

DEPARTMENT OF ZOOLOGY

PROGRAMME: M.Sc.

Statements of Programme Specific Outcomes (PSOs)

By the end of this course, the students will be able to:

1. Understand the structure & function of invertebrates.
2. Compare the physiology of animals.
3. Understand the biology of cell and genetic principles.
4. Compare the reproductive biology of animals.
5. Classify the invertebrates and their respective physiologies.
6. Perform the cell biology and advances reproductive biology experiments.

Statements of Course Outcomes (COs)

M.Sc. I Course: SEM-I; Paper 1, T₁

By the end of this course, the students will be able to:

1. Classify the animals on the basis of molecular taxonomy.
2. Describe the ultrastructure of locomotory organs.
3. Compare the reproductive systems of Platyhelminthes.
4. Describe the respiratory organs in Arthropoda.
5. Understand the water vascular system and larval forms of Echinodermata.
6. Explain the general affinities of Minor Phyla.

M.Sc. I Course: SEM-I; Paper 1, T₂

By the end of this course, the students will be able to:

1. Understand the biology of Neurotransmitters.
2. Study of color change mechanism.
3. Compare the bioluminescent organs.
4. Compare the difference between myogenic and neurogenic heart.
5. Study the structure and functions of Biomolecules.
6. Study the physiology of environmental stress and strain.

M.Sc. I Course: SEM-I; Paper 1, T₃

By the end of this course, the students will be able to:

1. Study the cellular organization and cell signaling.
2. Study the physiology of cancer.
3. Analyse the Mendelian, Quantitative genetics and Mutation.
4. Study the structural and numerical alterations of chromosomes.
5. Study the Human Genetics Principles.

M.Sc. I Course: SEM-I; Paper 1, T₄

By the end of this course, the students will be able to:

1. Discuss various methods of asexual and sexual reproduction in Protozoa.
2. Compare the regeneration in Platyhelminthes.
3. Study metamorphosis in insects and mechanism of vitellogenesis.
4. Describe the pre and post fertilization events.
5. Study the cryopreservation technique.

M.Sc. I Course: SEM-I; Practical 1, P₁

By the end of this course, the students will be able to:

1. Classify the Invertebrate animals.
2. Study the anatomy of different systems of Invertebrates.
3. Perform the preparation of permanent slides.
4. Study of permanent Invertebrate slides.
5. Perform various physiological experiments.

M.Sc. I Course: SEM-I; Practical 2, P₂

By the end of this course, the students will be able to:

1. Perform the cytogenetic experiments.
2. Solve the problems on genetics based on Monohybrid and Dihybrid ratios.
3. Study various Human Genetic Traits.
4. Perform the Spermatogenesis and Oogenesis in animals.
5. Study the histology of male and female reproductive organs and glands.

M.Sc. I Course: SEM-I; Seminar-1, S₁

By the end of this course, the students will be able to:

1. Acquire the presentation skills.
2. Topics are allotted from the recommended syllabus.

M.Sc. I Course: SEM-II; Paper 2, T₁

By the end of this course, the students will be able to:

1. Study the structure and function of Vertebrates.
2. Compare the organs and mechanism of respiration in Pisces and Amphibia.
3. Compare the appendicular skeleton of vertebrate animals.
4. Classify the Chelonia.
5. Study the comparative anatomy of brain.
6. Discuss the evolution of Man and heart in Vertebrates.

M.Sc. I Course: SEM-II; Paper 2, T₂

By the end of this course, the students will be able to:

1. Study of neurosecretory system of different Invertebrate phyla.
2. Study the physiology of neuroendocrine glands in Invertebrates.
3. Study the structure and function of endocrine glands.
4. Describe the hormonal actions and feedback mechanisms of endocrine glands.

M.Sc. I Course: SEM-II: Paper 2, T₃

By the end of this course, the students will be able to:

1. Describe the DNA replication, damage and repair.
2. Understand the process of transcription and translation.
3. Explain the antisense and ribozyme technology.
4. Study the isolation and sequencing of DNA.
5. Compare the different branches of biotechnology.

