

## Department of Zoology

### **Programme Outcomes (PO)**

After the completion of B.Sc. Honours Degree Programme, the students will be able to:

**PO1: Professional knowledge:** Acquire comprehensive knowledge of major concepts, theoretical principles and experimental findings to various subjects in pure sciences such as Physics, Chemistry, Botany, Zoology, Mathematics, etc.

**PO2: Critical thinking and Cognitive skills:** Convey the intricate science information effectively and efficiently, analyze and solve the problems related to plants, animal sciences without relying on assumptions and guesses.

**PO3: Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

**PO4: Effective Communication:** Demonstrate familiarity with and ability to analyze both verbally and in writing issues and forms of contemporary art with a clear understanding of historical precedents.

**PO5: Instruments and Experiments:** Acquired the skills in handling scientific instruments, planning and performing in laboratory experiments and drawing logical inferences from the scientific experiments.

**PO6: Research and Analysis:** Demonstrate analytical skill and proficiency in a range of tools and techniques used in research in science and interdisciplinary.

**PO7: Employability and higher Education:** Show proficiency in professional, employability and soft skills required for higher education and placements.

**PO8: Ethics:** Imbibe ethical, moral and social values in personal and social life leading to highly cultured and civilized personality in science field.

**PO9: Science and Society:** Apply reasoning informed by the scientific knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional science practice.

**PO10: Interdisciplinary Learning:** Integrate academic curriculum with other co-curricular goals, such as career development, life-long learning, develop interdisciplinary learning and opportunity to extend their knowledge across disciplines.

## **Programme Specific Outcomes (PSO)**

**After the completion of B.Sc. Honours Degree Programme, the student will be able to:**

**PSO1.** Identify, classify and differentiate diverse chordates and non-chordates based on their morphological, anatomical and systemic organization.

**PSO2.** Describe economic, ecological and medical significance of various animals in human life. This will create a curiosity and awareness among them to explore the animal diversity and take up wild life photography or wild life exploration as a career option. The knowledge about identifying and classifying animals will provide student professional advantages in teaching, research and taxonomist jobs in various government organizations; including Zoological Survey of India and National Parks/Sanctuaries.

**PSO3.** Acquire practical skills in cell & molecular biology, biochemistry, genetics, enzymology These methodologies will provide an extra edge to our students, who wish to undertake higher studies.

**PSO4.** Understand comparative anatomy and developmental biology of various biological systems; and learning about the organisation, functions, strength and weaknesses of various systems will let student critically analyse the way evolution has shaped these traits in human body.

**PSO5.** Skill enhancement course like medical diagnostics will provide them opportunity to work in diagnostic or research laboratory.

**PSO6.** Student undertaking wild life management courses would gain expertise in identifying key factors of wild life management and be aware about different techniques of estimating, remote sensing and Global Positioning of wild life. This

course will motivate student to pursue career in the field of wildlife conservation and management.

## **SEMESTER – I**

### **ZOO CC101 : Non-Chordates I : Protists To Pseudocoelomates**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1-** Learn & interpret the importance of taxonomy and classify Protista, Parazoa, Metazoa, Porifera, Cnidaria, Platyhelminthes and Nemathelminthes.

**CO2-** Understand and explain the economic importance and describe the life cycle and pathogenecity of *P. vivax*, *E. histolytica*, *Schistosoma haematobium*, *Taenia solium*, *Ascaris lumbricoides* and *Wuchereria bancrofti*;

**CO3-** Appreciate the diversity and complexities exhibited by non-chordates and familiarize with the morphology, anatomy and functioning of different groups of non-chordates.

**CO4-** Critically analyze the organization, complexity and adaptations in parasitic Nemathelminthes and Platyhelminthes; affinities and Evolutionary significance of Ctenophora and to enhance collaborative learning through practical sessions, assignments and projects.

## **Semester I**

### **ZOO CC102 : Principles of Ecology**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand and relate the key concepts in ecology with emphasis on historical perspective, role of physical factors and concept of limiting factors.

