



Name of the Programme: B.Sc. Zoology (CBCS)

Programme Outcomes (PO)

After completing the Three-Year Undergraduate Programme in Zoology, students are expected to achieve the following Programme Outcomes:

- PO1:** Critical thinking
- PO2:** Communication Skills
- PO3:** Problem-solving
- PO4:** Analytical and Logical reasoning
- PO5:** Research-oriented skills
- PO6:** Cooperation/Teamwork/Leadership
- PO7:** Reflective thinking
- PO8:** Digital Literacy/ Use of Modern Tools
- PO9:** Environmental Awareness
- PO10:** Entrepreneurship and Employability
- PO11:** Lifelong Learning
- PO12:** Ethical Awareness

Programme Specific Outcomes (PSO)

The programme-specific outcomes of the Undergraduate Programme in Zoology are listed below. After completing the program the students will be able to

PSO1: Understand the identification, classification, and differentiation of diverse non-chordates and chordates based on their morphological, anatomical, and systemic organization and to describe the economic, ecological, and medical significance of various animals in human life.

PSO2: Know the practical skills in biotechnology, biostatistics, bioinformatics and molecular biology and understand the basic experimental skills in various techniques in the fields of genetics; molecular biology; biotechnology; qualitative and quantitative microscopy; enzymology, and analytical biochemistry.

PSO3: Understand the in-depth knowledge of comparative anatomy and developmental biology of various biological systems; and the organization, functions, strengths and weaknesses of various systems, and the way evolution has shaped these traits in the human body.

Course Outcomes (CO)**B.Sc. 1st Semester****Course Title: Non-chordates I: Protista to Pseudocoelomates**Course Code: **ZC101T***On completion of this Course, the students will be able to –*

- CO1** Gain a comprehensive knowledge of the diversity of non-chordates, including their classification, phylogeny, and evolutionary relationships.
- CO2** Understand the morphology, anatomy, and physiology of non-chordates, highlighting their unique adaptations, characteristics, and pathogenicity.
- CO3** Learn about the ecological roles and behaviors of non-chordates, including their interactions with the environment and other organisms.
- CO4** Understand the importance of non-chordates in biodiversity and their roles in ecosystem functioning and conservation efforts.
- CO5** Develop skills in identifying and classifying various non-chordate species using morphological and genetic techniques.

Course Title: Principles of EcologyCourse Code: **ZC102T***At the end of this course, the students will be able to:*

- CO1** Understand the key concepts in ecology with emphasis on historical perspective, the role of physical factors, and comprehend the population characteristics, dynamics, growth models, and interactions.
- CO2** Understand the community characteristics, ecosystem development, and climax theories.
- CO3** Know about the types of ecosystems, food chains, food webs, energy models, and ecological efficiencies.
- CO4** Apply the basic principles of ecology in wildlife conservation and management.
- CO5** Inculcate scientific quantitative skills, evaluate experimental design, read graphs, and analyze and use the information available in scientific literature.

B.Sc. 2nd Semester**Course Title: Non-chordates II: Coelomates**Course Code: **ZC203T***At the end of this course, the students will be able to:*

- CO1** Gain insights into the diverse coelomate organisms, their identification, and structural complexities including annelids, mollusks, arthropods, echinoderms, and chordates.
- CO2** Understand the evolutionary relationships among different coelomate phyla, including their common ancestry and divergence.
- CO3** Recognize the ecological roles of coelomates in various ecosystems, including their interactions with other organisms and their contributions to ecosystem functioning.
- CO4** Learn about the biodiversity of coelomates, their conservation status, and the importance of preserving their habitats.
- CO5** Explore the use of coelomate models (e.g., *Drosophila melanogaster*, *Caenorhabditis elegans*) in genetic, developmental, and disease research.

Course Title: Cell BiologyCourse Code: **ZC204T***At the end of this course, the students will be able to:*

- CO1** Understand fundamental principles of cell biology.
- CO2** Explain the structure and functions of cell organelles involved in diverse cellular processes.
- CO3** Comprehend the process of cell signaling and its role in cellular functions and have an insight into how defects in the functioning of cell organelles and regulation of cellular processes can develop into diseases.
- CO4** Appreciate how cells grow, divide, survive, die, and regulate these important processes.
- CO5** Learn the advances made in the field of cell biology and their applications.

B.Sc. 3rd Semester**Course Title: Diversity of chordates**Course Code: **ZC305T***At the end of this course, the students will be able to:*

- CO1** Understand different classes of chordates, level of organization, and evolutionary relationships between different subphyla and classes, within and outside the phylum.
- CO2** Know about diversity in animals and understand about their distinguishing features
- CO3** Understand the similarities and differences in life functions among various groups of animals in Phylum Chordata
- CO4** Understand the digestive, circulatory, respiratory, excretory, nervous and skeletal system of chordates.
- CO5** Know about the habit and habitat of chordates in marine, freshwater and terrestrial ecosystems.

