DEPARTMENT OF ZOOLOGY

Programme Specific Outcomes (PSOs) – B. Sc Zoology Programme

	Programme specific outcomes
PSO1	Understand the biological diversity and grades of complexity of various animal forms through their systematic classification and process of organic evolution
PSO2	Understand the roles of plants, animals and microbes in the sustainability of the environment and their interaction among themselves and deterioration of the environment due to anthropogenic activities.
PSO3	Understand the concepts and principles of biochemistry, immunology, physiology, ethology, endocrinology, developmental biology, cell biology, genetics, molecular biology and microbiology and develop technical skills in biotechnology, bioinformatics and biostatistics
PSO4	Perform laboratory procedures as per standard protocols in the areas of animal diversity, systematics, cell biology, genetics, biochemistry, molecular biology, microbiology, physiology, immunology, developmental biology, environmental biology, ethology, evolution and science methodology,

Course Outcomes

Semester	Course Code	Course Name	Course outcomes
I	ZOL1B01T	Animal Diversity: Non-Chordata Part- I	• CO1:Describe the principles of classification and nomenclature
			• CO2:Explain the five kingdom classification of living organisms
			• CO3:Understand the concepts of classification of animals
			• CO4:Explain the classification with examples and characteristic features of kingdom Protista and describe the morphology and structural organization of Paramecium
			• CO5:Describe the characteristic features of subkingdom Mesozoa
			• CO6: Explain the classification of phylum Porifera and elucidate the salient features of each class
			• CO7:Describe the characteristic features of phylum Cnidaria and Ctenophora,illustrate the

			classification of phylum Cnidaria down to classes and explain the structural organization of Obelia
			• CO8:Explain the salient features of phylum Platyhelminthes and illustrate its classification down to classes
			• CO9:Explain the characteristic features and classification of super-phylum Aschelminthes and phylum Nematoda
			• CO10:Elucidate the characters of Pseudocoelomate minor phyla Rotifera and Gastrotricha
II	ZOL2B02T	Animal Diversity: Non-Chordata Part – II	• CO1: Explain the classification with examples and characteristic features of phylum Annelida and describe the morphology and structural organization of Neanthes
			• CO2:Describe the distribution, peculiarities and affinities of phylum Onychophora
			• CO3:Explain the classification of phylum Arthropoda;elucidate the salient features of each class and describe the morphology and structural organization of Penaeus
			• CO4:Describe the characteristic features of phylum Mollusca, illustrate its classification down to classes and explain the structural organization of Pilaglobosa
			• CO5:Explain the salient features of phylum Echinodermata and illustrate its classification down to classes
			• CO6:Understand the salient features and affinities of phylum Hemichordata
			• CO7:Elucidate the characters of coelomate minor phyla Phoronida, Ectoprocta and Echiura
III	ZOL3B03T	Animal Diversity: Chordata Part – I	• CO1: Explain the characteristics of chordates and outline classification of the phylum Chordata
			• CO2:Describe the salient features and affinities of subphylum Urochordata and its classification down to classes; elucidate the morphology and structural organization of Ascidia
			• CO3:Explain the salient features and affinities of subphylum Cephalochordata with reference to Branchiostoma

			• CO4:Describe the salient features of subphylum Vertebrata, illustrate its classification down to classes and elucidate the characteristics of division Agnatha
			• CO5:Enumerate the salient features of superclass Pisces and illustrate its classification down to orders and the morphology and structural organization of Mugilcephalus
			• CO6:Describe the salient features and affinities of class Amphibia and its classification up to orders; explain the morphology and organ systems of Hoplobatrachustigerinus
			• CO7:Elucidate the characteristic features of the class Reptilia and its classification down to orders; describe the morphology and organ systems of Calotesversicolor
IV	ZOL4B04T	Animal Diversity: Chordata Part-II	• CO1: Describe the classification of class Aves down to orders, salient features of each order with suitable examples
			• CO2:Describe the external characters and functional systems of Columba livia
			• CO3:Enumerate the salient features and classification of class Mammalia down to orders with suitable examples
			• CO4:Elucidate the external characters and functional systems of Oryctolaguscuniculus
			• CO5:Compare the circulatory, excretory and systems of vertebrates
IV	ZOL4B05P	Zoology [Core Course] Practical – I: Animal Diversity	• CO1: Identify and describe specified protists and acoelomate & pseudocoelomate nonchordates and perform the culture of selected protists; understand the histological features of coelenterate, platyhelminth and nematode
			• CO2:Identify and describe specified coelomate non-chordates and the transverse sections of annelids; Perform mounting of the specified organs of selected nonchordates.
			• CO3Identify and describe specified chordates and specified bones of chordates; Prepare key for identification of venomous snakes; Perform mounting and dissection of specified organ systems of chordates.
			• CO4:Identify and describe selected vertebrates and specified bones of vertebrates.

