

B.Sc. ZOOLOGY PROGRAMME

Programme Objectives

The B.Sc. Zoology programme is designed to help the students to:

PO 1. Impart basic knowledge of various branches of Zoology and General biology meant both for a graduate terminal course and for higher studies.

PO 2. Inculcate interest in and love of nature with its myriad living creatures.

PO 3. Understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance

PO 4. Acquire basic skills in the observation and study of nature, biological techniques, experimental skills and scientific investigation

PO 5. Acquire basic knowledge and skills in certain applied branches to enable them for self employment
6. Impart awareness of the conservation of the biosphere.

B.Sc. ZOOLOGY

Course Outcomes

The graduate of this programme should be able to

CO 1. Identify and list out common animals

CO 2. Explain various physiological changes in our bodies

CO 3. Analyze the impact of environment on our bodies

CO 4. Understand various genetic abnormalities

CO 5. Develop respect for nature

CO 6. Explain the role and impact of different environmental conservation programmes

CO 7. Identify animals beneficial to humans

CO 8. Identify various potential risk factors to health of humans

CO 9. Explain the importance of genetic engineering

CO 10. Use tools of information technology for all activities related to zoology

ANIMAL DIVERSITY: NON-CHORDATA PART- I

Code: ZO1B 01T

[DIVERSITY, ADAPTATIONS AND FUNCTIONAL ANATOMY OF PROTOZOANS AND NONCHORDATES)

OBJECTIVES

- To create appreciation on diversity of life on earth
- To understand different levels of biological diversity
- To familiarize taxa level identification of animals
- To study the scientific classification of invertebrate fauna.

ANIMAL DIVERSITY: NON-CHORDATA– PART- II

Code: ZO2B 02T

[DIVERSITY, ADAPTATIONS AND FUNCTIONAL ANATOMY OF NON-CHORDATE COELOMATES)

OBJECTIVES

- To learn the physiological and anatomical peculiarities of some invertebrate phyla through type study.
- To learn the evolutionary significance of various invertebrate fauna
- To stimulate the curiosity in living things around them.

ANIMAL DIVERSITY – CHORDATA- PART-I

CODE: ZO3B 03T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND ADAPTATIONS OF CHORDATES

OBJECTIVES

- To make the student observe the diversity in chordates and their systematic position.
 - To make them aware of the economic importance of some classes.
- To learn the physiological and anatomical peculiarities of some invertebrate phyla through type study.

- To learn the evolutionary significance of various vertebrate fauna

ANIMAL DIVERSITY – CHORDATA PART-II

Code: ZO4B 04T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND ADAPTATIONS OF CHORDATES – AVES AND MAMMALS]

OBJECTIVES

- To study the scientific classification of invertebrate fauna.
- To learn the physiological and anatomical peculiarities of some vertebrate phyla through type study.
- To learn the evolutionary significance of various vertebrate fauna

Code: ZO5B 06T

ENVIRONMENTAL BIOLOGY, WILDLIFE CONSERVATION AND TOXICOLOGY

OBJECTIVES

- To impart basic knowledge on ecosystems and their functioning
- To learn about various types of anthropogenic pressures on ecosystem
- related degradation and management measures To study toxicants, their impacts on human health and environment and
- remedial measures To create awareness about disasters, prevention and mitigation measures

Code: ZO 5B 07T

PHENOLOGY, EVOLUTION AND ZOOGEOGRAPHY

OBJECTIVES

- To acquire knowledge about the evolutionary history of earth (living and non living) To learn various tools and techniques for evolutionary studies
- To study the distribution of animals on earth, its pattern, evolution and
- causative factors To impart basic knowledge on animal behavioural patterns and their role

Code: ZO 5B 08T

CELL BIOLOGY AND GENETICS

OBJECTIVES

- To emphasize the central role of Cell biology and Molecular biology, being the most developing areas of biological science.
- To make aware of different cell organelles, their structure and role in living organisms.
- To introduce the nature of genetic materials at molecular level, their expression and regulation.
- To develop critical thinking, skill and research aptitudes.