Course Title: Physiology: Controlling and Coordinating systemsCourse Code: **ZC306T***At the end of this course, the students will be able to:*

- CO1** Know the basic fundamentals and understand the concepts to develop a strong foundation that will help them to acquire skills and knowledge to pursue advanced degree courses.
- CO2** Comprehend and analyze problem-based questions.
- CO3** Learn an integrative approach to understand the interactions of various organ systems resulting in the complex overall functioning of the body.
- CO4** Recognize and explain how all physiological systems work in to maintain homeostasis in the body and use of feedback loops to control the same.
- CO5** Synthesize ideas to make connection between knowledge of physiology and real world situations, including healthy life style decisions and homeostatic imbalances

Course Title: Fundamentals of BiochemistryCourse Code: **ZC307T***At the end of this course the students will be able to:*

- CO1** Gain knowledge and skill in the fundamentals of biochemical sciences, interactions and interdependence of physiological and biochemical processes.
- CO2** Demonstrate foundation knowledge in biochemistry; synthesis of proteins, lipids, nucleic acids, and carbohydrates; and their role in metabolic pathways along with their regulation.
- CO3** Get exposed to various processes and gain skills in techniques of chromatography and spectroscopy.
- CO4** Know about classical laboratory techniques, use modern instrumentation, design and conduct scientific experiments, and analyze the resulting data.
- CO5** Be knowledgeable in proper procedures and regulations in handling and disposal of chemicals.

B.Sc. 4th Semester**Course Title: Comparative anatomy of vertebrates**Course Code: **ZC408T***At the end of this course the students should be able to:*

- CO1** Gain comprehensive knowledge of the anatomical structures of various vertebrate groups, understanding their functional adaptations and evolutionary significance.
- CO2** Understand the evolutionary relationships among vertebrates, recognizing homologous structures and tracing their modifications across different lineages.
- CO3** Develop an understanding of phylogenetic methods and how anatomical data contribute to the construction of evolutionary trees.
- CO4** Acquire proficiency in dissection techniques and the handling of anatomical specimens, both preserved and fresh.
- CO5** Learn techniques for measuring and analyzing anatomical structures quantitatively.

Course Title: Physiology: Life Sustaining SystemsCourse Code: **ZC409T***At the end of this course, the students will be able to:*

- CO1** Understand the basic fundamentals and advanced concepts of digestion, respiration, renal physiology, blood and structure and function of heart so as to develop a strong foundation to acquire skills and knowledge
- CO2** Understand and analyse problem-based questions on physiological aspects
- CO3** Know and elucidate how all physiological systems work in unison to maintain homeostasis in the body
- CO4** Understand the use of feedback loops to control the homeostasis in body
- CO5** Understand the interactions of various organ systems resulting in the complex overall functioning of the body.

Course Title: Biochemistry of Metabolic ProcessesCourse Code: **ZC410T***At the end of this course, the students will be able to:*

- CO1** Understand the metabolic pathways such as glycolysis, TCA cycles, glycogen metabolism, oxidative phosphorylation, Electron Transport chain along with their regulation
- CO2** Understand the β -oxidation of fatty acids, omega oxidation of fatty acid, ketosis, transamination and deamination and its regulations.
- CO3** Understand the interactions and interdependence of physiological and biomolecules
- CO4** Know the principles, instrumentation and applications of bioanalytical techniques and understand about classical laboratory techniques, use modern instrumentation, design and conduct scientific experiments and analyze the resulting data.
- CO5** Understand the proper procedures and regulations in handling and disposal of chemicals

B.Sc. 5th Semester**Course Title: Molecular Biology**Course Code: **ZC511T***At the end of this course, the student will be able to:*

- CO1** Describe the basic structure and chemistry of nucleic acids, DNA and RNA.
- CO2** Compare and contrast DNA replication machinery and mechanisms in prokaryotes and eukaryotes.
- CO3** Elucidate the molecular machinery and mechanism of information transfer processes— transcription and translation-in prokaryotes and explain post-transcriptional modification mechanisms for the processing of eukaryotic RNA
- CO4** Discuss general principles of transcription regulation in prokaryotes by exploring the structure and function of lactose and tryptophan metabolism operons and post
- CO5** Quantitatively estimate the concentration of DNA and RNA by colorimetric methods.

Course Title: Principles of GeneticsCourse Code: **ZC512T***At the end of this course, the student will be able to:*

- CO1** Understand the basic principles of inheritance, sex determination, linkage, crossing over, chromosomal mapping, extrachromosomal inheritance, recombination in bacteria and viruses and transposable genetical elements
- CO2** Know the mechanisms of mutations, the causative agents and the harmful impact of various chemicals and drugs being used in day to day life.
- CO3** Understand the pedigree analysis leading to development of analytical skills and critical thinking enabling to present the conclusion of their findings in a scientific manner.
- CO4** Understand the varied branches of the biological sciences like microbiology, evolutionary biology, genomics and metagenomics.
- CO5** Find out the effects of indiscriminate use of various chemicals, drugs or insecticides in nature by studying their effect on various bacterial species in soil and water samples from different industrial or polluted areas.

