

M.Sc Zoology

Program Specific outcome:

We strongly believe that teachers are not there in the society for merely teaching subject matters, but also contributing in all possible ways in the process of overall development of a future citizen of our revered country. Department of Zoology is a combination of a well nurtured legacy and a lot of future prospects. Due to our location, our prime interest lies on exploring the vast coastal regions and resources, sustainable development, biosensing and biodiversity conservation of this area. The syllabus is designed to educate and train our students in such a way that they can utilize the vast resource of coastal region and apply that in the field of biodiversity conservation and sustainable development.

The post graduate department of Zoology offer Ecology & Environment as elective paper for M.Sc students. Besides, teaching undergraduate and post graduate studies we are conducting basic research in the field of ecology, genetics, systematics and applied zoology which constitutes an important part of the economy of this region.

Our comprehensive post graduate program prepares students for a wide range of career options including opportunities in biotechnology, environmental management and conservations, research and education. Integration of knowledge across levels of biological complexity is required for addressing many of today's pressing societal challenges.

| PAPER | GROUP | SUBJECT | COURSE OUTCOME |
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| ZOO- 101 | A | Non- Chordates | <p>This section deals with structure, physiology, lifecycle and evolution of representative animals under different animal phyla.</p> <p>The main outcomes are:</p> <ul style="list-style-type: none"> • Student should be able to describe unique characters of protozoa to Echinodermata. • Student should be able to recognize life functions of protozoa to Echinodermata. • To recognize the ecological role of invertebrate phyla. • To recognize the diversity from protozoa, Echinodermata. |
| | B | Chordates | <p>This portion of the syllabus includes Origin, diversification and detail anatomy of protochordates and vertebrates. The learning outcomes of this section are:</p> <ul style="list-style-type: none"> • Student should be able to describe unique characters of urochordates, cephalochordates and fishes. • Student should be able to recognize life functions of urochordates to fishes. • To understand the ecological role of different groups of chordates. • To understand the diversity of chordates. |
| ZOO- 102 | A | Histochemistry | <p>At the end of the course the student will be able to understand fundamental concepts of Histochemistry. The learning outcomes of this section are to</p> <ul style="list-style-type: none"> • Understand why different staining procedures are used on tissue sections. • Understand the principles of immunohistochemistry. • Visualize detail internal histology of organisms. |
| | B | Animal Physiology | <p>The learning outcomes of this section are:</p> <ul style="list-style-type: none"> • Students will be able to understand the physiology at cellular and system levels. • Students will be able to describe the role and functions of different biomolecules. • Able to describe the physiology of |

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| | | | <p>digestion</p> <ul style="list-style-type: none"> • Students will be able to understand how mammalian body gets nutrition from different biomolecules. |
| ZOO- 103 | A | Immunology | <p>After going through this unit student shall be able to:</p> <ul style="list-style-type: none"> • Trace the history and development of immunology. • Describe surface membrane barriers and their protective functions. • Explain the importance of phagocytosis and natural killer cells in innate body defense. • Describe the roles of different types of T cells, B cells and APCs. • Compare and contrast the origin, maturation process, and general function of B and T lymphocytes |
| | B | Methods in Biology | <p>Molecular Biology gives in-depth knowledge of biological processes through the investigation of the underlying molecular mechanisms. The learning outcomes of this section are:</p> <ul style="list-style-type: none"> • Students will gain an understanding of chemical and molecular processes that occur in and between cells. Their understanding will become such that students will be able to describe and explain processes and their meaning for the characteristics of living organisms. • Students will gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology. |
| ZOO- 104 | A | Cell Biology | <p>After going through this unit student shall be able to:</p> <ul style="list-style-type: none"> • Describe the function and the composition of the plasma membrane. • Explain the principles of the cell theory. • Differentiate between prokaryotes and eukaryotes. • Understand the importance of the nucleus and its components. • Understand how the endoplasmic reticulum and Golgi apparatus interact with one another and know with which other organelles they are associated. |