M.Sc. I Course: SEM-II: Paper 2, T₄

By the end of this course, the students will be able to:

1. Explain the implantation, foetal membrane and placenta in Mammals.
2. Describe the process of regeneration, apoptosis and ageing in vertebrates.
3. Study MOET and cloning techniques.
4. Explain contraceptive techniques.
5. Analyse the role of mutants and transgenics in Human welfare.

M.Sc. I Course: SEM-II: Practical 2, P₁

By the end of this course, the students will be able to:

1. Perform the Identification and Classification of Vertebrates.
2. Explain the different systems in Vertebrates.
3. Study of stained permanent preparation.
4. Perform microtechnique.
5. Compare the skeleton of Fowl and Rabbit.
6. Study histological slides of endocrine glands.

M.Sc. I Course: SEM-II: Practical 2, P₂

By the end of this course, the students will be able to:

1. Perform the demonstration of biomolecules.
2. Perform histochemical analysis of protein, acid and alkaline phosphatase.
3. Perform biochemical estimation of sugar, protein, DNA and RNA.
4. Perform qualitative analysis of bile.
5. Demonstrate separation of amino acids by paper chromatography and TLC.
6. Study reproductive system in Mammals and types of eggs.
7. Study of developmental stages of Frog and Chick.
8. Perform sperm count experiment and preparation of Chick embryo slides.

M.Sc. I Course: SEM-II: Seminar-2, S₂

By the end of this course, the students will be able to:

1. Acquire the presentation skills.
2. Topics are allotted from the recommended syllabus.

M.Sc. II Course: SEM-III: Paper 3, T₁

By the end of this course, the students will be able to:

1. Understand the life cycles of various Bacteria and Viruses.
2. Understand the life cycles of various Protozoan Parasites.
3. Compare Innate and Adaptive immune system.
4. Study the physiology of Cytokines.
5. Understand the hypersensitivity reactions.
6. Study the Transplantation and Tumor Immunology.

M.Sc. II Course: SEM-III: Paper 3, T₂

By the end of this course, the students will be able to:

1. Study the origin and evolution of fishes.
2. Study the development of jaws and limbs in fishes.
3. Analyse the general characters, classification and affinities of Placoderms, Elasmobranch, Actinopterygii & Dipnoi.
4. Study the respiratory system of fish.
5. Study the physiology of Accessory respiratory organs.

M.Sc. II Course: SEM-III: Paper 3, T₃

By the end of this course, the students will be able to:

1. Understand the Fresh Water, Estuarine & Marine fisheries.
2. Understand the culture of exotic fishes, monoculture & monosex culture.
3. Study the Catfish, Trout, Ornamental fish, Sea Weeds & Spirulina culture.
4. Compare the Pearl, Oysters, Prawn and Frog culture.

M.Sc. II Course: SEM-III: Paper 3, T₄

By the end of this course, the students will be able to:

1. Explain the importance and conservation of wild life.
2. Compare the International Conservation Bodies.
3. Study the Predatory-Prey relationships.
4. Analyse the social organization in carnivores and primates.
5. Discuss the wild life population and pest management.
6. Evaluate Avian Systematics.
7. Compare the Bird diversity and breeding.

M.Sc. II Course: SEM-III: Practical 3, P₁

By the end of this course, the students will be able to:

1. Study parasitic Protozoans, Helminthes and Insect vectors.
2. Identify the ecto and endoparasites.
3. Study of Insect vectors and their mouth parts.
4. Identify the Gram positive and Gram negative bacteria.
5. Study Immunolectrophoresis, ODD and Immunological diagnosis of pregnancy.
6. Identify lymphoid organs, T & B cells and mast cells.

