

## **DEPARTMENT OF ZOOLOGY**

### **PROGRAM: BSc. ZOOLOGY**

#### **PROGRAM OUTCOMES**

- PO1. Students understand the interactions among various living organisms and gain knowledge about Animal Kingdom
- PO 2. Students are able to study animals of different phyla, their similarities and differences and their habits and habitats.
- PO 3. Students understands the complex evolutionary mechanism and behavioural pattern of animals.
- PO 4. Students are able to understand structure and functions of cells and cellular organelles.
- PO 5. Analyse the relationships among animals with their ecosystems, understand the ecological factors, environmental conservation and its importance, pollution control and biodiversity and protection of threatened species.
- PO 6. Gain knowledge about applied fields like sericulture, pisciculture, apiculture, poultry and aquaculture
- PO 7. Understanding about various concepts of genetics and biotechnology
- PO 8. Gains knowledge about reproductive biology and endocrinology
- PO 9. Understands the importance of applications of microbiology for human benefits.
- PO 10. Perform procedures as per laboratory standards in the areas of Classification, Physiology, Ecology, Cytology, Genetics, Applied Zoology.

#### **PROGRAM SPECIFIC OUTCOMES**

- PSO1. Gains a broad understanding of animal diversity, including knowledge of the scientific classification and evolutionary relationships of major groups of animals.
- PSO2. Understands the morphology and functional characteristics at cellular and molecular level
- PSO 3. Acquires technical skills for experimental purposes
- PSO 4. Recognize the relationships between structure and functions at different levels of biological organization
- PSO 5. Understands how organisms function at the level of the gene, cell, tissue, organ and organ-system, and are able to give specific examples of the physiological adaptations, development, reproduction and behavior of different life forms.

**COURSE OUTCOMES : BSc. ZOOLOGY**  
**B.Sc. Part I**  
**Paper I (Cell Biology and Non-Chordata)**

**On completion of the course, the students are able**

**Unit:I**

1. To understand the scope and importance of cell biology and characteristics between Prokaryotic and Eukaryotic cell.
2. To understand the organization of cell and to study the whole-cell organelles with their structure and function.
3. To understand the structure, function and organization of chromosomes, DNA and RNA.

**Unit:II**

1. To understand the cell division (Mitosis and Meiosis) and to know the importance and features of the cell cycle in organisms.
2. To understand the various applications of cells and to understand and study various types of tumor and to get an elementary idea of Cancer cells and cell transformation.
3. To develop an elementary idea about immunity to study the lymphoid organs and the immune system

**Unit:III**

1. To understand the general characters and classification of Phylum Protozoa, Porifera, and Coelenterata up to order.
2. To study the structure of Protozoa(Paramecium), Porifera (Sycon),Coelenterata (Obelia).

**Unit: IV**

1. To understand the general characters and classification of Phylum Platyhelminthes, Nematelminthes, Annelida and Arthropoda up to order.
2. To study the structure of selected species of Platyhelminthes, Nematelminthes, Annelida and Arthropoda

**Unit:V**

1. To study the general characters and classification of Phylum Mollusca and Echinodermata up to order.
2. To understand the features of Phylum Mollusca with the help of animal Pila.
3. To understand the external and internal morphology of Echinodermata- with the help of Asterias (Starfish).

# **B.Sc. Part I**

## **Paper II (Chordata and Embryology)**

**On completion of the course, the students are able**

### **Unit:I**

1. To study and understand various aspects of Hemichordata and its Classification.
2. To understand all features of Hemichordata with the help of animal Balanoglossus.
3. To understand the classification of Chordates upto orders.
4. To study the features of Protochordata with the help of Amphioxus.
5. To study the comparative account of Petromyzon and Myxine.

### **Unit: II**

1. To be familiar with the features and structure of fish skin and scales.
2. To acquire knowledge on migration in fishes and parental care in fish.
3. To know the class Amphibia, its parental care behaviour and neoteny.
4. To familiarize the features of class Reptilia.
5. To differentiate poisonous & Non-poisonous Snakes their Poison apparatus, venom and also able to understand the Extinct Reptiles.

### **Unit:-III**

1. To know the Birds, their Flight Adaptation, Migration, and Perching mechanism.
2. To know the features of Mammals-Comparative account of Prototheria, Metatheria, Eutheria and Affinities.
3. To know the features of Aquatic Mammals and their adaptations.

### **Unit:IV**

1. To understand the various aspects of Fertilization and Gametogenesis.
2. To understand the structure of gamete and Types of eggs and Cleavage.
3. To know the development of Frog up to the formation of three germ layers.
4. To understand Parthenogenesis

### **Unit:V**

1. To know the process of embryonic induction, Differentiation and Regeneration.
2. To understand the Development of Chick up to the formation of three germ layers and also the features of Extra-embryonic membranes.
3. To understand the Placentation in mammals.