Code: ZO5B 09 T

**GENERAL METHODOLOGY IN SCIENCE, BIOSTATISTICS
AND INFORMATICS**

OBJECTIVES

- To make aware of the basic philosophy of science, its history, concepts and scope
- To develop proper scientific mind, culture and work habits
- To familiarize with the basic tools and techniques of scientific study with emphasis on biological sciences

Code: ZO6B 10T

BIOCHEMISTRY

OBJECTIVES

- This course will provide students with a deep knowledge in biochemistry.
- Defining and explaining the basic principles of biochemistry useful for biological studies for illustrating different kinds of food, their structure, function and metabolism.

Code: ZO6B 11T

PHYSIOLOGY AND ENDOCRINOLOGY

OBJECTIVES

- Explaining various aspects of physiological activities of animals with special reference to humans.
- Students will acquire a broad understanding of the hormonal regulation of physiological processes in invertebrates and vertebrates.
- By the end of the course, students should be familiar with hormonal regulation of physiological systems in several invertebrate and vertebrate systems.
- This also will provide a basic understanding of the experimental methods and designs that can be used for further study and research.
- The achievement of above objectives along with periodic class discussions of current events in science, will benefit students in their further studies in the biological/physiological sciences and health-related fields, and will contribute to the critical societal goal of a scientifically literate citizenry.

Code: ZO6B 12T

MOLECULARBIOLOGY & BIO INFORMATICS

OBJECTIVES

- Explaining various aspects of molecular biology of cells with special reference to prokaryotes and eukaryotes.

- Students will acquire a broad understanding of the broad aspects of
- By the end of the course, students should be familiar with hormonal regulation of physiological systems in several invertebrate and vertebrate systems

REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY

OBJECTIVES

- This will provide a basic understanding of the experimental methods and designs that can be used for further study and research.
- The achievement of above objectives along with periodic class discussions of current events in science, will benefit students in their further studies in the biological/physiological sciences and health-related fields, and will contribute to the critical societal goal of a scientifically literate citizenry.

GENETICS AND BIOTECHNOLOGY

OBJECTIVES

- To emphasize the central role that genetics and biotechnology plays in the life of all organisms.
- To introduce the student to some of the present and future applications of bio-sciences
- To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.

M.Sc. ZOOLOGY PROGRAMME

Programme Objectives

The M.Sc. Zoology (Human genetics) programme is designed to help the students to:

To provide training and skills for a career in human genetics

- To provide the necessary skills and basic knowledge required to underpin a higher degree in the same or a related discipline
- To facilitate the conversion of graduates from other relevant disciplines to human molecular genetics
- To produce students that are able to carry out “unsupervised” practical work in all basic molecular biology techniques and follow all experimental instructions with some supervision
- To provide students with the knowledge and skills to interpret, analyse and present scientific data, develop and apply scientific thought and experimental design skills and develop independent scientific thought
- To develop new areas of teaching in response to advances in the field of Human Molecular Genetics and the needs of vocational training

M.Sc. ZOOLOGY (Human Genetics)

Programme Outcomes

The graduate of this programme should be able to attain knowledge and understanding of

