

Program and Course Outcomes of M. Sc. Zoology

Program Specific Outcomes:

After successful completion of the program, students will be able to;

- gain deeper understanding of key concepts of Zoology at biochemical, cellular and molecular level.
- elucidate knowledge and understand the complex interactions among various living organisms
- understand the physiology and endocrinology, reproduction and various processes at organisimal level.
- Strengthen the knowledge of fundamental and advanced genetics principles in light of advancements in understanding human genome and genomes of other model organisms.
- Understand the genetics of cancer, neurological disorders, and their impact
- describe the expression of genome revealing multiple levels of regulation and strategies to manipulate the same in the benefit of the mankind.
- get an insight into the advancement in computerized biology information, introduction to genomics and proteomics databases
- gain expertise in handling DNA sequence data and its analysis and get employed in R&D in the industry involved in DNA sequencing services, diagnostics.
- describe the theoretical and technical expertise in microarray technology and gene silencing
- understand the zoological science for its application in medical entomology, apiculture, aquaculture, agriculture and modern medicine.
- develop theoretical and practical knowledge in handling the animals and using them as model organisms
- understands the complex evolutionary processes and behaviour of animals
- understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species
- The students will be well equipped to become very competent in research or teaching fields after completion of this program.

I Semester

Course HC.1.1 : Biosystematics, Non-chordata and Chordata

Student Learning Course Outcomes:

After successful completion of the course student will be able to;

- describe levels, importance, applications and goals of taxonomy.
- learn about the theories and types of biological classification
- acquire the knowledge of taxonomic procedures, and importance of Zoological nomenclature.
- expose to new trends in Systematics such as Cytotaxonomy, Numerical taxonomy, Cladistics, Molecular systematics.
- Learn and understand the phylogenetic tools and construction of phylogenetic trees.
- describe distinguishing characters of Non-chordates and chordates
- recognize life functions of lower and higher organisms.
- to understand the external as well as internal characters, comparative anatomy and physiology of different groups of Non-chordates and chordates.

Course HC-1.2: Animal Physiology and Endocrinology

Student Learning Course Outcomes:

After successful completion of the course student will be able to;

- understand the fundamental concepts of physiology
- understand mechanisms of various physiological processes such as digestion, respiration, circulation.
- Illustrate the physiology of the nervous and muscle contraction.
- learn the effect of environment on physiology of stress.
- know the structural organization of the endocrine system and how hormones regulate the cellular processes.
- be familiar with chemical messengers' role in communication endocrine system
- study the relation between hormones and reproduction in animals.
- illustrate how the homeostasis is related to endocrine system in normal physiology and disease

Course HC-1.3: Fundamental Genetics

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- explain principles and deviations to Mendelian principles

- learn mapping of genes and their linkage
- explain sex determining systems and dosage compensation
- elucidate the fine structure of the gene
- describe types, causes, implications of mutations
- understand the methods of gene transfer in prokaryotes using *E.coli*

Course SC 1.4a: Ecology and Evolution

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn basic concepts of ecology and evolution
- develop the knowledge of community and population ecology
- understand the species interactions among living organisms.
- explain the biogeography
- describe the evolutionary thoughts
- understand the origin of cells and unicellular evolution
- describe the paleontology and evolutionary history
- explain molecular evolution
- describe the mechanisms of speciation

Course SC-1.4b: Biological chemistry and Biostatistics

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn basic chemical interactions and principles
- understand the chemical composition, structure, functions and metabolism of nucleic acids, carbohydrates, proteins, lipids, vitamins and enzymes
- describe the structure and function of enzymes
- explain the disorders associated with the carbohydrates and lipids.
- familiar with the clinical applications of enzymes
- describe the sampling methods, collection and classification, analysis and interpretation of data
- learn basic statistical methods applied in biology

II Semester

Course HC-2.1: Cell Biology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- give the overview of the prokaryotic and eukaryotic cell
- describe the structure and function of plasma membrane and intracellular organelles
- describe molecular organization of the eukaryotic chromosome
- give detailed structural organization of the cytoskeleton
- describe the mechanism of cell division and cell cycle
- understand the mechanism of cell communication
- illustrate the programmed cell death and aging.
- Explain the methods/techniques used in cell biology.

