

### **M.SC ZOOLOGY PROGRAMME SPECIFIC OUTCOMES (PSO)**

<b>Programme Outcome</b>	<b>Programme Specific Outcomes (PSO)</b>
<b>PSO1</b>	Understand recent developments in the principles and practices of systematics and taxonomy, analyze link between the origin, evolution, phylogeny of invertebrates and vertebrates.
<b>PSO2</b>	Understand and analyze the advanced concepts in cell biology, biochemistry, developmental biology, genetics, evolution, microbiology, immunology, research methodology, statistics and physiology.
<b>PSO3</b>	Understand and apply, advanced tools and techniques related to biological sciences such as biophysics, bioenergetics, Instrumentation, Microbiology, Immunology, Biochemistry, Biotechnology and their potential applications in Animal Biology.
<b>PSO4</b>	Developing deeper understanding of key concepts of biology at biochemical, molecular and cellular level, physiology and reproduction at organismal level, and ecological impact on animal behavior.
<b>PSO5</b>	Understand functional aspects of ecosystem thereby enabling the learner to understand threats to biodiversity and importance of conserving natural resources, ecosystem restoration and equip the students to use various tools and techniques to coordinate and participate in field activities.
<b>PSO6</b>	Generate an awareness about the biology of insects for its diversity, application in agricultural pest management, sericulture, apiculture, lac culture , vermicomposting, fish farming and forensic science thereby impart skill as well a source of self-employment.
<b>PSO7</b>	Elucidation of animal-animal, animal-plant, animal-microbe interactions and their consequences to animals, humans and the environment Develops empathy and love towards the animals and plants.
<b>PSO8</b>	Imbibe and present varied knowledge applications by means of written, verbal, graphical/ virtual communications and interact effectively with people from different backgrounds

### **M.SC ZOOLOGY COURSE OUTCOMES**

<b>SEMESTER</b>	<b>PAPER CODE</b>	<b>TITLE OF PAPER</b>	<b>CO</b>	<b>COURSE OUTCOME</b>
<b>Semester I</b>	ZI010101	Animal Diversity, Phylogenetic Taxonomic approach	CO1	Understand the origin, diversification, modifications and evolutionary relationships among invertebrates and the vertebrates.
			CO2	Evaluate adaptive radiations of different major phyla that helped them to evolve into their present form.

			CO3	Understand the phylogenetic relationship among the different groups of animals.
			CO4	To provide classical, modern methods and molecular techniques employed in systematics and apply these methods for construction of Phylocode, Barcode, and phylogenetic trees.
			CO5	Evaluate the phylogenetic relationship among protostome lineage and Deuterostome lineage.
			CO6	Evaluate taxonomic characters of different kinds and analysis of variation.
			CO7	Apply the various taxonomic procedure for collection, preservation and curation of living things.
			CO8	Construct taxonomical keys for identification of taxa and understand taxonomic publications.
			CO9	Apply the rules and ethics of ICZN for the scientific naming and designation of types.
			CO10	To understand importance of molecular phylogeny and nucleic acid phylogeny.
<b>Semester I</b>	ZI010102	Evolutionary Biology And Ethology	CO1	To analyze concept of relatedness and its connection to biological evolution
			CO2	To apply knowledge to new information and data, as well as the capacity to effectively communicate the principles of evolution and its application to human biology
			CO3	To expose students to the basics and advances in ethology, and generate an interest in the subject in order to understand the complexities of studying animal behavior on every level of the biological hierarchy
			CO4	Understand the basics of prehistoric time periods and events, fossils and extinction
			CO5	Create curiosity for learning the scientific way of the origin of life, first cell and eukaryotic- prokaryotic origin
			CO6	Create scientific attitudes and rational thoughts by observing the evidences for evolution
			CO7	Understand molecular evolution and nucleotide ,protein analysis
<b>Semester I</b>	ZI010103	Biochemistry	CO1	To understand the chemical nature of life and life process
			CO2	Understand the basic chemistry and biophysical chemistry of molecules, interactions and body fluids

			CO3	To provide an idea on structure and functioning of biologically important molecules
			CO4	Develop awareness on the importance of vitamins, minerals free radicals and antioxidants
			CO5	To generate an interest in the subject and help students explore the new developments in Biochemistry
			CO6	Explain classification, the specificity of enzymes, and the chemistry involved in enzyme action
			CO7	To understand the importance of metabolism of bio macromolecules in normal physiology of a man
			CO8	To understand the abnormal metabolism of biomolecules and the resultant diseases
<b>Semester I</b>	ZI010104	Biostatistics, Computer Application And Research Methodology	CO1	To enable learners to effectively apply suitable statistical tests in research
			CO2	To impart concepts of statistics and research methodology, and create awareness about the gadgets, tools and accessories of biological research.
			CO3	To sensitize students about the ethics involved in research and enable them to come up with innovative research design
			CO4	To equip learners to prepare research papers and project proposals
			CO5	Identify the fundamental idea and ethical approach to carry out original research in biology
			CO6	To help students improve analytical and critical thinking skills through problem solving
<b>Semester I</b>	ZI010105	Practical I: Animal Diversity, Evolutionary Ethological And Biochemical Methods And Approaches.	CO1	Identify invertebrates and vertebrates in relation to their systematic position and unique features
			CO2	Identify larval forms based on morphological features
			CO3	Analyze the systematic position and evolutionary relationships of different taxa through the construction of cladogram and taxonomic key
			CO4	Analyze hardy Weinberg law for calculation of gene frequency
			CO5	Identify the behavioural patterns of organisms