1. fundamentals of human molecular genetics
2. approaches to the study of human genetic disease
3. cytogenetics and molecular diagnostics
4. population genetics, polygenic disease and quantitative genetics
5. animal models of genetic disease, comparative genetics
6. cancer genetics
7. gene therapy
8. An introduction to clinical genetics and NHS genetics services
9. statistical genetics, computing and data analysis
10. lab skills and research techniques including experimental design, molecular techniques and bioinformatics
11. presentation and communication skills, including, problem solving, teamwork, poster presentation, oral presentations and critical appraisal of scientific papers
12. the essential concepts, principles and theories relevant to the students chosen research project

area

BIOCHEMISTRY AND CYTOGENETICS

Code: ZO 1CT 01

OBJECTIVES

- This course will provide students with a deep knowledge in biochemistry.
- Defining and explaining the basic principles of biochemistry useful for biological studies for illustrating different kinds of food, their structure, function and metabolism.
- To emphasize the central role of Cell biology and Molecular biology, being the most developing areas of biological science.
- To make aware of different cell organelles, their structure and role in living organisms.
- To introduce the nature of genetic materials at molecular level, their expression and regulation.
- To develop critical thinking, skill and research aptitudes.

BIOPHYSICS AND BIostatISTICS

Code: ZO 1CT 02

OBJECTIVES

- Came to know the data collection, tabulation and presentation.
- Described the mean, median, mode and SD.
- Understood the Analysis of Variance.
- Described Student 't' test and probability
- Understood the Correlation and Regression.

ECOLOGY AND ETHOLOGY

Code: ZO 1CT 03

OBJECTIVES

- To impart basic knowledge on ecosystems and their functioning
- To learn about various types of anthropogenic pressures on ecosystem
- To study toxicants, their impacts on human health and environment and
- To create awareness about disasters, prevention and mitigation measures
- To acquire knowledge about the evolutionary history of earth (living and non living)
 - To learn various tools and techniques for evolutionary studies
- To study the distribution of animals on earth, its pattern, evolution and
- causative factors To impart basic knowledge on animal behavioural patterns and their role

PHYSIOLOGY

Code: ZO 2CT 04

OBJECTIVES

An integrated Understanding of physiological mechanisms

- Described the physiology of digestive and respiratory system of human beings.
- Understood the blood composition, types, groups and circulatory system.
- Described the physiology of excretory system and nervous system of human beings.
- Came to know the physiology of sense organs, muscles and reproductive system.

MOLECULAR BIOLOGY

Code: ZO 2CT 05

OBJECTIVES

- Described the ultra-structure and functions of cell organelles.
- Understood DNA replication, RNA and protein synthesis and came to know protein
- Study of transcription and translation.
- Understood cell signaling and cellular communication.
- oncogenes
- Understood the types and applications of stem cells.

SYSTEMATICS AND EVOLUTION

Code: ZO 2CT 06

OBJECTIVES

- By biological evolution we could understand that many of the organisms that inhabit the
- Earth today are different from those that inhabited it in the past
- Understood that the four propositions underlying Darwin's theory of evolution through
- natural selection are:
 - (1) more individuals are produced than can survive;
 - (2) There is therefore, a struggle for existence
 - (3) Individuals within a species show variation
- Basic concepts of systematics and taxonomy
- Species concept and Classification
- Zoological nomenclature
- Newer trends in systematic

IMMUNOLOGY

Code: ZO 3CT 07

OBJECTIVES

- Outline the key components of the innate and adaptive immune responses.
- Described about cell types and organs which are involved in an immune response
- Described the Infectious diseases, hypersensitivity, autoimmune disorders, Immunodeficiency diseases

DEVELOPMENTAL BIOLOGY AND ENDOCRINOLOGY

Code: ZO 3CT 08

OBJECTIVES

- Students will acquire a broad understanding of the hormonal regulation of physiological processes in invertebrates and vertebrates.
- By the end of the course, students should be familiar with hormonal regulation of physiological systems in several invertebrate and vertebrate systems.
- This also will provide a basic understanding of the experimental methods and designs that can be used for further study and research

HUMAN GENETICS 1: CLINICAL GENETICS

Code: ZO 3ET 09

OBJECTIVES

- Indications to genetic testing, targets and methods of genetic testing.
- Characterization of genetic diseases.
- The etiology of genetic diseases.