**BSc. PART II**  
**PAPER – I (ANATOMY & PHYSIOLOGY)**  
**(Paper Code - 0863)**

**On completion of the course, the students are able**

**UNIT-I**

1. To familiarize the Comparative Anatomy of various organ systems of vertebrates.
2. To know the Integument and its derivatives: structure of scales, hair and feathers.
3. To know the structure of the alimentary canal and digestive glands in vertebrates.
4. To understand the Respiratory Organs, Gills, lung and Air-Sac in birds.

**UNIT-II**

1. To study the endoskeleton-Limbs, girdles and vertebrae.
2. To understand the features of circulatory System and able to know the evolution of heart and aortic arches.
3. To understand the features of Urinogenital System and able to know the structure of Kidney and excretory ducts.

**UNIT-III**

1. To study the Nervous System and general plan of the brain and spinal cord.
2. To study the classification and histology of endocrine glands.
3. To know the structure and functions of gonads and genital ducts.

**UNIT-IV**

1. To understand the process of Digestion and absorption of dietary components.
2. To know the Physiology of heart, Cardiac cycle and ECG.
3. To know the processes of Blood Coagulation.
4. To know the Mechanism of Respiration and control of breathing.

**UNIT-V**

1. To understand The Physiology of excretion and Osmoregulation.
2. To know the Physiology of Muscle contraction.
3. To understand the Physiology of nerve impulse, Synaptic transmission.
4. To know the structure and function of Ear and Eye.

**PAPER-II**  
**VERTEBRATE ENDOCRINOLOGY, REPRODUCTIVE BIOLOGY BEHAVIOUR,**  
**EVOLUTION AND APPLIED ZOOLOGY**  
**(Paper Code - 0864)**

**On completion of the course, the students are able**

**UNIT-I**

1. To know the General Characters of Hormones and Hormone Receptors
2. To understand various aspects of Biosynthesis and secretion of the thyroid, Adrenal; Ovarian and testicular hormones.
3. To know the Endocrine disorders due to hormones and other glands.

**UNIT-II**

1. To know the Reproductive cycle in vertebrate, Menstruation, Lactation and pregnancy.
2. To know the Mechanism of parturition.
3. To know the Hormonal regulation of gametogenesis.
4. To study the structure and functions of Extra embryonic membranes.

**UNIT-III**

1. To familiar with the evidence of organic evolution, Theories of organic evolution.
2. To understand Variation, Mutation, Isolation and Natural selection.
3. To know the Evolution of Horse.

**UNIT-IV**

1. To know various aspects of Ethology.
2. To know the Patterns of Behaviour Taxes, Reflexes, Drives and Stereotyped Behaviour.
3. To understand the Reproductive Behavioural Patterns.
4. To know the Hormones and Drugs which influence Behaviour.

**UNIT-V**

1. To know the importance of Aquaculture, Sericulture, Apiculture, Pisciculture and Poultry keeping.
2. To understand the methods and features of Pest Control (Chemical control and Biological Control).

**BSc. PART III**  
**Paper-I (Paper Code-0917)**  
**Ecology, Environmental-biology; Toxicology ; Microbiology and Medical Zoology.**

**On completion of the course, the students are able**

**UNIT-I (ECOLOGY)**

1. To know the aims and scopes of Ecology.
2. To familiarize with the major ecosystems of the world.
3. To know the Characteristics and methods of regulation of Population densities.
4. To familiarize with the Communities and Ecosystems.
5. To study the Bio-geochemical cycles
6. To understand the impacts of air and water pollution
7. To know various stages of Ecological succession.

**UNIT-II (ENVIRONMENTAL BIOLOGY)**

1. To study the Laws of limiting factors
2. To study the food chain in a freshwater ecosystem.
3. To know the energy flow in ecosystem-trophic levels
4. To know the importance of conservation of natural resources
5. To understand the importance of Environmental Impact Assessment

**UNIT-III (TOXICOLOGY)**

1. To know the field of Toxicology and principle of systematic toxicology
2. To study the Classification of toxicants, toxic agents (Metallic and inorganic agents) and their action.
3. To know the animal poisons (Snake-venom, Scorpion and bee poisoning) and Food poisoning.

**UNIT-IV (MICROBIOLOGY)**

1. To know the areas and scope of microbiology.
2. To understand the microbiology of domestic water and sewage, milk and milk products.
3. To familiarize the area of industrial microbiology.