**CO2:** Understand and explain the population attributes; population growth models and population interactions and to understand and describe the community characteristics and ecological succession

**CO3:** Understand and describe the different ecosystems, food chains, energy flow & efficiency; biogeochemical cycles.

**CO4:** Learn and relate the application of the basic principles of ecology in wildlife conservation and management.

## **SEMESTER – II**

### **ZOO CC203 : Non-chordates II: Coelomates**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Classify and compare phylum Annelida, Arthropoda, Mollusca and Echinodermata.

**CO2:** Understand and describe Excretion in Annelida; Vision and Respiration in Arthropoda; Metamorphosis in Insects; Social life in bees and termites.

**CO3:** Understand and describe Respiration in Mollusca; Torsion and detorsion in Gastropoda; Pearl formation in bivalves.

**CO4:** Understand and describe the Water-vascular system in Asteroidea; Larval forms in Echinodermata.

## **SEMESTER – II**

### **ZOO CC204 : Cell Biology**

**(Theory :4 credits + Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand the structures and purposes of basic components of Prokaryotic and Eukaryotic cells.

**CO2:** Understand the structures and functions of Plasma Membrane, Endomembrane System and Cytoskeleton.

**CO3:** Understand the detailed structure of Mitochondria and how energy is produced by it through the Respiratory chain.

**CO4:** Understand the detailed structure of Nucleus and its associated structures, Cell Division, Cell Cycle and Cell Signaling.

### **ZOO GE101 : Animal Diversity**

**(Theory :4 credits + Practical: 2 credits )**

**Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand and describe the features of Protista, Porifera, Radiata, Acoelomates and Pseudocoelomates.

**CO2:** Understand and describe the features of Arthropoda, Mollusca and coelomate deuterostomes.

**CO3:** Understand and describe the features of Protochordates, Pisces and Amphibia.

**CO4:** Understand and describe the features of Reptiles, Aves and Mammalia.

**SEMESTER – II**

**ZOO GE202 : Environment and Public Health**

**(Theory :4 credits + Practical: 2 credits )**

**Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Acquire knowledge about various sources of environmental hazards, their risk assessment, fate of toxic and persistent substances in the environment.

**CO2:** Understand the factors of Climate change like Greenhouse gases, Global warming, Acid rain, Ozone layer destruction and Effect of Climate change on public health.

**CO3:** Know about the sources and effects of Air, Water and Noise Pollution and their control methods, Waste Management Technologies, Bhopal Gas Tragedy, Chernobyl Disaster, Seveso Disaster and Three Mile Island Accident and their aftermath.

**CO4:** Understand the causes, symptoms and control of Diseases like- Tuberculosis, Asthma, Silicosis, Asbestosis, Cholera, Minamata, Arsenicosis and Fluorosis.

**SEMESTER – III**

**ZOO CC305 : Diversity of Chordates**

**(Theory :4 credits + Practical: 2 credits )**

**Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand the General Characteristics and Classification of Hemichordata, Urochordata and Cephalochordata, the Larval forms of Protochordata and Retrogressive Metamorphosis in Urochordata.

**CO2:** Acquire knowledge about the General Characters and Classification of Agnatha, Pisces and Amphibia.

**CO3:** Understand the General Characteristics and Classification of Reptilia, Aves and Mammals, Biting Mechanism in Snakes, Flight Adaptations in Birds and Migration in Birds.

**CO4:** know about the Zoogeographical Realms and Characteristic Fauna.

### **SEMESTER – III**

**ZOO CC306 : Animal Physiology: Controlling and Coordinating Systems**  
(Theory :4 credits + Practical: 2 credits )

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** know about different types of Tissues, Bone and Cartilage, Muscles and physiology of Muscle Contraction.

**CO2:** Aquire knowledge about the structure and function of Nervous System.

**CO3:** Understand the Histology and physiology of Male and Female Reproductive System.

**CO4:** Learn about the Histology and Physiology of human Endocrine System and Associated Diseases.

### **SEMESTER – III**

**ZOO CC307 : Fundamentals of Biochemistry**  
(Theory :4 credits + Practical: 2 credits )

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand the Structure, Classification and Importance of Carbohydrates and Proteins.