- Clinical and genetic testing, basic syndromology. The importance of signal symptoms for the differential diagnosis of syndromes. Diagnostic algorithm.
- Genetic screening.
- Ethical and legal aspects.
- Genetics of sensory defects. Hereditary disorders of the senses (sight, hearing, smell) – the most common syndromes vs. nonsyndrome disorders (daltonism, blindness, deafness, anosmia), modes of inheritance, the possibility of DNA analysis of sensory defects.
- Genetics of mental retardation and autism.
- Practical exercises – the most common situations in Genetic Counseling Centre.

BIOTECHNOLOGY AND MICROBIOLOGY

Code: ZO 4CT 10

OBJECTIVES

- To emphasize the central role that genetics and biotechnology plays in the life of all organisms.
- To introduce the student to some of the present and future applications of bio-sciences
- To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.

- Understood the microbial diversity, ultra structure, culture techniques of microbes.
- Came to know about the various pathogenic fungi and viruses and beneficial microbes.

HUMAN GENETICS II: DIAGNOSTIC GENETICS

Code: ZO 4ET 11

- Biochemical genetics

- Developmental genetics
- Reproductive genetics
- Molecular genetics
- Prenatal diagnosis

HUMAN GENETICS II: CANCER GENETICS & GENETIC SERVICES

Code: ZO 4ET 12

- Cancer cell characteristics, modes of cancer, types of cancer
- Cell signaling in cancer cells.
- Regulation of cancer cell, Cell transformation and tumourigenesis,
- Tumour progression: angiogenesis and metastasis
- Familial cancers, Genetic predisposition to sporadic cancer
- Chromosomal aberrations in neoplasia, Tumour specific markers
- Cancer and environment: physical, chemical and biological carcinogens
- Cancer treatment and prevention.

ANIMAL DIVERSITY – CHORDATA- PART-I

CODE: ZO3B 03T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND ADAPTATIONS OF CHORDATES

OBJECTIVES

- To make the student observe the diversity in chordates and their systematic position.
- To make them aware of the economic importance of some classes.

To learn the physiological and anatomical peculiarities of some invertebrate phyla through type study.

- To learn the evolutionary significance of various vertebrate fauna

ANIMAL DIVERSITY – CHORDATA PART-II

Code: ZO4B 04T

[TAXONOMY, DIVERSITY, STRUCTURAL ANATOMY AND ADAPTATIONS OF CHORDATES – AVES AND MAMMALS]

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- To learn the physiological and anatomical peculiarities of some vertebrate phyla through type study.
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Code: ZO5B 06T

ENVIRONMENTAL BIOLOGY, WILDLIFE CONSERVATION AND TOXICOLOGY

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PHYSIOLOGY AND ENDOCRINOLOGY

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Code: ZO6B 12T

MOLECULARBIOLOGY & BIO INFORMATICS

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REPRODUCTIVE AND DEVELOPMENTAL BIOLOGY

OBJECTIVES

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- The achievement of above objectives along with periodic class discussions of current events in science, will benefit students in their further studies in the biological/physiological sciences and health-related fields, and will contribute to the critical societal goal of a scientifically literate citizenry.

GENETICS AND BIOTECHNOLOGY

OBJECTIVES

- To emphasize the central role that genetics and biotechnology plays in the life of all organisms.
- To introduce the student to some of the present and future applications of bio-sciences
- To develop critical thinking skill and research aptitude among students, by introducing the frontier areas of the biological science.
 - Understood the microbial diversity, ultra structure, culture techniques of microbes.
 - Came to know about the various pathogenic fungi and viruses and beneficial microbes.