**UNIT-V (MEDICAL MICROBIOLOGY)**

1. To know the pathogenic micro-organisms, Rickettsia, Spirochaetes and Bacteria.
2. To study the life-history and pathogenicity of the Pathogenic Protozoans, Pathogenic helminths and Nematode Pathogenic parasites with reference to man.
3. To know prophylaxis and treatment.
4. To know the Vector insects.

**PAPER-II**  
**(Paper Code-0918)**  
**(GENETIC'S, CELL PHYSIOLOGY, BIOCHEMISTRY, BIOTECHNOLOGY AND**  
**BIOTECHNIQUES)**

**On completion of the course, the students are able**

**UNIT-I (GENETIC'S)**

1. To understand Linkage and Linkage maps.
2. To know the varieties of gene expression - Multiple alleles; lithogenesis; Pleiotropic genes; gene interaction; epistasis.
3. To know the sex chromosome systems and sex-linkage.
4. To understand mutation and chromosomal alterations; meiotic consequences.
5. To familiarize the area of Human genetics – chromosomal and single-gene disorders (somatic cell genetics)

**UNIT-II (CELL PHYSIOLOGY)**

1. To get a general idea about pH and Buffer.
2. To understand the structure of cell membrane, Mitochondria and Endoplasmic reticulum.
3. To know about the transport mechanisms across membranes and active transport and its mechanism in Mitochondria and Endoplasmic reticulum.
4. Hydrolytic enzymes – their chemical nature, activation and specificity.

**UNIT-III (BIOCHEMISTRY)**

1. To understand the structure and biological functions of amino acids and peptides.
2. To study Carbohydrate and its metabolism through understanding Glycogenesis; Gluconeogenesis; glycolysis, Glycogenolysis and Cose cycle.
3. Lipid metabolism – Oxidation of glycerol; oxidation of fatty acid.
4. Protein metabolism – Deamination, Transamination, Transmethylation; Biosynthesis of Protein;

**UNIT-IV (BIOTECHNOLOGY)**

1. To understand the scope and importance of Biotechnology.
2. To study and know the recombinant DNA technology and gene cloning techniques and other tools of biotechnology.
3. To understand the applications of biotechnology in (i) Pharmaceutical industry, and (ii) Food processing industry.

**UNIT-V (BIOTECHNIQUE)**

1. To study the Principles and techniques of pH meter, Colorimeter, Microscopy-Light microscopes, Phase contrast and Electron microscopes, Centrifugation etc..
2. To know the methods of Separation of biomolecules by chromatography and Electrophoresis.
3. To understand Histochemical methods for determination of Protein, Lipids and carbohydrates.

## PRACTICAL

### BSc Part I

On completion of the course, students are able to:

1. To study and understand the internal and external features of Earthworm, Cockroach, Palaemon and Pila.
2. To know the structure of appendages of Prawn & hastate plate, mouthparts of insects and radula of Pila.
3. To understand the morphology and arrangement of various systems of selected species through Alternative methods such as Clay/Thermacol/drawing/Model etc.)
4. To study the Adaptive characters of Aquatic, terrestrial, aerial and desert animals.
5. To understand the features of invertebrates with the help of Museum specimens.
6. To study the morphology of Invertebrates, frog embryology, Chick embryology and cytology with the help of slides.

### BSc Part II

On completion of the course, students are able to:

1. To Study the Classification and characters of the different chordates with the help of representative examples.
2. To understand the structure of Afferent and Efferent branchial vessels, cranial nerves and internal ear of Scoliodon by dissection.
3. To understand the Simple microscopic technique through unstained or stained permanent mounts.
4. To Study and understand the prepared histological slides, as per theory papers.
5. To understand the structure of limb girdles and vertebrae of frog, Varanus, fowl and Rabbit.
6. To identify species and individuals of honey bees.
7. To understand the Life cycle of honey bee and silkworm.

### BSc Part III

On completion of the course, students are able to:

1. To Estimate population density, Percentage frequency and Relative density.
2. To understand the Producers and consumers in grassland.
3. To Detect gram-negative and gram-positive bacteria.
4. To understand various haematological experiments (blood grouping, Blood coagulation time, R.B.C and W.B.C counting and Preparation of Hematin crystals from the blood of rat).
5. To study Drosophila, wild and mutant through various experiments.
6. To understand the features of Chromatography (Paper or gel).
7. To know the Colorimetric estimation of haemoglobin.
8. To understand the processes in Mitosis with the aid of onion root tip.
9. To know the methods of Biochemical detection of Carbohydrate, Protein and Lipid.
10. To study about Parasites using Permanent slides based on theory paper.
11. To know the working Principles of pH meter, Colorimeter, centrifuge and microscopes.