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| | | | <ul style="list-style-type: none"> Identify the three primary components of the cell's cytoskeleton and how they affect cell shape, function, and movement. |
| | B | Cytogenetics | <p>The learning outcomes of this section are:</p> <ul style="list-style-type: none"> Detailed understanding of the chemical basis of heredity (DNA, RNA & Protein). Understanding about the role of genetics in evolution. The ability to evaluate conclusions that are based on genetic data. The ability to understand results of genetic experimentation in animals. |
| Zoo195 | Practical | Non- Chordates, Chordates, Histochemistry & Animal Physiology | In this section students will be able to identify, different representative animals under different phyla, dissect animals to understand the structure of internal organs and stain different slides to visualize internal histology of organs. |
| Zoo196 | Practical | Immunology, Methods in Biology, Cell Biology & Cytogenetics | <p>In this section students will be able to</p> <ul style="list-style-type: none"> isolate and quantify DNA and RNA Study the phagocytic activity of macrophages Study polytene chromosome of Drosophila Solve different puzzles of genetic cross. |

2nd Semester

| PAPER | GROUP | SUBJECT | COURSE OUTCOME |
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| ZOO- 201 | A | Biosystematics | <p>This course will describe the importance of taxonomy in biology, historical resume of systematics and stages of taxonomy.</p> <p>The course will resolve the concepts of biological classification, basic principles and rules for the classification of organisms.</p> <p>The course will enlighten the students with modern trends of biosystematics-concepts.</p> |
| | | | <p>The subject ecology deals with the relationship among different life forms. At the end of the course students will be able to:</p> <ul style="list-style-type: none"> Describe the relation between abiotic |

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| | B | Ecological principles | <p>and biotic factors.</p> <ul style="list-style-type: none"> • Describe various biological interactions. • Understand how change in population affects the ecosystem. • Describe evolutionary history of man. • Describe origin of species on earth. |
| ZOO- 202 | A | Biophysics | At the end of the course the student will be able to understand fundamental concepts in biophysics that govern biological processes. Students will be able to understand the basic principles of thermodynamics, electromagnetic and ionizing radiation and principles of biophysical chemistry. |
| | B | Biochemistry | <p>The course will provide an understanding of fundamental biochemical principles such as biomolecules, metabolic pathway and regulation of biological process. On completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand about the agencies responsible for Production of various products using biochemistry. • Understand the structure and function of carbohydrate, amino acids, proteins, and lipids. • Understand the fundamental energetic of biochemical processes and chemical logic of metabolic pathways. • Understand the integration of metabolic process in cellular systems and organization of cellular pathways. |
| ZOO- 203 | A | Molecular Biology | At the end of the course students will be able to explain the fundamentals of genetics and the Mendelian laws, the concept of alleles, concept of linkage and crossing over of genes. The course will open an avenue to be familiar with a variety of types of genetic data (genotyping, expression, and sequence data), chromosomal mapping, genetic composition of biological population and evolutionary factors that explain the variation. An in-depth knowledge of chemical and molecular processes that occur in |

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| | | | between cell including the central dogma will be assured at the end of this course. |
| | B | Parasitology | <ul style="list-style-type: none"> • The course will provide an understanding of the diversity and biology of parasites and their epidemiological aspects. • Students will be able to gain knowledge regarding the mode of transmission of parasitic diseases and preventive measures. |
| ZOO- 204 (CBCS) | A | Wildlife & Eco- Management | <p>On completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • Understand the factors affecting the need to find sustainable practices for production of food, fiber crops and how to implement them. • Be competent in basic forest management principles. • Understand the status of biodiversity of India and the present threats for their survival. • Understand the role of the local peoples participation in preservation of our biodiversity. |
| | B | Aqua informatics | Aquaculture is now viewed as a strong option to increase fish production as it plays a vital role in providing food security in India. Students will be able to educate the fish farmers through Community based organization and to provide an information system, in low cost, to fulfill their requirements. |

3rd Semester

| PAPER | GROUP | SUBJECT | COURSE OUTCOME |
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| ZOO- 301 | A | Basic & applied Entomology | <p>This section deals with general idea, physiology and lifecycle of different insects. The main outcomes are to</p> <ul style="list-style-type: none"> • Understand basic aspects of arthropod ecology, morphology, parasitology, physiology, systematics and toxicology. • Understand importance of beneficial arthropods in apiculture, agricultural, sericulture and lac culture. • Get an idea about medical and veterinary pest management. |
| | B | Ecotoxicology | <p>Upon completion students will be able to:</p> <ul style="list-style-type: none"> • utilize scientific literature and databases to identify information needed to understand and effectively communicate aspects of toxicology • gather knowledge concerning the fundamentals in the basic areas of toxicology • demonstrate an understanding of legal, regulatory, and ethical considerations relating to toxicology |
| ZOO- 302 | A | Molecular Evolution | <p>On completion of the course, students will be able to:</p> <ul style="list-style-type: none"> • describe evolutionary process at the molecular level • apply molecular methods to study genetic variation within and between species • apply the process to do and evaluate a phylogenetic analysis , and explain the different steps |
| | | | <p>Students will be able to:</p> <ul style="list-style-type: none"> • Identify ways microorganisms play |