Program Specific Outcomes: PSO of M. Sc., Zoology

- Used the evidences of comparative biology to explain how the theory of evolution offers the only scientific explanation for the unity and diversity of life on earth. They are able to use specific examples to explicate how descent with modification has shaped animal morphology, physiology, life history, and behavior.
 - Explicated the ecological interconnectedness of life on earth by tracing energy and nutrient flows through the environment. They are able to relate the physical features of the environment to the structure of populations, communities, and ecosystems.
 - Subjects such as invasive or endangered species, embryonic development in mammals and ageing in social insects. Lead to advances in medicine to prevent disease amongst both animals and human beings.
 - Developed knowledge and understood of living organisms at several levels of Zoological and Biological organization from the molecular, through to cells and whole organisms and ecosystems all organs of evolutionary perspectives.
- Understood how the chemistry and structure of the major biological macromolecules, including proteins and nucleic acids, determines their biological properties.

M.Sc., ZOOLOGY – COURSE OUTCOMES

COURSE OUTCOMES - ANIMAL DIVERSITY

- Understood the Classification and Phylogeny of Animals
- Described General characteristics, classification of invertebrates and vertebrates.
- Described General characteristics, classification and systematic portion of Minor phyla
- Described the general biology of few selected non-chordates and chordates which are useful to mankind?
- Enriched knowledge on ecology of some important fishes, amphibians, reptiles, birds and mammals

COURSE OUTCOMES – BIOCHEMISTRY

- Identified the five classes of polymeric biomolecules and their monomeric building blocks.
- Explained the specificity of enzymes (biochemical catalysts), and the chemistry involved in enzyme action.
- Understood types, Structure, biochemical properties and functions of vitamins.
- Explained how the metabolism of organic compounds leads ultimately to the generation of large quantities of ATP.
- Described the structure and classification of hormones.

COURSE OUTCOMES – CELL AND MOLECULAR BIOLOGY

- Described the ultra-structure and functions of cell organelles.

- Understood DNA replication, RNA and protein synthesis and came to know protein synthesis can be controlled at the level of transcription and translation.
- Understood cell signaling and cellular communication.
- Described the oncogenes
- Understood the types and applications of stem cells.

COURSE OUTCOMES – BIOSTATISTICS

- Came to know the data collection, tabulation and presentation.
- Described the mean, median, mode and SD.
- Understood the Analysis of Variance.
- Described Student ‘t’ test and probability
- Understood the Correlation and Regression.

COURSE OUTCOMES: LAB – ANIMAL DIVERSITY, BIOCHEMISTRY AND CELL AND MOLECULAR BIOLOGY

- Performed and understood the anatomy and physiology of animals by dissection.
- Performed by experiments to analyze the macromolecules in animals
- Understood the principles and types of PCR demonstration.
- Described the fine structure and functions of cell organelles.
- Performed a variety of molecular and cellular biology techniques.

COURSE OUTCOMES – ANIMAL PHYSIOLOGY

- An integrated Understanding of physiological mechanisms
- Described the physiology of digestive and respiratory system of human beings.
- Understood the blood composition, types, groups and circulatory system.
- Described the physiology of excretory system and nervous system of human beings.
- Came to know the physiology of sense organs, muscles and reproductive system.

COURSE OUTCOMES – GENETICS

- Described the fundamental molecular principles of genetics
- Understood the structure and function of DNA & RNA
- Understood about the transmission, distribution, arrangement, and alteration of genetic information and how it functions and is maintained in populations
- Described the basics of genetic mapping.

COURSE OUTCOMES – IMMUNOLOGY AND MICROBIOLOGY

- Outline the key components of the innate and adaptive immune responses.
- Described about cell types and organs which are involved in an immune response
- Described the Infectious diseases, hypersensitivity, autoimmune disorders, immunodeficiency diseases
- Understood the microbial diversity, ultra structure, culture techniques of microbes.
- Came to knowing about the various pathogenic fungi and viruses and beneficial microbes.

COURSE OUTCOMES – LAB – ANIMAL PHYSIOLOGY, GENETICS,
IMMUNOLOGY AND MICROBIOLOGY

- Biological chemistry and its importance in physiology by testing
- Performed an experiment to culture *Drosophila*, Identifications of sex & mutants.
- Observed ABO blood grouping and studied the lymphoid organs
- Performed an experiments about the immunodiffusion Immunoelectrophoresis and Immunoelectrophoresis
- Learnt about the microbial culture methods.