			CO6	Understand structure of biomolecules (carbohydrate , aminoacids , cholesterol ), using ball and stick models and Protein and Nucleic acid using software tools
			CO7	Analyze preparation of standard curve for protein glucose, cholesterol and/or creatinine and estimation of unknown concentration
			CO8	Apply statistical measures both manual and computeraided for execution of biological research
<b>Semester II</b>	ZI010201	Ecology- Principles And Practices	CO1	Understand structure and function of ecosystem and various methods for its monitoring
			CO2	To provide the knowledge of animal adaptations to a variety of environment
			CO3	To learn the different aspects of population and its interactions
			CO4	Understand the natural resources and manmade issues on environment and its management
			CO5	Understand basic theories and principles of ecology
			CO6	Apply the basics of diversity indices in taxonomical research areas.
			CO7	Acquire critical understanding on anthropogenic activities on environment and knowledge of ecology is vital in taking conservation measures
			CO8	Apply the knowledge of environmental biotechnology for mitigating emerging environmental issues
<b>Semester II</b>	ZI010202	Developmental Biology	CO1	To introduce the concepts and process in developmental biology
			CO2	To help students understand and appreciate the genetic mechanisms and the unfolding of the same during development
			CO3	To expose the learner to the new developments in embryology and its relevance to Man
			CO4	Develop detailed understanding of the events that lead up to and comprise the process of fertilization and the events after fertilization
			CO5	Be familiar with Early Development of Model organisms like <i>Caenorhabditis elegans</i> , <i>Drosophila</i> and frog
			CO6	Analyse the molecular basis of development

			CO7	Provide adequate information regarding the genetic pathway and cellular interactions involved in development
			CO8	Students get adequate information regarding metamorphosis and regeneration.
<b>Semester II</b>	ZI010203	Genetics and Bioinformatics	CO1	Understand the principles and mechanism of inheritance
			CO2	Analyze the fine structure of genetic material and molecular basis of hereditary transmission
			CO3	understand the significance of Genetics in Principle in inheritance of traits in Man
			CO4	understand the role of genetics in evolution
			CO5	Effectively use the existing software and extract information from large databases so as to use this information in computer modeling
			CO6	Explore the applications of the emerging field of bioinformatics
			CO7	Understand the concepts of epigenetics, quantitative and population genetics, Advanced Human Genetics
<b>Semester II</b>	ZL010204	Micro Biology and Bio-Technology	CO1	Understand the mechanism of microbial metabolism, interaction and ecology
			CO2	To provide an over view of the microbial world, its structure and function
			CO3	To understand the fundamental aspects of the basic biology of bacteria and viruses.
			CO4	To give students an intensive and in-depth learning in the field of biotechnology
			CO5	To familiarize the student with emerging field of biotechnology
			CO6	Understand the modern biotechnology practices and approaches with an emphasis in technology application, medical, industrial, environmental and agricultural areas and nanomedicine
			C08	Familiarize the students with public policy, biosafety, and intellectual property rights issues related to biotechnology
			C09	Analyze the strategies involved in recombinant DNA technology and environmental biotechnology
<b>Semester II</b>	ZL0101205	Diversity of Life:Ecological	CO1	Understand and identify adaptations, feeding habit of interactions, diversity etc

		,Embryological, Hereditary and Microbial Methods and Approaches	CO2	Analyze and determine the amount water and soil parameters
			CO3	Understand technological and modern advancements in ecological monitoring , imaging etc
			CO4	Observe and understand sexual dimorphism , Mutation and development in Drosophila
			CO5	Apply Mendelian principles of genetics to solve problems in genetics
			CO6	Understand and apply the tools in Bioinformatics
			CO7	Understand and apply the knowledge involved in sterilization techniques and culture techniques, media preparation
			CO8	Understand the methods to identify and enumerate Microorganisms
<b>Semester III</b>	ZL010301	Animal Physiology	CO1	To develop detailed understanding of the organization of the human body and the major functional systems
			CO2	Understand homeostatic mechanism of the major functional systems in invertebrates and vertebrates
			CO3	Provide adequate knowledge about osmo-regulation in animals living in different habitats
			CO4	Analyse the coordination of body functions by chemical messengers and disorders of hormonal imbalance in man
			CO5	Students get adequate information regarding sensory system and physiology of different senses
			CO6	Take students to higher levels of learning about the human reproductive cycles, different aspects related to child birth and reproduction
			CO7	Take students to higher levels of learning about the human reproductive cycles, different aspects related to child birth and reproduction
<b>Semester III</b>	ZL010302	Cell And Molecular Biology	CO1	Analyze the structural and functional aspects of the basic unit of life at the molecular level
			CO2	Evaluate how the cell to cell communications are established and the impacts of signaling in biological systems at molecular level
			CO3	Analyze the regulated sequence of events involved in cell cycle at the molecular level

