Zoology Program Outcomes, Program Specific Outcomes and Course Outcomes

Zoology Program Outcomes:

1. PO1 - Students gain knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms
2. PO2 – Analyse complex interactions among the various animals of different phyla, their distribution and their relationship with the environment
3. PO3 – Apply the knowledge of internal structure of cell, its functions in control of various metabolic functions of organisms.
4. PO4 – Understands the complex evolutionary processes and behaviour of animals
5. PO5 – Correlates the physiological processes of animals and relationship of organ systems
6. PO6 – Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species
7. PO7 – Gain knowledge of Agro based Small Scale industries like sericulture, fish farming, butterfly farming and vermicompost preparation.
8. PO8 – Understands about various concepts of genetics and its importance in human health
9. PO9 - Apply ethical principles and commit to professional ethics and responsibilities in delivering his duties
10. PO10 – Apply the knowledge and understanding of Zoology to one’s own life and work
11. PO11 – Develops empathy and love towards the animals

Program Specific Outcomes:

1. PSO1. Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology
2. PSO2. Analyse the relationships among animals, plants and microbes
3. PSO3. Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Clinical science, tools and techniques of Zoology, Toxicology, Entomology, Nematology Sericulture, Biochemistry, Fish biology, Animal biotechnology, Immunology and research methodology
4. PSO4. Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine
5. PSO5. Gains knowledge about research methodologies, effective communication and skills of problem solving methods
**Course Outcomes:**

**Animal Diversity – Invertebrates**

CO1 Describe general taxonomic rules on animal classification  
CO2 Classify Protista up to phylum using examples from parasitic adaptation  
CO3 Classify Phylum Porifera to Echinodermata with taxonomic keys  
CO4 Describe Phylum Nematoda and give examples of pathogenic Nematodes

**Ecology, Zoogeography and Animal Behaviour:**

CO1 Distribution of fauna in different realms interaction  
CO2 Understand Animal behaviour and response of animals to different instincts  
CO3 Interaction of biota abiotia  
CO4 Various kinds of Animal adaptations

**Animal Diversity – Vertebrates & Developmental Biology:**

CO1 Imparts conceptual knowledge of vertebrates, their adaptations and associations in relation to their environment  
CO2 Classify phylum Protochordates to Mammalia  
CO3 Complex Vertebrate interactions  
CO4 Basic concepts of developmental biology

**Cell Biology, Genetics and Evolution:**

CO1 Structural and functional aspects of basic unit of life i.e. cell concepts  
CO2 Mendelian and non mendelian inheritance  
CO3 Concept behind genetic disorder, gene mutations- various causes associated with inborn errors of metabolism  
CO4 Theories of Evolution  
CO5 Knowledge of eras and evolution of species

**Physiology and Biochemistry:**

CO1 Seeks to understand the mechanisms that work to keep the human body alive and functioning  
CO2 Physiological and biochemical understanding through scientific enquiry into the nature of mechanical, physical, and biochemical functions of humans, their organs, and the cells of which they are composed  
CO3 Interactions and interdependence of physiological and biochemical processes
ANIMAL PHYSIOLOGY
CO1 Students are taught the detailed concepts of digestion respiration excretion the functioning of nerves and muscles
CO2 Students gain fundamental knowledge of animal physiology
CO3 Students will gain skill to execute the roles of a biology teacher or medical lab technicians with training as they have basic fundamentals

Animal physiology genetics and evolution
CO1 Students learn the concepts of endocrine systems and homeostasis a brief account of genetics and organic evolution.
CO2 This course helps students to gain fundamental knowledge in these topics
CO3 Students gain fundamental knowledge of physiology and endocrine systems
CO4 Students gain fundamental knowledge of physiology of homeostasis
CO5 Understanding of basic concepts of genetics, laws of inheritance and central dogma of biology
CO6 Understanding of genetic basis of evolution, human karyotyping and speciation

Applied Zoology
CO1 Understands concepts of fisheries, fishing tools and site selection
CO2 Aqua culture systems, induced breeding techniques, post harvesting tecniques
CO3 Understands about composition of blood, blood born diseases, autopsy and biopsy
CO4 Types of immunity, antigens-antibodies and their properties

Entomology:
CO1 Imparts knowledge of beneficial and non-beneficial insects
CO2 Knowledge of how they interact with their environment, other species and humans
CO3 Classification of Insects
CO4 Role of insects in spread of diseases