Course Title: DSE-1: Animal Behaviour and ChronobiologyCourse Code: **ZD501T***At the end of this course, the students will be able to:*

- CO1** Gain in-depth knowledge of the behavioral patterns of different animal species.
- CO2** Understand the genetic, neural, and hormonal mechanisms underlying behavior.
- CO3** Acquire knowledge about biological rhythms, including circadian rhythms, seasonal rhythms, and other time-based biological processes.
- CO4** Learn to identify, analyze, and solve complex problems related to animal behavior and chronobiology.
- CO5** Understand the application of animal behavior and chronobiology in various fields such as conservation, wildlife management, animal welfare, and biomedical research.

Course Title: DSE 4: Biology of InsectaCourse Code: **ZD504T***At the end of this course, the student will be able to:*

- CO1** Develop knowledge of the vast diversity of insect species, their classifications, identifying and categorizing insects using morphological and their evolutionary relationships.
- CO2** Grasping the roles insects play in ecosystems, including their interactions with plants, animals, and microorganisms.
- CO3** Understand the importance of insects in ecosystem services such as pollination, decomposition, and nutrient cycling.
- CO4** Acquire skills in pest management, including integrated pest management (IPM) strategies to control agricultural pests.
- CO5** Understand the role of beneficial insects in agriculture, such as pollinators and natural predators of pests.

B.Sc. 6th Semester**Course Title: Developmental Biology**Course Code: **ZC613T***At the end of this course the students will be able to:*

- CO1** Understand the events that lead to formation of a multicellular organism from a single fertilized egg, the zygote and acquire basic knowledge of the cellular processes of development and the molecular mechanisms underlying these.
- CO2** Describe the general patterns and sequential developmental stages during embryogenesis; and understand how the developmental processes lead to establishment of body plan of multicellular organisms.
- CO3** Discuss the general mechanisms involved in morphogenesis and to explain how different cells and tissues interact in a coordinated way to form various tissues and organs.
- CO4** Learn the importance of latest techniques like stem cell therapy, in vitro fertilization and amniocentesis etc. to be applied for human welfare.
- CO5** Develop the skill to raise and maintain culture of model system; chick embryo development in the laboratory.

Course Title: Evolutionary BiologyCourse Code: **ZC614T***At the end of this course, the students will be able to:*

- CO1** Gain a thorough understanding of key principles and theories of evolutionary biology, including natural selection, genetic drift, speciation, and phylogenetics.
- CO2** Understand the historical development of evolutionary theory, from early ideas to modern synthesis and beyond.
- CO3** Understand the relevance of evolutionary biology to addressing contemporary challenges, such as climate change, emerging diseases, and conservation strategies.
- CO4** Understand the origins and maintenance of biological diversity, including the roles of adaptation, sexual selection, and co-evolution.
- CO5** Understand the ethical implications of research in evolutionary biology, including issues related to conservation, genetic modification, and biodiversity protection.

Course Title: DSE-7: Fish and FisheriesCourse Code: **ZD607T***At the end of this course, the students will be able to:*

- CO1** Gain an in-depth understanding of fish biology, including anatomy, physiology, genetics, and species diversity.
- CO2** Comprehensive knowledge of freshwater and marine ecosystems, including the physical, chemical, and biological interactions within these environments.
- CO3** Understanding of aquaculture principles and practices, including breeding, nutrition, and disease management.
- CO4** Understanding of fisheries science principles, including fish population dynamics, stock assessment, and fishery management practices.
- CO5** Knowledge of conservation biology, sustainable fishing practices, and the impact of human activities on aquatic environments.

Course Title: DSE-8: ImmunologyCourse Code: **ZD608T***At the end of this course, the students will be able to:*

- CO1** Understand the basic mechanisms, distinctions, and functional interplay of innate and adaptive immunity
- CO2** Understand the cellular and molecular pathways of humoral and cell-mediated adaptive responses including the role of Major Histocompatibility Complex
- CO3** Explain the cellular and molecular aspects of lymphocyte activation, homeostasis, differentiation, and memory
- CO4** Understand the molecular basis of complex, humoral (Cytokines and Complement) and cellular processes involved in inflammation and immunity, in states of health and disease
- CO5** Demonstrate the basic and state-of-the-art experimental methods and technologies and integrate the knowledge of each subsystem to see their contribution to the functioning of higher-level systems in health and disease including the basis of vaccination, autoimmunity, immunodeficiency, hypersensitivity, and tolerance