**CO2:** Understand the Structure and Significance of physiologically important Lipids.

**CO3:** Understand the Basic Structure and Types of DNA and RNA, Base pairing, Denaturation and Renaturation of DNA.

**CO4:** Understand the Types of Enzymes, Mechanism of Enzyme Action and Enzyme Kinetics

#### **SEMESTER – IV**

**ZOO CC408 : Comparative Anatomy of vertebrates**

**(Theory :4 credits + Practical: 2 credits )**

##### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Describe the function and derivative of integument

**CO2:** Explain the Evolution of heart and aortic arches

**CO3:** Compare structure and function of the Alimentary canal and associated glands

**CO4:** Evaluate the techniques relating to the nervous system and how they within the body respond to challenges.

#### **SEMESTER – IV**

**ZOO CC409 : Animal Physiology: Life Sustaining Systems**

**(Theory :4 credits + Practical: 2 credits )**

##### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Compare the mechanical and chemical digestion of food

**CO2:** Remember and understand hormonal control of secretion of enzymes in gastrointestinal tract

**CO3:** Acquire knowledge of mechanism of breathing, Pulmonary ventilation and its control and to understand the concept of hemostasis and blood clotting system

**CO4:** Explain origin and conduction of cardiac impulses and cardiac cycles.

#### **SEMESTER – IV**

### **ZOO CC410 : Biochemistry of Metabolic Processes**

**(Theory :4 credits + Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Compare catabolism Vs Anabolism, Compartmentalization of metabolic pathways and membrane transporters

**CO2:** Construct a flowchart for the steps involved in sequence of reactions of glycolysis, citric acid and pentose phosphate pathway

**CO3:** Acquire a comprehensive knowledge of  $\beta$  – oxidation of saturated fatty acids

**CO4:** Understand the transamination and determination.

### **ZOO CC511 : Molecular Biology**

**(Theory :4 credits + Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand Central dogma of molecular biology. Explain and distinguish mechanism of replication, transcription and translation in prokaryotes and eukaryotes.

**CO2:** Understand and explain the post transcriptional modifications in eukaryotes .

**CO3:** Explain and differentiate the mechanism of gene expression and regulation in prokaryotes and eukaryotes

**CO4:** Describe the concept of regulatory RNAs, Ribo-switches and RNA interference and to enhance skill in molecular biology through relevant experiments.

### **ZOO CC512 : Principles of Genetics**

**(Theory :4 credits + Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Explain and discuss the genetic variation through linkage and crossing over.

**CO2:** Describe sex-linked, sex limited and sex influenced inheritance.



**CO3:** Understand the Concept behind genetic disorder, gene mutations and molecular basis of mutations and to explain the criteria for extra-chromosomal inheritance.

**CO4:** To describe the molecular mechanisms of recombination in bacteria and to explain and distinguish the concept of transportable genetic elements in prokaryotes and eukaryotes. Solve genetic based problems.

### **ZOO CC613 : Developmental Biology**

**(Theory :4 credits + Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Describe the mechanism of gametogenesis, fertilization and blocks to polyspermy.

**CO2:** Explain early embryonic development in frog and chick.

**CO3:** Understand the concepts of late embryonic development in model organisms.

**CO4:** Describe post embryonic development such as metamorphosis and regeneration with suitable examples and apply important experiments and project work.

### **SEMESTER – II**

### **ZOO CC614 : Evolutionary Biology**

**(Theory :4 credits + Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand the basis of origin of life such as: chemogeny, RNA world, biogeny and evolution of eukaryotes.

**CO2:** Obtain the various evolutionary concepts and heritable variation and to understand concept of species, isolating mechanisms, modes of speciation and adaptive radiation.

**CO3:** Explain and different types of fossils, geological time scale, climatic conditions, hominid characteristics, primate phylogeny and evolution of horse and man.

**CO4:** Understand Hardy-Weinberg principle of genetic equilibrium and its destabilizing forces such as Natural selection, Mutation, Migration and genetic drift .