Sericulture:
CO1 Gives knowledge of silk worm rearing
CO2 Mulberry cultivation
CO3 Pests and diseases associated with silk worm and mulberry
CO4 Various process involved in silk production
Research Methodology:

CO1 Understanding of scientific method, concepts and steps in research

CO2: Differentiate between the Quantitative and Qualitative Research and understand different types of Research Design

CO3: Understand the various techniques of Data Collection- Observation, Questionnaire, Interview Schedule; Case Study, Social Survey, Content Analysis

CO4: Describing various types of Sampling

CO5: Elaborate on Data Processing and Data Analysis

Immunology:

CO1Imparts in depth knowledge of tissues, cells and molecules involved in host defense mechanisms

CO2 Understanding of types of immunity

CO3 Interactions of antigens, antibodies, complements and other immune components

CO4 Understanding of immune mechanisms in disease control, vaccination, process of immune interactions

Clinical science:

CO1 Gives knowledge related to the techniques involved in detection of various diseases

CO2 Pathology associated with various diseases

CO3 Practical skills of conducting basic clinical lab experiments

CO4 Application of knowledge of clinical science and pathology to one’s own life

Animal biotechnology:

CO1 Imparts the Knowledge to culture animal cells in artificial media.

CO2 Knowledge of animal cells in culture, growth of cell lines

CO3 Use in recombinant DNA technology, genetic manipulations and in a variety of industrial processes.
**Aquarium fish management**

CO1 Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth

**Clinical Science and pathology:**

CO1 Understands about composition of blood, blood born diseases, autopsy and biopsy

CO2 Techniques of microscopy, microtomy, biopsy, autopsy and immunological techniques

CO3 Types of immunity, antigens-antibodies and their properties

CO4 Understanding of pathology of diseases caused by various microorganisms such as bacteria, virus, parasites and fungus

**Structural Biology [SB]**

CO1 Allows the students to gain basic knowledge about various bio molecules and their role in metabolism

CO2 Classification of enzymes, enzyme kinetics

CO3 Metabolism of carbohydrates, nucleic acids and metabolic disorders

CO4 Gains understanding of cellular organization and functional biology nucleic acids

**Environmental and Conservation Biology [ECB]**

CO1 Imparts knowledge to the student regarding environment and conservation biology.

CO2 Gains knowledge in the areas of responses to Laws of limiting factor, Laws of minimum, Laws of Tolerance and Tragedy of commons

CO3 Types of ecosystem – freshwater, marine and terrestrial,

CO4 Population characteristics and dynamics – conceptual approach
CO5 Growth curves and pyramids; sigmoid curve, J curve and hyperbola; logistic equation and concepts relating to growth

CO6 The students will be well equipped to become very competent in research or teaching fields after completion of this course

**Immunology [IMM]**

CO1 Provides basics knowledge about immune system and allows the student to create insight as how to improve their immune system and good health.

CO2 Types of immunity, antigens-antibodies and their properties

CO3 Complement system, MHC’s and immune responses

CO4 Understanding of types of hypersensitivity reactions and auto immune diseases

CO5 Ability to understand concepts of tumor immunology and transplantation immunology

**Taxonomy, Systematics and Functional Anatomy of Invertebrates [TSFAI]**

CO1 Imparts knowledge regarding the various Invertebrates species and the regulatory processes to safeguard them

CO2 With the study of this paper students gain knowledge in the areas of responses to Systematic position, general organization and affinities of Ctenophora and Nemertea

CO3 Rhynchoceola; Systematic position, general organization and affinities of Rotifera;

CO4 Systematic position, general organization and affinities of Hemichordata

CO5 The students will be well equipped to become very competent in research or teaching fields after completion of this course

**Tools, Techniques and Biostatistics [TTB]**

CO1 Students gain knowledge about various tools & techniques used in biological systems and gives them insight about their use in research.