V	ZOL5B06T	Cell Biology And Genetics	• CO1:Understand the principles and applications of various types of light microscopes, electron, Scanning-tunnelling and Atomic force microscope and illustrate the histological and histochemical processing of tissues
			• CO2:Explain the basic structure of a eukaryotic cell and the structure and functions of plasma membrane, mitochondria, lysosome, cytoskeletal elements and interphase nucleus
			• CO3:Illustrate the nucleosome organization of chromatin and higher order structures; structure of chromosomes and giant chromosomes
			• CO4:Enumerate eukaryotic cell cycle and cell division by amitosis, mitosis and meiosis
			• CO5:Explain the causes of transformation, characteristics of transformed cells and the role of protooncogenes and tumor suppressor genes in malignant transformation; mechanism and significance of apoptosis
			• CO6: Enumerate allelic and non-allelic gene interactions; supplementary, complementary, polymeric, duplicate and modifying genes and polygenic inheritance
			• CO7:Illustrate multiple allelism and solve problems related to blood group inheritance
			• CO8:Explain characteristics of linkage groups and linkage map; crossing over and calculation of recombination frequency; sex-linked, sex-influenced and sex-limited characters; sex differentiation and disorders of sexual development
			• CO9:Describe the mechanisms of sex determination including chromosomal, genic, haploid-diploid mechanisms; the hormonal and environmental influence on sex determination and gynandromorphism
			• CO10:Explain mutagenesis, mutagens and chromosomal and gene mutations
			• CO11:Enumerate the classification and grouping of human chromosomes; numerical and mutational human autosomal and sex chromosomal anomalies; polygenic human traits and genetic counseling

V	ZOL5B07T	Biotechnology, Microbiology And Immunology	• CO1:Illustrate the steps in genetic engineering and animal cell culture
			• CO2:Explain transfection methods, transgenic animals and ethical issues of transgenic animals
			• CO3:Enumerate the applications of biotechnology
			• CO4:Understand the biological diversity of microbial forms and the various techniques for handling microbes in the laboratory
			• CO5:Enumerate the basic structure and life cycle of bacteria and virus
			• CO6: Understand the industrial and medical importance of microorganisms
			• CO7:Describe different types of immunity and the cells and organs of the immune system
			• CO8:Explain antigen, antibody, immunity and major histocompatibility complex
			• CO9:Enumerate autoimmune and immunodeficiency diseases and immunology of tumor and organ transplantation
V	ZOL5B08T	Biochemistry And Molecular Biology	• CO1:Understand the elements of biological importance and the non-covalent interactions that stabilize biomolecules
			• CO2:Describe the classification, types, structure, reactions and biological roles of carbohydrates, and diabetes Type I and II
			• CO3:Enumerate the properties and classification of amino acids and their standard abbreviations; hierarchial levels of protein structure, classification, separation, purification and sequencing of proteins
			• CO4:Explain the classification and functions of lipids and fatty acids; chemistry and structure of nucleic acids and sequencing of DNA
			• CO5:Understand the classification, nomenclature and properties of enzymes; enzyme action, co-enzymes, cofactors, isozymes, ribozymes and allosteric enzymes
			• CO6: Explain glycolysis, Kreb's cycle, glycogenesis, glycogenolysis, gluconeogenesis, HMP pathway; amino acid and fatty acid oxidation and oxidative phosphorylation