## **PROGRAM : MSc. ZOOLOGY**

### **PROGRAM OUTCOMES**

- PO1. Enable the learners to take certification of Master's degree in Zoology.
- PO2. Equip the students with an in-depth knowledge in the area of Zoology
- PO3. Enable them to specialize in one of the branches of Zoology that would be offered as optional courses.
- PO4. Provide opportunities of continuing education and professional development.
- PO5. Widen the scope of the learners for careers in different sectors of employment.
- PO6. Enable the students to avail career opportunities in teaching, industry and research.

### **PROGRAM SPECIFIC OUTCOMES**

- PSO1. Developing academically sound future researchers and intellectuals in the area of General Biology, Molecular biology, Biotechnology, Genetics, Cell biology, and Environmental Conservation.
- PSO 2. Developing deeper understanding of key concepts of Zoology
- PSO 3 Enables to produce contributors in the area of teaching, biological research, and biological conservation
- PSO 4. Cultivating a generation with Scientific Temper.
- PSO 5. Development of theoretical and practical knowledge in the subject.
- PSO6: Enables to gain deeper understanding of the Zoological Science for its application in other related fields

## **PROGRAM : MSc. ZOOLOGY**

### **PROGRAM OUTCOMES**

PO1. Critical & Reflective Thinking: will be enable to correlate the theoretical knowledge acquired in the subject with the practical life science and will be able to further explore scientific facts through logical reasoning.

PO2. Effective communication: will be able to make the stake holders understand the subject easily with appropriate illustration through effective communication

PO3.Social Interaction: Will be able to interact and enlighten the society on the opportunities in various fields' for promoting entrepreneurship and good culture thus contributing to the growth of the country.

PO4. Moral and Ethical Values: Will be helpful, honest, respect others with the correct sense of right and wrong and stick to principle at all circumstances.

PO5.Life-long learning: Will be able to sustain the interest on the subject by updating the knowledge on continuous basis and contribute to the field of life science by teaching and research.

### **PROGRAM SPECIFIC OUTCOMES**

PSO1. Developing academically sound future researchers and intellectuals in the area of General Biology, Molecular biology, Biotechnology, Genetics, Cell biology, and Environmental Conservation.

PSO 2. Developing deeper understanding of key concepts of Zoology

PSO 3 Enables to produce contributors in the area of teaching, biological research, and biological conservation

PSO 4. Cultivating a generation with Scientific Temper.

PSO 5. Development of theoretical and practical knowledge in the subject.

PSO 6: Enables to gain deeper understanding of the Zoological Science for its application in other related fields

### **MSC ZOOLOGY- COURSE OUTCOME**

#### **I SEMESTER**

CO1; Study the significance of biosystematics importance of biosystematics, different aspects of taxonomy and bio diversity

CO2; Study the importance of body organisation, locomotion, feeding mechanism in invertebrates. The importance of respiration excretion and larval stages in invertebrates

CO3: Study the importance of evolution, evolution of different animals population genetics

CO 4: Study the working principles, applications of tools, different Methods of fixation, different methods of staining

## II SEMESTER

CO1; Brief account of cell organelles, genetic materials, protein synthesis, genetic code

CO2; Brief account of physiological processes such as digestion, respiration, temperature regulation, endocrine glands and hormones.

CO3; Brief account of gametes, fertilisation, developmental processes, metamorphosis organisms, teratology

CO 4: Brief knowledge of software, hardware, basic knowledge of computer applications. Importance of biological data, testing of significance

## III SEMESTER

CO1; Discuss the of classification of vertebrates, study comparative anatomy of different organ system of vertebrates

CO2; Brief account of behaviour, orientation, migration in fish understand the scope and importance of Neural and hormonal control of behaviour. Social behaviour, Social organization in insects and primates, echolocation in bats

CO 3; Brief knowledge of demography, life table, reproductive rates, reproductive values, Population growth, Population density adaptations, Stress. Physiology; Basic concepts of environmental stress and strain, Concept of elastic and plastic strain

CO 4: Brief account of immune systems, lymphoid organs, cells of immune systems, immune globin pathogens, vaccines.

## IV SEMESTER

CO1: A detailed knowledge on structure functions of proteins, carbohydrates lipids, vitamins. Chemistry of nucleic acids

CO 2; A detailed knowledge of physiological role of nerve cells nerve physiology, reflex action, brain

CO 3: A detailed knowledge on character of origin and evolution of fishes and importance of classification of fishes as proposed by Berg

CO 4: To understand the scope and importance of Collection of fish seed, breeding in fish, ponds required for fresh water fish culture farms. Management of fish farm. Composite fish culture Prawn culture and pearl industries in India