments , devices used in vermiculture, Vermicompost Technology – Methods and products, Vermiwash Collection, Composition & use.

**UNIT II Apiculture**

Morphology and Biology of honey bees – Honey bee species – social behavior of honey bees – Bee keeping and ancillary industries – Newton's Bee hive Extraction of honey – Medicinal value of honey – bee products – Importance of bee colonies in crop pollination.

**UNIT III Prawn culture**

Prawn fishery – Types of prawn fishery – Culture of fresh water prawn – Culture of marine prawn – Preparation of farm. Preservation and processing of prawn. Export of prawn.

**UNIT IV Fish culture**

Fish culture – Aim of fish culture – Breeding Pond – Fish Seed – Hatching pond. Transport of fish fry to rearing ponds. Harvesting – Preservation of fish – Composite fish forming. By – Products of fishing industry.

**UNIT V Poultry Management**

Breeds of fowl, Housing and Equipment, Deep litter System, Laying cages, Methods of brooding and Rearing, Debeaking. Management of growers, Layers, Broilers – Feed formulations for chicks, Growers and Broilers. Diseases of fowl. Nutritive value of egg and meet. Incubation and hatching of eggs.

**REFERENCE BOOKS**

1. Vasantharaj David, B. and Kumaraswami T., 1998. Elements of Economic Entomology Pop. Book Depot. Chennai.
2. Bhatnagar, R.K. and Palpa, R.K. 1996 Vermiculture and Vermicomposting, Kalyani Publishers, New Delhi.
1. Arul K. Sharma, A Hand book of Organic farming, Agro, Bio. Jothpur, India.
2. Shukla, G.S. and Xupadhyay G.S. Economic Zoology, Rastogi Publications, Meerut.
3. Arumugam, N. 2008. Aquaculture, Saras Publication Nagarkoli, Tamilnadu.
4. Shanmugam, K. 1992. Fishery Biology and Aquaculture LEO Pathipagam, Chennai.

**EXAMINATION  
THEORY**

<b>University Examination UB</b>	<b>Internal Assessment (IA)</b>
75 Marks	25 Marks

**CLASSIFICATION OF INTERNAL ASSESSMENT STRUCTURE  
MARKS**

Seminar	-	05
Test	-	10
Assignment	-	05
Attendance	-	05
<b>Total</b>	-	<b>25 Marks</b>
Passing minimum (IA) – 50%	-	12 Marks
Passing minimum (UE) – 50%	-	38 Marks
<b>Total Passing minimum</b>	-	<b>50 Marks</b>

**PRACTICAL**

<b>University Examination UB</b>	<b>Internal Assessment (IA)</b>
60 Marks	40 Marks

**CLASSIFICATION OF INTERNAL ASSESSMENT STRUCTURE  
MARKS**

Practical Attendance	-	10
Practical – Performance	-	20
Record Work	-	10
<b>Total</b>	-	<b>40 Marks</b>
Passing minimum (IA) – 50%	-	20 Marks
Passing minimum (UE) – 50%	-	30 Marks
<b>Total Passing minimum</b>	-	<b>50 Marks</b>

## **QUESTION PAPER PATTERN**

(For the candidates admitted from 2017 - 2018 onwards)

**M.Sc, DEGREE EXAMINATION**

**BRANCH II - STATISTICS**

**First Semester**

**Core IV - SAMPLING THEORY**

Time :Three hours

Maximum:75 marks

**PART A - ( 5 x 5 = 25 marks )**

Answer ALL questions.

All questions carry equal marks.

**PPART B - (5 x 10 = 50 marks)**

Answer ALL questions.

All questions carry equal marks.

(For the candidates admitted from 2017 - 2018 onwards)

**MODEL QUESTION PAPER**

**M.Sc, DEGREE EXAMINATION**

**BRANCH II - STATISTICS**

**First Semester**

**Core IV - SAMPLING THEORY**

Time :Three hours

Maximum:75 marks

**PART A - ( 5 x 5 = 25 marks )**

**Answer ALL questions.**

**All questions carry equal marks.**

1. (a) Mention the important steps involved in drafting a questionnaire. (Or)  
(b) What is meant by non-response? Write down its types.
2. (a) In SRSWOR, show that the sample mean square is an unbiased estimate of the population mean square (Or)  
(b) Explain circular systematic sampling.
3. (a) Explain separate and combined regression estimators. (Or)  
(b) Define multivariate ratio estimator.
4. (a) Explain Lahiri's method of selecting sample under PPSWR scheme. (Or)  
(b) Derive Horwitz-Thompson estimator for population total.
5. (a) Describe the sub sampling procedure. (Or)  
(b) In double sampling for stratification, show that the sample mean is an unbiased estimate of the population mean

**PART B - (5 x 10 = 50 marks)**

**Answer ALL questions.**

**All questions carry equal marks.**

6. (a) Explain the principal steps involved in sample survey? (Or)  
(b) Derive Warner's model in randomized response technique.
7. (a) If f.p.c is ignored, then show that  
$$V_{opt} < V_{prop} < V_{rand} \quad (Or)$$
  
(b) Compare systematic sampling with stratified and simple random sampling when the population consists of linear trend.
8. (a) Define ratio estimator. Derive the variance of the ratio estimator and also obtain its relative bias. (Or)  
(b) Obtain an unbiased estimate of population mean and its variance in cluster sampling.
9. (a) Define Desraj's ordered estimator. Also derive the expression for the variance of the estimate of the population total. (Or)  
(b) In the case of pps sampling with replacement, obtain an unbiased estimator of the population total and variance of the estimator.
10. (a) Suggest an estimator for population mean in two stage sampling and obtain its variance. (Or)  
(b) Discuss double sampling for stratification and derive the standard error of estimate.