M.Sc. II Course: SEM-III; Practical 3, P₂

By the end of this course, the students will be able to:

1. Identify the local fishes.
2. Study the anatomy of fishes.
3. Compare the nervous system of *Wallago & Labeo*.
4. Identify the various developmental stages of fish.
5. Perform the preparation of permanent slides of fish scales.
6. Perform estimation of various physiology experiments.

M.Sc. II Course: SEM-III; Seminar-3, S₃

By the end of this course, the students will be able to:

1. Acquire the presentation skills.
2. Topics are allotted from the recommended syllabus.

M.Sc. II Course: SEM IV; Paper 4, T₁

By the end of this course, the students will be able to:

1. Discuss the sterilization techniques and tissue culture practices.
2. Study of basic principles of Sedimentation, Centrifugation and Radioactive Isotopes.
3. Explain TLC, gas chromatography and electrophoresis.
4. Analyse biostatistic principles.
5. Study the physiology of toxicants and justify with toxicity tests.
6. Explain the Bioinformatic principles and phylogenetic analysis.

M.Sc. II Course: SEM IV; Paper 4, T₂

By the end of this course, the students will be able to:

1. Describe the internal structure of fish visceral organs.
2. Study the structure of chemosensory organs.
3. Describe migration in fishes and role of hormones.
4. Describe male and female reproductive systems.
5. Explain the structure, functions and hormones of endocrine glands.

M.Sc. II Course: SEM IV; Paper 4, T₃

By the end of this course, the students will be able to:

1. Construct the ponds and its management.
2. Understand the conservation of fish, legislation and their importance.
3. Describe migration in fishes and role of hormones.
4. Discuss water pollution and inland fisheries.
5. Compare the phytoplanktons and zooplanktons.
6. Understand fish marketing, curing and preservation of fish.
7. Describe the fish products and bi-products, fish pathology and diseases.

M.Sc. II Course: SEM IV; Paper 4, T₄

By the end of this course, the students will be able to:

1. Study the radiation biology.
2. Analyse the effect of radiation on human health.
3. Study the central and peripheral circadian clock system.
4. Compare circadian pacemaker system in *Drosophila* and Rodents.
5. Describe the centers of biological clock.

6. Compare depression and sleep disorders.
7. Discuss the Chronopharmacology, Chronomedicine and Chronotherapy.

M.Sc. II Course: SEM-IV; Practical 4, P₁

By the end of this course, the students will be able to:

1. Perform surgical ablation of gonads in fishes.
2. Study normal differential count and effect of stress on blood.
3. Perform the estimation and separation of proteins in blood serum.
4. Study of permanent histological slides of fish.
5. Compare the skeletal system of *Wallago* and *Labeo*.
6. Explain weberian assicles and accessory respiratory organs in fish.
7. Perform assessment of maturity of gonads in fish.

M.Sc. II Course: SEM-IV; Project

By the end of this course, the students will be able to:

1. Respective faculties allot the projects works to students as per their choice.

M.Sc. II Course: SEM-IV; Seminar-4, S₄

By the end of this course, the students will be able to:

1. Acquire the presentation skills.
2. Topics are allotted from the recommended syllabus.

DEPARTMENT OF ZOOLOGY

PROGRAMME: B.Sc.

Statements of Programme Specific Outcomes (PSOs)

By the end of this course, the students will be able to:

1. Compare the life and diversity of Animals-Nonchordates (Protozoa to Annelida).
2. Understand the biology of environment.
3. Compare the life and diversity of Animals-Nonchordates (Arthropoda to Hemichordata).
4. Explain the biology of cell.
5. Compare the life and diversity of Animals-Chordates (Protochordata to Amphibia).
6. Study the concepts of Genetics.
7. Compare the life and diversity of Animals-Chordates (Reptilia, Aves & Mammals).
8. Study the principles of molecular biology and immunology.
9. Study the physiology of Mammals.
10. Discuss the Aquaculture practices and Insects of economic importance.
11. Explain the principles of Biotechniques, Microtechniques, Biotechnology, Bioinformatics and Biostatistics.