			• CO7:Describe the mechanism of DNA duplication and the role of enzymes
			• CO8:Understand the concept of gene and gene expression; genetic code and wobble Hypothesis
			• CO9:Explain the mechanism of transcription and post-transcriptional modification of hnRNA
			• CO10:Enumerate the processes of translation and post-translational modification and targeting of peptides
			• CO11:Describe the regulation of trp operon, C-value, repetitive DNA, satellite DNA, selfish DNA, overlapping genes, pseudogenes, cryptic genes, transposons and retrotransposons
			• CO12:Explain the structure and life cycle of bacteriophages and the gene transfer mechanisms in bacteria
V	ZOL5B09T	Methodology In Science, Biostatistics And Bioinformatics	• CO1:Explain science, its importance, disciplines and the major steps in formulating a hypothesis, various hypothesis models, theory, law and importance of animal models, simulations and virtual testing
			• CO2:Illustrate the principles and procedures in designing experiments and elaborate the requirements for carrying out experiments
			• CO3:Describe the ethical concerns in practicing science
			• CO4:Understand the Scope and role of statistics; methods and procedures of sampling; Construction of tables, charts and graphs
			• CO5:Calculate central tendency and measures of dispersion and application of its knowledge on hypothesis testing as well as in problem solving
			• CO6: Enumerate major biological databases and database search engines
			• CO7:Perform DNA and protein sequence analysis, including sequence alignment and sequence similarity search using BLAST, FASTA, CLUSTAL W and CLUSTAL X
			• CO8:Understand molecular phylogenetics and tools and methods for construction of phylogenetic trees

			• CO9:Explain genome sequencing technologies, functional genomics, proteomic technologies and molecular docking and drug design
V	ZOL6B15P	Zoology [Core Course] Practical – II	• CO1:Perform experiments in cell biology and genetics including demonstration of Barr body in buccal epithelial cells of man, polytene chromosome in the salivary glands of D. Melanogaster larva, mitotic division in onion root tip cells, micrometry of microscopic objects, prepare whole mounts of microscopic objects, and calculatemitotic and metaphase index from slides
			• CO2:Enumerate the inheritance of major human genetic traits, pedigree chart, normal and abnormal human karyotypes, phenotypic differences of male and female drosophila and solve problems on Monohybrid, dihybrid crosses, blood groups and sex-linked inheritance.
			• CO3:Understand electrophoresis, PCR, Northern blotting, Southern blotting and Western blotting, DNA sequencing and fingerprinting and isolation of genomic DNA.
			• CO4:Perform gram staining and preparation of culture media for bacteria and demonstrate bacterial motility by standard laboratory protocols
			• CO5:Understand the detection of human blood groups and organs of immune system
			• CO6: Perform standard biochemical tests for the detection of reducing and nonreducing sugars, polysaccharides, proteins and lipids.
			• CO7:Understand the staining of mitochondria, tissue homogenization and isolation of nuclei, effect of colchicines of cell division, extraction of DNA and polyacrylamide and agarose gel electrophoresis
			• CO8:Solve basic problems in biostatistics and Bioinformatics
V	ZOL5D01T	Zoology Open Course- I (Theory) Reproductive Health And Sex Education	• CO1:Understand the reproductive health, and importance of sex education for teen and youth
			• CO2:Explain the chromosomal mechanism of sex determination and sex chromosomal anomalies

			• CO3:Describe the structural and functional features of human reproductive system, fertilization, implantation, pregnancy, gestation, placenta, parturition and lactation
			• CO4:Explain the scope of reproductive technologies in infertility management and the assisted reproductive techniques
			• CO5:Understand the different methods of prenatal diagnosis and associated ethical issues
			• CO6: Describe the different methods of fertility control.
			• CO7:Understand the symptoms, mode of transmission, diagnosis and treatment ofdifferent sexually transmitted diseases and their socio economic dimensions
			• CO8:Describe sexual orientation, sexual abuse and myths
			• CO9:Understand the ethical aspects of sex
VI	ZOL6B10T	Physiology And Endocrinology	• CO1: Describe the regulation of digestion in man, nutrition in pregnancy and infancy, nutritional disorders, balanced diet, starvation, fasting and obesity.
			• CO2: Understand the mechanism of transport and exchange of respiratory gases and its neurophysiological control and physiological problems in diving mammals, new-born and aged individuals.
			• CO3:Describe functions, composition, coagulation, transfusion, agglutination and clinical analysis of blood, haemoglobinopathies, types of heart and common cardio-vascular problems
			• CO4:Understand the osmoregulatory mechanisms in animals; excretion and its hormonal control and common renal disorders in man.
			• CO5: Explain the ultrastructure of skeletal muscles and biochemical events and energetics of muscle contraction.
			• CO6 :Understand the different types of nerve cells, glial cells and nerve fibres, and the mechanism of nerve impulse transmission
			• CO7: Understand the types, physiology and significance of bioluminescence, and the structure and functions of electric organs.