CO2 Biostatistics teaches them to use the best data analysis methods in their research projects
CO3 Students gains knowledge about statistical methods like measures of central tendencies, Probability
CO4 Learns about hypothesis testing and inferential statistics
CO5 Learns the problem-solving methods

**Animal Physiology [AP]**
CO1 Imparts knowledge about various metabolic and physiological mechanisms of the human body.
CO2 Understands about neurophysiology and receptors
CO3 Gain knowledge about hormones and bioluminescence
CO2 Understanding of stress physiology and endocrine mechanisms will allow them to control their stress and emotions there by diverting their energy towards the positive nation building activities

**Molecular Genetics and Developmental Biology [MGDB]**
CO1 Knowledge about genetics, developmental biology and organogenesis
CO2 Application of DNA technology and molecular biology for research
CO3 Gains knowledge about gametogenesis, cleavage mechanisms, gastrulation and role of hormones in metamorphosis and regeneration
CO4 Provides students insight into maintaining healthy relationships with their opposite gender and allows them to make right choice about their life partner thus preventing congenital/consanguial diseases.

**Evolution and Functional Anatomy of Vertebrates [EFAV]**
CO1 Imparts knowledge regarding the various theories of evolution, evolutionary process such as variation, speciation, natural selection, origin of primates and man
CO2 Understanding of origin and salient features of Ostracoderms to Actinopterygii, adaptive radiation of Amphibians, Reptiles, birds and Mammals
CO3 Gains knowledge of functional anatomy of vertebrates from fishes to mammals
CO4 Understanding of evolutionary significance of internal fertilization, neoteny and paedogenesis
CO5 Identifies the significance of amniotic egg its structure and evolutionary significance of skeletal system

**Systems Biology [SB]**

CO1 Imparts knowledge regarding the various concepts of systems biology, systems approach and its application in biological systems.

CO2 The structural biology paper is physiological chemistry of all the bio molecules.

CO3 The paper imparts through knowledge in the fundamentals of biochemistry of all the biomolecules like the carbohydrates, proteins, lipids, nucleic acids, their classification, structure and metabolism.

CO4 Understanding of Mammalian biological clocks, Sustainable pest and disease management and bioremediation.

CO5 Develops skills of Insect outbreak models Data formats, simulation techniques, modeling tools.

CO6 Application, characterization and interactions of nanoparticles in biological systems.

**Research Methodology [RM]**

CO1 The course provides wide knowledge about research, experimental & sampling design.

CO2 Data collection, analysis & interpretation of data and allows student to present the research data in scientific method.

CO3 Gains skill to solve problems using inferential statistical tools.

CO4 Learns to collect literature collection, literature citation, and components of research report – Text, tables, figures, bibliography.

CO5 Writing of dissertations, project proposals, project reports, research papers.

CO6 Intellectual Property Rights – Biopiracy, copyrights, patent and traditional knowledge and plagiarism.

CO7 Understanding of Laboratory safety measures, laboratory good practices, animal model systems, animal ethics- animal welfare guidelines for care and use of animals.
Comparative Animal Physiology I

CO1 Comparative animal physiology is a comprehensive subject that gives in depth knowledge of various physiological processes in the animal kingdom.

CO2 Students gain knowledge about the comparative physiological concepts of nutrition digestion respiration excretion metabolism and osmoregulation.

CO3 Course provides students comprehensive understanding about neurobiology, neurophysiology, molecular neurobiology.

CO4 Understanding of cognitive/behavior neurobiology, thus allowing them to correlate the human behavior under given situation.

CO5 It gives comprehensive understanding regarding inborn disorders and deranged metabolisms.

CO6 Students feel confident in teaching physiology as well as executing research projects.

Comparative animal physiology- II

CO1 With the study of this paper students gain knowledge in the areas of responses to environment with study of receptors CNS integration of behavior.

CO2 Understanding of the functions of effectors in all aspects as well as the circulatory physiology and reproduction and adaptations by animals to environment.

CO3 The students will be well equipped to become very competent in research.

CO4 The course provides employability in teaching fields.

Applied Toxicology

CO1 It is a discipline overlapping with biology, chemistry, medicine that involves the study of toxicants, their mechanism of action.

CO2 It involves the study of the adverse effects of chemical substances on living organisms.

CO3 Skill development in environmental and occupational Toxicology.

CO4 It provides opportunities for students research projects, internships in assessing the effects of toxic pollutants on the environment and in the food chain.
**Medical Entomology I & II**

CO1 Medical Entomology is an integral part of applied ecology involving the study of diverse ecto and endoparasites.

CO2 Understanding of fundamental complement of numerous diseases which have significant impact on human health.

CO3 Understanding of Insect vector host interactions of many important diseases like Malaria, Filaria, Dengue etc.

CO4 Understanding of denudation of forests its results in increased human vector contact which have become almost irreversible.