Statements of Course Outcomes (COs)

B.Sc. Course: SEM-I, Paper-1

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the general character of phylum protozoa, Porifera, Coelenterate, and Helminthes.
2. Describe the parasitic protozoa of man.
3. Explain the structure, life cycle and classification of *Sycon* and *Obelia*.
4. Describes the general characters and classification of phylum Annelida.
5. Define vermiculture and its importance.
6. Justify the elementary idea of parasitic adaptations in Helminthes.

B.Sc. Course: SEM-I, Paper-2

Course Outcomes: By the end of this course, the students will be able to:

1. Define atmosphere and its major zones with its importance.
2. Explain renewable and non-renewable energy sources.
3. Summarize pond ecosystem.
4. Define biodiversity and its conservation with cause of reduction in biodiversity.
5. Describe hotspot of Biodiversity in India.
6. Summarize water, air and noise pollution with source and control measures.

B.Sc. Course: SEM-I, Practical-I

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the museum specimens from phylum Protozoa to Annelida.
2. Study the permanent slides.
3. Describe dissection of digestive, nervous and reproductive system of earthworm.
4. Perform the practical of DO, CO₂, pH & total hardness of given water sample.
5. Describe pond ecosystem.

B.Sc. Course: SEM-II Paper-1

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the general characters of Phylum Arthropoda, Mollusca, Echinodermata and Hemichordata.
2. Describe the insects as a vector.
3. Explain the pearl formation in Mollusca.
4. Describe water vascular system and locomotion in Starfish.
5. Explain digestive system and reproduction in Balanoglossus.
6. Describe the affinities of Balanoglossus.

B.Sc. Course: SEM-II, Paper-2

Course Outcomes: By the end of this course, the students will be able to:

1. Describe the ultrastructure of prokaryotic and Eukaryotic cells.
2. Explain the ultrastructure of Mitochondria.
3. Describe the electron transport chain and terminal oxidation.
4. Explain the structure of ribosome and Lake's model.
5. Justify mitosis and meiosis cell division.
6. Summarize cellular aging and cell death and elementary idea of cancer and its causative agents.

B.Sc. Course: SEM-II, Practical-2

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the museum specimen's of phylum Arthropoda to Hemichordata.
2. Study the permanent slides.
3. Perform the dissection of digestive and reproductive system of Cockroach and nervous system of Pila.
4. Perform the practical's of cell biology.
5. Perform the experiments of Ocular Micrometer and Measurements of micro objects.

B.Sc. Course: SEM-III, Paper-1

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the general characters of *Herdmania*, *Amphioxus*, Pisces and Amphibia.
2. Describe the silent features of Agnatha.
3. Explain the parental care in Amphibia.
4. Describe the gametogenesis and types of eggs.
5. Identify the types of scales of fish and describe the developments of placoid scales.
6. Describe the frog embryology and development of respiratory organs in frog.

B.Sc. Course: SEM-III, Paper-2

Course Outcomes: By the end of this course, the students will be able to:

1. Describe Mendelian principle and interaction of genes.
2. Explain quantitative genetics and extracellular genome.
3. Describe linkage and crossing over and genetic disorders in human beings.
4. Define concepts of genes and chromosomal aberrations.
5. Describe disorders related to chromosomal number and genetic counselling.
6. Explain lethal genes and gene mutations.

B.Sc. Course: SEM-III, Practical-3

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the museum specimens from Urochordata to Amphibia.
2. Explain digestive, reproductive system and brain of fish.
3. Study the permanent slides.
4. Perform the experiments of genetics and permanent stained preparation.
5. Describe the genetic traits and syndromes.

B.Sc. Course: SEM-IV, Paper-1

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the general characters of Reptilia, Aves and Mammals.
2. Describe the modern theories of evolution, adaptations and races in Man.
3. Discuss the comparative account of aortic arches in Reptiles, Birds and Mammals.
4. Describe the development of chick embryo and embryonic membranes.
5. Discuss the blastocyst and implantation in mammals and stem cells.
6. Explain the biological clock and role of pheromones.