Course HC 2.2: Animal behaviour and Wildlife studies

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- understand different behavioural patterns in animals
- describe various behavioural patterns in different animals.
- understand innate and acquired behaviours as well as functional aspects of learning and imprinting in animals including human.
- describe the social organization in animals and biological rhythms
- understand the importance and values of wildlife
- to be familiar with the conservation of diversity.
- familiar with the wildlife Legislation - its amendments and implementation.
- to implement management planning of wildlife in protected areas.
- learn the bird migration and environmental factors affecting bird migration

Course SC 2.3a: Developmental Biology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn the basic concepts of development
- explain the fundamental concepts of early embryonic development
- learn the fundamental concept of Organogenesis
- describe the model systems of development
- learn post-embryonic development
- understand the concept, types, ethical issues concerned with stem cells
- describe the medical implications of developmental biology

Course SC-2.3b: Economic Zoology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn the culture of fishes, honeybees, and silkworm
- understand the economic importance of aquaculture, apiculture and sericulture
- familiar with the methods/techniques involved in aquaculture, apiculture and sericulture
- describe the application of genetic engineering related to aquaculture, apiculture and sericulture
- explain the pathological aspects and pests related to aquaculture, apiculture and sericulture

III Semester

Course HC 3.1: Molecular Biology and Biotechnology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- understand the fundamental concept of DNA Replication, transcription and translation
- describe the regulation of gene expression
- explain the mechanisms of DNA repair
- describe the mechanism and applications of gene silencing
- describe the steps, tools and applications of the genetic engineering
- explain the hybridoma technology
- familiar with transgenic technology and its applications
- learn the cell culture, and application of biotechnology

Course HC 3.2: Entomology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn taxonomy of insects
- describe the general insect morphology
- describe the insect physiology
- explain agriculturally, forensically and veterinary important pests and crops
- learn about integrated pest management and as well as different methods pest control
- describe the pheromones in insects and their use in pest surveillance and management
- explain the bioluminescence in insects

Course SC.3.1a: Microbiology and Immunology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- gain knowledge of different types of microorganisms and their significance
- describe the isolation and culture of microorganisms, and sterilization techniques
- explain the structure and classification of viruses, mycoplasma and yeast
- familiar with industrial microbiology
- explain fundamental concepts of immunity, immune cells, antigens and immunoglobulins
- describe the antigen-antibody reactions and Immunotechniques
- understand the mechanism of immune response, and immune autoimmune disorders
- describe the Major histocompatibility complex and Hypersensitivity, and vaccines

Paper 3.3b: Parasitology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn the various types of parasites and hosts.
- understand the relationship between a parasite and the host and their effects.
- learn the classification and general characteristics of pathogenic parasites.
- differentiate the parasitic Protozoan, Trematodes, Cestodes, and Nematodes.
- know the geographic distribution, life cycle, pathogenicity, control and treatment of Protozoan, Trematode, Cestode, Nematode parasites.
- understand the important vector transmitted diseases and their control measures
- gain knowledge about virus transmitting nematodes, types and management of nematode issues.

IV Semester

Course 4.1: Advanced Genetics and Computational Biology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- learn the genome organization of prokaryotes and eukaryotes, and genome projects
- acquire the knowledge of genetics basis of cancer and animal models of cancer
- understand the genetics of neurogenesis, and molecular basis of neurological disorders
- describe the polygenic inheritance and QTL mapping
- understand the human genome organization, and genetic basis of syndromes and disorders
- explain the genomics and genome sequencing
- explain the proteomics, protein structure determination and protein interactions

- learn to access databases and genomic tools
- develop skill in analysis genomic and proteomic data
- gain knowledge of applications of Genomics and Proteomics

Course 4.2: Environmental Pollution and Toxicology

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- understand the basic concepts of environmental pollution and toxicology.
- describe the various types and causes of pollution
- distinguish the effect of pollutants on human health, economy and wild environments.
- familiar with solid waste and biomedical waste management
- explain the impact of environmental impact assessment, and natural hazards such as Volcanoes, Earthquakes, Tsunamis and their effects
- comprehend the methods and applications to measure or detect pollutants, economic and health hazards
- develop knowledge of toxicity of pesticides agrochemicals and foods, among youngsters.
- know the pathways of transformation of toxicants and pesticides inside the body.
- gain the knowledge about heavy metal toxicity as well as various poisonous and, venomous organisms on the earth
- aware of the toxic cosmetics and their effects as well as safety regulations for usage of cosmetics
- know public health hazards due to smoking and other dangerous occupation.

Course 4.3: Project work

Student Learning Course Outcomes: After successful completion of the course student will be able to;

- identify skills and capabilities that are interested in a specialized scientific research
- formulate a scientific question and frame a hypothesis
- Develops the ability to apply techniques and methods in Zoological science research
- Plan a research design including sampling, observational statistical analysis.
- Analyze the scientific data and interpret the results
- Create a logically coherent project report, defend the work in viva voce and publish.

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