			• CO8: Describe invertebrate neuro-endocrine organs and hormones, vertebrate endocrine glands, their hormones and functions
			• CO9:Understand the concept of neurosecretion and the mode of action of peptide and steroid hormones.
VI	ZOL6B11T	Reproductive And Developmental Biology	• CO1: Explain the reproductive strategies in invertebrates and vertebrates and structural and functional features of human reproductive system
			• CO2: Describe process of fertilization, pregnancy, gestation, placentation, parturition and lactation in humans.
			• CO3: Explain the scope of reproductive technologies in infertility management; prenatal diagnostic techniques and methods of fertility control
			• CO4:Understand the phases and theories of development, and classification of eggs
			• CO5: Enumerate the types of cleavage, arrangement of blastomeres, germ layers and their derivatives, cell lineage in Planocera and different types of blastula.
			• CO6: Illustrate the early developmental process of egg in Amphioxus,frog, chick and man
			• CO7: Explain the basics of cell differentiation and its genetic control, stem cells and applications of stem cell technology
			• CO8: Describe parthenogenesis, types, and significance
			• CO9:Explain fate map construction, Spemann's constriction experiments on amphibian embryos, organizers in development, embryonic induction, gradient experiments in sea urchin eggs, cloning experiments in sheep and teratogenesis.
VI	ZOL6B12T	Environmental And Conservation Biology	• CO1: Explain the structure of ecosystem and its functioning through energy flow and nutrient cycling.
			• CO2:Enumerate biogeochemical cycles and understand the concept of limiting factors
			• CO3:Describe the ecology of population, community and habitat as a self regulating system
			• CO4:Understand various types of population interactions and appraise the co-evolution

			• CO5:Comprehend the diverse environmental and sustainability challenges ranging from local to global and the establishment of perfect harmony between economic development, social issues and environmental conservation
			• CO6: Enumerate the several tools and techniques employed for studies on populations, communities and ecosystems.
			• CO7:Understand the threats to biodiversity, and strategies adapted for the conservation of diversity of organisms
			• CO8: Describe the various international strategies for conserving biodiversity
			• CO9 :Describe the toxic chemicals, their toxicity levels and the health hazards caused by them
VI	ZOL6B13T	Ethology, Evolution And Zoogeography	• CO1:Describe the patterns and mechanisms of animal behavior
			• CO2: Illustrate biological rhythms and the chemical basis of communication
			• CO3:Identify major evolutionary transitions over time, and explain the tools and evidences that support current hypotheses of the history of life on earth
			• CO4:Describe the evidences for evolution and its required corollaries
			• CO5:Explain the various theories of evolution
			• CO6:Describe the mechanisms by which evolution occurs
			• CO7:Recognize the significance of reproductive isolation in reducing gene flow between populations, biological and morphological species concepts and distinguish between prezygotic and postzygotic barriers to reproduction
			• CO8:Review the events in human evolution
			• CO9:Explain ecological and historical foundations for understanding the distribution and abundance of species, and their changes over time and comprehend the basic principles of biogeography as a discipline
VI	ZOL6B14 (E)02T	Aquaculture, Animal Husbandry And Poultry Science	• CO1:Explain aquaculture and the process of prawn, mussel and pearl culture
			• CO2:Illustrate the methodology of pisciculture and understand common culture fishes and ornamental fishes