COURSE OUTCOMES – SERICULTURE

- Described the Taxonomy, Morphological sex differences in larva and adult of beneficial and harmful insects.
- Understood the culture of mulberry plants, mulberry silk and silk gland.
- Came to know the culture methods of *B.mori* and *Apis*
- Described the diseases and pests of *B.mori* and plants.
- Studied the quality of silk and marketing strategies of silk.

COURSE OUTCOMES – DEVELOPMENTAL BIOLOGY

- Understood and mastered on the basic concepts of developmental biology.
- Understood how fertilization, cleavage and gastrulating occur.
- Understood the basic concepts of organogenesis.
- Understood about the basic concepts of growth, regeneration and ageing

- Described the test tube baby and placentation in mammals.

COURSE OUTCOMES – ECOLOGY

- Demonstrated an Understood of ecological relationships between organisms and their environment.
- Presented an overview of diversity of life forms in an ecosystem.
- Explained and identified the role of the organism in energy transfers
- Described the Habitat ecology and Resource ecology
- Understood the Environmental Pollution and their management

COURSE OUTCOMES – EVOLUTION

- By biological evolution we could understand that many of the organisms that inhabit the Earth today are different from those that inhabited it in the past
- Understood that the four propositions underlying Darwin's theory of evolution through natural selection are:
 - (1) more individuals are produced than can survive;
 - (2) There is therefore, a struggle for existence
 - (3) Individuals within a species show variation
 - (4) Offspring tend to inherit their parental characters
- Explained adaptation, providing examples from several different fields of biology
- Explained how the molecular record provides evidence for evolution
- Understood the Human origin and evolution.

COURSE OUTCOMES – LAB – DEVELOPMENTAL BIOLOGY, ECOLOGY AND EVOLUTION

- Performed to know the various embryonic stages of animals.

- Learnt that the mounting of chick blastoderm and observation of sperm motility
- Confirmed the role of iodine and thyroxin in Amphibian metamorphosis.
- Analysed various physicochemical parameters in environmental matrices.

- Came to knowing the Animals of evolutionary importance, fossils, analogous and homologous organs, Mimicry and Colouration.

COURSE OUTCOMES – ANIMAL CELL CULTURE TECHNOLOGY

- Described the structure and Organization of animal cell.
- Understood the preparation of the culture medium.
- Came to knowing the basic techniques of mammalian cell culture in vitro.
- Understood about Cell cloning and micromanipulation
- Applications of cultured animal cells are known.

COURSE OUTCOMES – TRANSGENIC TECHNOLOGY

- Described the history and scope of transgenic animals.
- Understood Recombinant DNA technology.
- Described the Systems and strategies for improvement of livestock for milk, meat, wool production and poultry for eggs and meat.
- Described the production of transgenic Cattle, pigs, sheep etc.
- Understood the History, definition, importance and application of cell technology

COURSE OUTCOMES – ANIMAL BIOTECHNOLOG

- Understood animal cell structure, scope of biotechnology.
- Described the Gene cloning and gene transfer methods.
- Came to know the concept of PCR, Screening of recombinant clones – nucleic acid hybridization, DNA sequencing, DNA fingerprinting.
- Described the Animal tissue culture techniques.
- Understood Embryo transfer & transgenic animal technology.

COURSE OUTCOMES – FISHERY BIOLOGY AND AQUACULTURE

- Learnt the general classification of fishes, economically important marine and freshwater fishes, migration and fishery products.
- Described recent concepts in fisheries management, endangered species management.
- Came to know the various aquaculture systems.
- Understood the type of hatchery, brood stock, larval production, feed management water quality and disease management in cultivable species, live feed production.
- Described the feed and disease management.