CO5 Course gives insight into physiology, biochemistry and reproduction of insect vectors and their control measures.

CO6 Students gain knowledge about the concepts of overview of Entomology.

CO7 Source reduction and environmental methods for vector control, biological control and other Insect bites.

CO8 Knowledge of hormones and Insects.

CO9 Students get good insight into how Medical Entomology is acting as a promising factor for entomologist vacancies in both public and private sectors.

CO10 Student gains knowledge regarding vector born diseases their pathology, control measures, thus aiming at 'Swach and Swasth Bharat'.

CO11 Students feel confident in teaching Medical Entomology as well as executing research projects.

**Sericulture**

CO1 Gives knowledge of silk worm rearing, mulberry cultivation, pests and diseases associated with silk worm, mulberry and various process involved in silk production. CO2 It is an agro based cottage industry in India that enables them to get self-employment.

CO3 Sericulture is a comprehensive subject that gives in depth knowledge of the study of silkworms both physiological as well as commercial purposes including the various processes involved in the formation of silk.

CO4 Students gain knowledge about various systems study of silkworms and cocoons, other defective cocoons.
CO5 Reeling and significant diseases seen in the silkworms

CO6 Students feel confident in teaching Sericulture as well as executing research projects

Animal Biotechnology [AB]

CO1 It gives insight into various cell/tissues culture techniques

CO2 Understanding of in vitro culturing of organisms and production of transgenic animals.

CO3 Understanding of cloning of mammals, large scale culture and production from recombinant microorganisms

CO4 Gains skills in medical, environmental biotechnology, biopesticides, Biotechnology of aquaculture and use of animals as bioreactors

CO5 This insight allows students to take into consideration about ethical issues involved in production transgenic animals and BT products.

Fish Biology [FB]

CO1 Course provides them comprehensive understanding about aquatic ecosystem and various economical important fishes.

CO2 Students gain knowledge in the areas of responses characterization and classification of Ostracoderms, placoderms, acanthodians, holocephali, elasmobranchs.

CO3 Students gain knowledge of integumentary system - basic structure of skin, dermal and epidermal pigments, fins, and scales.

CO4 Understanding of embryogenesis - Early development and post embryonic development

CO5 Understanding of fishes habits and habitats and their functional anatomy

CO6 The students will be well equipped to become very competent in research or teaching fields

CO7 It is one of the small scale industry which can provide the student employment opportunity.

Instrumentation and computer applications in biology

CO1 Understanding of basic concepts of instrumentation such as cell fractactionation, homogenation and centrifugation
CO2 Students gain skills in techniques of chromatography, electrophoresis, spectroscopy and radioisotopes

CO3 Students gain skills in histological, immunological and electrophysiological techniques

CO4 Students gain skills in basics of computers, operating systems, overview of programming languages

CO5 Application of internet and statistical bioinformatics in research

**Agricultural Nematology**

CO1 Students gain knowledge of nematodes, their taxonomic importance, collection and fixation

CO2 Understanding of morphology of nematodes, life cycles, pathogenic and predatory nematodes

CO3 Understanding of feeding mechanisms of nematodes and nematode associations

CO4 Students gain skills of various kinds of nematode control measures

**Biodiversity and Conservation**

CO1 Biodiversity and conservation explore natural landscapes, species and ecosystems and acquires theories and practical methods in preserving environments and organisms.

CO2 Biodiversity refers not only to endangered species but also to every organism, including microbes and fungi.

CO3 Biodiversity and Conservation increase awareness and understanding of how human life depends on preserving animal species and natural ecosystems.

CO4 Biodiversity and conservation is connected to similar disciplines like environmental science, natural resources management and animal sciences.

CO5 Conserving biodiversity in the face of pressures such as land clearing, pest plants and animals and climate change is a challenge facing land managers and policy-makers globally.

CO6 Key threats to biodiversity, including habitat modification and loss, unsustainable resource use, introduced species and climate change.

CO7 Management actions that are used to mitigate threats to biodiversity, including selecting nature reserves, connectivity and wildlife corridors, ecosystem restoration and control of pest plants and animals.
CO8 Policies to conserve biodiversity including financial incentives, market-based instruments (e.g. biodiversity offsetting), ecological triage and adaptive management.

**Project**

CO1: Make research proposal CO2: Construct tool of data collection CO3: Learn fieldwork modalities CO4: Understand the process of data analysis CO5: Writing research report