			CO4	Analyze the mechanisms of gene expression and various regulatory pathways involved- in both prokaryotes and eukaryotes at the molecular level
			CO5	Understand the properties and genetic basis of cancer at the molecular level
			CO6	Identify the new developments in molecular biology and its implications in human welfare
<b>Semester III</b>	ZI010303	Biophysics, Instrumentation And Biological Techniques	CO1	Understand the basic biophysical principles
			CO2	Analyze biophysical properties and functioning of living system
			CO3	Understand the doctrines of thermodynamics and bioenergetics to assess the flow of energy in the living system.
			CO4	Understand the principle, functioning and applications of the tools and techniques available for studying biochemical and biophysical nature of life
			CO5	Accustom the learner to use tools and techniques for research in biology
<b>Semester III</b>	ZL010304	Immunology	CO1	To provide an intensive and in-depth knowledge to the students in immunology
			CO2	Examine the advanced molecular-theoretical approach in Antigen and antibodies and the interactions between them.
			CO3	Understand the organisation, expression and regulation of Major Histocompatibility Complex
			CO4	Create intensive and in-depth knowledge in immunological pathways like, complement system, inflammations, hypersensitivity etc.
			CO5	To help the learner to understand the role of immunology in human health and well-being
<b>Semester III</b>	ZY3CP03	Molecular, Physiological And Immunological Methods & Approaches In Biosciences	CO1	Understand the advanced techniques in immunological diagnosis and other immunological techniques
			CO2	Analyse and identify the various meiotic and mitotic stages
			CO3	Calculate mitotic index in normal cell and observe the effect of drugs on cell division
			CO4	Identify the salivary gland chromosomes

			CO5	Understand and apply the various histochemical staining techniques for the identification of biomolecules
			CO6	Isolate genomic DNA and plasmid DNA
			CO7	To understand the basics of Instrumentation
			CO8	Analyze effect of different pH and temperature on salivary amylase activity & Calculation of Q10
			CO9	To understand Virtual Practicals in Physiology
			CO10	To demonstrate WIDAL Test and Western Blotting –ELISA , Rocket Immune electrophoresis
			CO11	Identification of absorption maxima of the given sample by colorimetry
<b>Semester IV</b>	ZL820401	Entomology: Morphology And Taxonomy	CO1	To introduce the insect diversity and its significance
			CO2	Understand the morphology of the insects, and taxonomic characters of important insects
			CO3	To study the economical and medical importance of insects
			CO4	To learn about the insect pest , vectors and their control measures
			CO5	To provide skills for scientific study of insects
			CO6	Encourage research aptitude among students by familiarizing frontier areas of entomology
<b>Semester IV</b>	ZL820402	Entomology: Anatomy And Physiology	CO1	Understand anatomy and histology, Physical and chemical properties of insects.
			CO2	Evaluate the role of hormones and pheromones in the anatomy and physiology of insects.
			CO3	Analyze and integrate the physiology of nervous coordination, digestion, circulation, respiration, excretion and reproduction in insects.
			CO4	Analyze the unique metabolic pathways through which insects maintain structural and functional integrity.
			CO5	Understand Chemistry of the Cuticle.
<b>Semester IV</b>	ZL820403	Applied Entomology	CO1	Envisages an insight on economically important pests of various foods, fiber and household
			CO2	Understand insects encountered in agricultural fields



			CO3	Manage and Practice Apiculture, Sericulture and lac culture units and understand the economically important insects
			CO4	Discuss the evolutionary significance of insect plant interaction and insect animal interaction
			CO5	Learn to apply various agricultural equipment and understand the effect of chemicals and its dosages in agricultural pest management
			CO6	Insecticide Application Technology
			CO7	Introduction to Forensic entomology Insects used in forensic entomology
Semester IV	ZL820404	Entomology: Morphology, Anatomy And Taxonomy, Insect Physiology, Applied Entomology	CO1	Understand in details about the various morphological parts of insects
			CO2	Analyse the anatomy of different orders of insect
			CO3	Familiarize the use and preparation of taxonomic keys for the identification insects
			CO4	Understand of sexual dimorphism in insects
			CO5	Understand collection, preservation and identification of insects
			CO6	Analyze morphological studies of different castes of social insects
			CO7	Evaluate and compare the physiology of digestion in herbivorous, carnivorous and omnivorous insect Groups. Learns to link the digestive enzymes of insects with the feeding habits
			CO8	Analyze the haemolymph for cytologic study and for free amino acid
			CO9	Create an insect collection box with economically important pests of various foods, fibre and household
			CO10	Identify the pests of crops, and vegetables and also. identify vectors, life cycle and disease caused by them