**ZOO GE303 : Food, Nutrition and Health**

**(Theory :4 credits + Practical: 2 credits )**

**Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Explain the concept of balanced diet

**CO2:** Compare nutrient needs and dietary pattern for various groups – adults, pregnant and nursing mothers.

**CO3:** Understand the concept of Carbohydrate, lipids and proteins.

**CO4:** Apply the knowledge of potable water and apply to methods of purification at domestic level.

**SEMESTER – IV**

**ZOO GE404 : Insect Vectors and Diseases**

**(Theory :4 credits + Practical: 2 credits )**

**Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1-** Understand and describe the morphological features of insects

**CO2-** Understand and exemplify the important insect Vectors- mosquitoes, Sand fly and houseflies

**CO3-** Understand and Explain mosquito-borne diseases like Malaria, Dengue, Chikungunya, Viral encephalitis

**CO4-** Understand and describe the Hemipteran disease vectors

**SEMESTER – V**

**ZOO DSE501 : Endocrinology**

**(Theory :4 credits+ Practical: 2 credits)**

**Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Describe and of types of endocrine glands, classify hormones and explain their features.

**CO2:** Explain structure ,functions and regulation of peripheral endocrine glands and associate function of neuroendocrine system, epiphysis, and hypothalamo-hypophysial axis.

**CO3:** Understand the mechanism of regulation of hormone action hormone action at cellular level and gain the knowledge of hormone receptors.

**CO4:** Apply the knowledge by performing biochemical assays to detect level of hormones in plasma and visualize cross sections of endocrine glands.

### **ZOO DSE502 : Immunology**

**(Theory :4 credits+ Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Explain cells and organs of the immune system, innate and adaptive immunity

**CO2-** Describe autoimmunity with reference to rheumatoid arthritis and tolerance and AIDS.

**CO3-** Understand antigens and its type, structure and functions of immunoglobulins, antigen-antibody interactions and immunoassays (such as ELISA and RIA).

**CO4-** Explain structure and functions major histocompatibility complex, know the concept of hypersensitivity and vaccines.

### **SEMESTER – VI**

#### **ZOO DSE603 : Animal Behavior and Chronobiology**

**(Theory :4 credits+ Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand various pattern of animal behaviours such as stereotyped, instinct, learnt, associative behaviour along with operant conditioning and habituation imprinting and to explain the concept of social and sexual behaviour.

**CO2:** Develop the concept of biological rhythm, photoperiod and regulation of seasonal reproduction of vertebrates and role of melatonin.

**CO3:** Understand the relevance of biological clock in terms of chronopharmacology, chronomedicine and chronotherapy.

**CO4:** Develop the skill in this course by performing practical works such as studying nest and nesting habitat of birds and social insects and other significant experiments.

## **SEMESTER – VI**

### **ZOO DSE604 : Wild Life Conservation and Management**

**(Theory :4 credits+ Practical: 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Understand different physical and biological parameters for evaluation and management of wild life.

**CO2:** Get the knowledge of Grazing logging, cover construction, preservation of genetic diversity and restoration of degraded habitats under management of habitats.

**CO3:** Estimate Population density, Natality, Birth rate, Mortality and fertility schedules.

**CO4:** Get the concept of climax persistence, Rescue and rehabilitation, Quarantine, Common disease of wild animal and Man – Animal conflict and to enhance exposure through visit to Wild life Sanctuary, Biodiversity Park and Zoological Parks .

## **SEMESTER – IV**

### **ZOO SEC402 : Medical Diagnostics ( 2 credits )**

#### **Course Outcomes:**

**After completion of the course, the student will be able to:**

**CO1:** Explain medical diagnostics and its importance.

**CO2:** Understand the concept of diagnostics methods used for analysis of blood and urine.

**CO3:** Describe distinguish infectious diseases and non-infectious diseases, its causes, types, symptoms, complications, diagnosis and preventions.

**CO4:** Describe and distinguish tumour, its types. Explain methods of detection such as medical imaging: X-ray of bone fracture, PET, MRI and CT Scan (using photographs).