			• CO3:Identify major fishing crafts and gear and enumerate fish utilization and Preservation
			• CO4: Enumerate the poultry rearing techniques and understand major breeds of fowl
			• CO5 :Understand the major breeds of cattle, cattle feeds and diseases of cattle
			• CO6:Illustrate the steps in dairy processing and identify the role of dairy development in rural economy
VI	ZOL6B16P	Zoology [Core Course] Practical – III	• CO1:Perform standard laboratory experiments for the estimation of Hb, presence of hCG/abnormal constituents in urine, detection of blood pressure, bleeding and clotting time and identification of formed elements in blood
			• CO2:Identify selected stages in the development of frog and chick and chosen larval forms of invertebrates and vertebrates
			• CO3: Carry out experiments of laboratory standards to estimate water quality parameters including, dissolved Oxygen, Carbon dioxide, hardness and pH; determination of adulteration of selected food items and identify marine planktons and soil organisms
			• CO4:Demonstrate the behavioural response of earthworm/dipteran larva to selected stimuli
			• CO5:Describe homologous , analogous and vestigial organs, connecting links, adaptive radiation and evolution of man
			• CO6:Illustrate zoogeographical realms, Wallace line, Weber line, Wallacea and the distribution of Peripatus, lung fishes, Sphenodon, monotremes and marsupials
			• CO7:Identify the normal and selected abnormal human karyotypes and inheritance of chosen traits from pedigree charts/describe ornamental and other culture fishes/ describe chosen beneficial and harmful insects
COMPLEMENTARY COURSE			
I	ZOL1C01T	Animal Diversity And Wildlife Conservation	• CO1:Describe the general characters of protists and salient features of phylum– Rhizopoda,Ciliophora, Dinoflagellata and Apicomplexa
			• CO2:Enumerate the salient features and examples of Phylum – Porifera, Coelenterata,Platyhelminthes,Aschelminthes,Annelida,Arthropoda, Onychophora, Mollusca and Echinodermata, and the structural

			organization of Peneaus sp.
			• CO3:Describe the characteristic features and classification of phylum Chordata with examples and, structural organization of Oryctolaguscuniculus
			• CO4:Explain levels of biodiversity, threats to biodiversity, biodiversity hotspots, importance and strategies for conservation of wildlife and sustainable development
II	ZOL2C02T	Economic Zoology	• CO1:Explain parasitism and the major protist, cestode, trematode and nematode parasites of man and major insect vectors of human diseases and their control
			• CO2:Understand major beneficial and harmful insects, damages caused to host plants and their control measures
			• CO3:Understand pisciculture, prawn, mussel and pearl culture
III	ZOL3C03T	Physiology And Ethology	• CO1:Describe the structure of plasma membrane and the various trans-membrane transport mechanisms
			• CO2:Enumerate the constituents of normal diet and the mechanism of digestion and absorption of carbohydrates, proteins and lipids and the regulation of gastrointestinal function
			• CO3:Explain the mechanism of transport of respiratory gases, control of respiration, respiratory problems and artificial ventilation
			• CO4:Explain the structure and working of human heart and mechanism of regulation of heart beat; constituents of human blood and blood transfusion and cardiovascular problems
			• CO5:Illustrate the structure of human kidney, the mechanism of urine formation, hormonal control of kidney function and kidney disorders; osmoregulation and urea cycle
			• CO6:Enumerate the structure of myofibrils and myofilaments; muscle contractile and regulatory proteins and mechanism of muscle contraction
			• CO7 Explain different types of nerve cells and glial cells, maintenance of resting membrane potential, generation and propagation of action potential and synaptic transmission
			• CO8:Describe innate behavior, learned behavior, patterns of behavior and factors that affect behavior

			• CO9:Enumerate biological rhythms, communication in animals and social organization in mammals
IV	ZOL4C04T	Genetics And Immunology	• CO1:Describe human karyotype , chromosomal anomalies and polygenic inheritance
			• CO2 Explain the mechanisms of sex determination
			• CO3:Enumerate the concept of genes, gene expression, genetic code, transcription and translation
			• CO4:Illustrate the mechanism of recombinant DNA technology and its practical applications
			• CO5:Explain the types of cancer, causes of transformation and characteristics of transformed cells
			• CO6:Identify the cells and organs of immune system, antigens and antibodies
			• CO7:Enumerate antigen-antibody interaction, generation of B-cell and T-cell response and major immune techniques
			• CO8:Explain primary and secondary immunodeficiency diseases, autoimmune diseases, vaccination and vaccines
IV	ZOL4C05P	Complementary Course Practical	• CO1:Identify the salient features of the phylum; taxonomic position, habit, habitat, adaptations/importance of selected protists, non-chordates and chordates
			• CO2:Describe major human parasites and economically important insects, mollusks and fishes
			• CO3:Perform detection of human blood groups and prepare human blood smear as per laboratory standards; mounting of specialized organs of selected nonchordates and chordates, and demonstrate the presence of biomolecules in samples by standard laboratory protocols
			• CO4:Illustrate the normal and selected abnormal human karyotypes and mode of inheritance of selected human genetic disorders and perform the dissection of earthworm and sardine to demonstrate the alimentary canal and Penaeus to demonstrate the nervous system