B.Sc. Course: SEM-IV, Paper-2

Course Outcomes: By the end of this course, the students will be able to:

1. Describe the structure of DNA, forms of DNA and RNA and prokaryotic and eukaryotic gene structure.
2. Explain recombination in bacteria and DNA replication and genetic code.
3. Explain mechanism of protein synthesis.
4. Define the concept of immunity and antigen-antibody interactions.
5. Describe the types of immune response and complement system.
6. Discuss autoimmunity and immunodeficiency.

B.Sc. Course: SEM-IV, Practical-4

Course Outcomes: By the end of this course, the students will be able to:

1. Identify and classify the museum specimens from Reptilia, Birds and Mammals.
2. Explain the skeleton of Rabbit and Fowl.
3. Perform the experiment of developmental biology experiment and study of permanent slides.
4. Perform the molecular biology experiments and describe the laboratory instruments.
5. Perform immunological experiments of blood groups and describe histological slides.

B.Sc. Course: SEM-V, Paper-1

Course Outcomes: By the end of this course, the students will be able to:

1. Describe the chemical nature of enzymes and enzymatic activity.
2. Explain the structure and function of digestive glands and their hormones.
3. Compare the fat soluble and water soluble vitamins.
4. Explain various respiratory pigments, their types and mechanism of respiration.
5. Explain transport of O₂ and CO₂, various respiratory disorders and effect of smoking.
6. Describe composition and function of blood, blood factors, blood groups and cardiac cycle.

B.Sc. Course: SEM-V, Paper-2

Course Outcomes: By the end of this course, the students will be able to:

1. Explain site selection and construction of fish pond, management and rearing of fish.
2. Compare polyculture, cage culture, fed fish culture and integrated fish farming.
3. Explain prawn culture and pearl culture.
4. Describe various method pest controls such as chemical control and biological control.
5. Classify and identify various pest of cotton, store grain pests, animal pests.
6. Classify and identify mulberry and non-mulberry silkworm, honey bees and lac culture.

B.Sc. Course: SEM-V, Practical-5

Course Outcomes: By the end of this course, the students will be able to:

1. Perform action of salivary amylase on starch and detection of carbohydrate, protein and lipids.
2. Identify histological slides of various glands.
3. Perform dissection of digestive system and brain of fish
4. Perform whole mount preparation of scales of fishes and zooplanktons
5. Identify and classify agricultural pest, medical pest, and veterinary pest.

B.Sc. Course: SEM-VI, Paper-1

Course Outcomes: By the end of this course, the students will be able to:

1. Explain types of neurons and E.M. structure of neuron.
2. Describe properties of muscles and conduction of nerve impulse.
3. Describe the structure of uriniferous tubules and mechanism of urine formation.
4. Compare normal and abnormal constituent of urine.
5. Describe the structure and function of pituitary gland, thyroid gland, adrenal gland and pineal gland.
6. Explain menstrual cycle, male and female sex hormones and causes of infertility in male and female.

B.Sc. Course: SEM-VI, Paper-2

Course Outcomes: By the end of this course, the students will be able to:

1. Describe various bio-techniques such as sterilization, separation of biomolecules and electrophoresis.
2. Explain various micro-techniques like dehydration, fixation, section cutting and double staining.
3. Perform histochemical staining techniques for carbohydrates, proteins and lipids.
4. Discuss about recombinant DNA technology, Vectors and Splicing mechanism.
5. Explain concept of Bioinformatics and types of Databases.
6. Explain protein databases.

B.Sc. Course: SEM-VI, Practical-6

Course Outcomes: By the end of this course, the students will be able to:

1. Perform sperm count in semen sample and detection of urea and sugar in urine.
2. Identify histological slides like T.S. of Kidney, Adrenal gland, Testis, Ovary etc.
3. Perform block preparation and section cutting.
4. Perform double staining method.