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| | B | Microbiology | <p>an <i>integral role</i> in disease</p> <ul style="list-style-type: none"> • Explain why microorganisms are <i>ubiquitous in nature</i> • Demonstrate that microorganisms have an <i>indispensable role</i> in the environment. |
| ZOO- 303B (Ecology Special) | A | Biodiversity & Conservation Ecology | <p>Upon successful completion, students will be able to:</p> <ul style="list-style-type: none"> • Find out why society strives to conserve biodiversity. • Identify key threats to biodiversity. • Evaluate which management options are likely to be effective for conserving biodiversity. • Develop appropriate policy options for conserving biodiversity in different settings. |
| | B | Aquatic Ecology | <p>Students will be able to:</p> <ul style="list-style-type: none"> • Gain basic knowledge of the organisms found in marine and fresh waters and on the interactions between environmental factors and biological processes in aquatic ecosystems. • Study how pollution and other human influences affect the aquatic system, from rivers and lakes to coastal and Ocean. |
| ZOO- 395 (Practical) | Practical | Entomology, Ecotoxicology, Molecular Evolution and Microbiology | <p>After going through this unit student shall be able to:</p> <ul style="list-style-type: none"> • Understand the method of collection and preservation of insects • Understand the importance of Pests and Aquatic insects • Estimate the LC50 and LD50 values of different toxicants. • Understand how to stain different categories of microbes. |
| Zoo396B | Practical Special Paper | Ecology Practical | <p>In this section students will be able to estimate different physic chemical parameters of soil and water.</p> |

4th Semester

| PAPER | GROUP | SUBJECT | COURSE OUTCOME |
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| ZOO- 401 | A | Environmental pollution and management | <p>The students will be able to:</p> <ul style="list-style-type: none"> • Acquire analytical skills in assessing environmental impacts through a multidisciplinary approach. • Identify environmental problems and solutions through organized research. • Improve the communication and writing skill so as to face the competitive world. |
| | B | Biostatistics | <p>Upon completion of this course, students will be able to:</p> <ul style="list-style-type: none"> • Analyze statistical data graphically using frequency distributions and cumulative frequency distributions. • Use the basic probability rules, including additive and multiplicative laws, using the terms, independent and mutually exclusive events. • Organize and manage data. |
| ZOO- 402 | A | Developmental Biology | <p>After the completion of the course students will be able to:</p> <ul style="list-style-type: none"> • List the types of characteristics that make an organism ideal for the study of developmental biology. • Be familiar with the events that lead to fertilization, cleavage, gastrulation and organogenesis. • Be able to describe the chemicals and genes involved in organogenesis. |
| | B | Neuro-Endocrinology | <p>The course will provide an understanding of basic concept of neural system. Students will be able to:</p> <ul style="list-style-type: none"> • Demonstrate an understanding of the anatomy of the endocrine system. • Demonstrate an understanding of the basic properties of hormones and their role in maintaining body function. • Demonstrate those endocrine details helpful in the clinical realm |

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| ZOO- 403 (ECOLOGY SPECIAL) | A | Systems Ecology | Both theory and practical learning process are to acquaint students with both the basic traditional/ conventional components of the ecological science in order to develop proper knowledge base to tackle the ongoing ecological changes in and around human settlements with special emphasis to the landscapes & ecosystems of south West Bengal. The entire syllabus has four dimensions- Systems Ecology, Human Ecology, and Aquatic Ecology & Wildlife Ecology. The major emphasis was laid in developing the syllabus to cover not only on traditional aspects of Ecology but also on modern developments in the sphere of ecological sciences: system, mathematical, molecular, urban, restoration and aquatic ecology. |
| | B | Human Ecology | |