

VIDYASAGAR UNIVERSITY

Department of Zoology

The Syllabus for POST- GRADUATE Programme in Zoology

Under Choice Based Credit System (CBCS)

PROGRAMME OUTCOME

The course curriculum of the department has been designed and developed giving due importance to both classical components of subject Zoology along with its different ramifications in tune with the modern scientific development across the world. The classical aspects of zoology includes basic structural functional organization of the Non-Chordates and Chordates, taxonomy, biosystematics, histology, animal physiology, evolution and adaptation whereas the modern dimension of the course curriculum has attached most significant aspects of molecular biology, genetics, biotechnology, bioinformatics, biochemistry, immunology and biostatistics. The effort appears to be very fruitful by virtue of the results and academic performance of the existing and former students which are being reflected in their success in different national and state level competition. Keeping pace with the above mentioned course curriculum the department although has initiated its journey with only one special paper now it is offering four different special papers (Fishery, Ecology, Genetics & Molecular biology and parasitology) which also enabled rural based students of the University to get proper recognition both nationally and also getting different subject based services. Moreover the outreach and extension program involving the students in their practical curriculum have provided significant contribution of livelihood generation of marginalized people of the region. All the courses in the program are carefully designed to equip the students for competitive exams like CSIR NET, SET etc. and also to write research proposals for grants.

1 st YEAR SEMESTER- I

Course No: ZOO 101: Non-Chordate & Chordates

Non-chordates

Course Outcome: At the end of the course, the students will be acquainted with the non-chordate biology. Students will be able to identify the invertebrates and classify them.

Nonchordates (Metazoa) representing largest groups of animal kingdom are characterised by several unique features and display various phenomena (polymorphism, torsions, metamorphosis etc), based on which an array of theories, hypothesis, scientific principles have been advocated in the gamut of the subject of Zoology. The syllabus has provided more stresses on three different aspects:--1) Evolution based on existing theories and hypothesis explaining non-chordate, especially metazoans origin and evolution; 2) Phylogenetic relationships among metazoans based on superphyletic concepts; and 3) Conservation strategies of metazoans for the ecological and economic benefits.

Chordates

Course Outcome: Through the course, the students will be accustomed with the chordate biology. Students will be able to identify the chordates and classify them.

Course No: ZOO 102: Histochemistry& Animal Physiology

Histochemistry

Course Outcome: Students will understand the Scope and importance of histology and histochemistry. General principles for the preparation of tissue for histological studies and histochemical localization of various cellular components would be another significant aspect of the course Syllabus:

Animal Physiology

Course outcome: The course will provide detailed knowledge on the various physiological organ-systems and their importance to the integrative functions of the human body. To have an enhanced knowledge and appreciation of mammalian physiology; to understand the functions of important physiological systems including the cardio-respiratory, renal, reproductive and metabolic systems; to understand how these separate systems interact to yield integrated physiological responses to challenges such as exercise, fasting and ascent to high altitude, and how they can sometimes fail; to be able to perform, analyze and report on experiments and observations in physiology; to be able to recognize and identify principal tissue structures.

Course No: ZOO 103: Immunology and Methods in Biology

Immunology

Course outcome: This course will describe the immune systems of vertebrates that enable them to recognize and respond specifically to foreign substances. The students will be able to comprehend the roles of lymphoid organ, cells of immune system, antigens, antibodies, MHC, antigen presentation and immunity to infectious diseases.

Methods in Biology

Course Outcome: On completion of this course students will be able to: address a research problem in biotechnology, Provide examples of current applications of biotechnology and advances in the different areas like medical, microbial, environmental and bioremediation. After getting theoretical knowledge students would be acquainted with some modern instruments and methods which are indispensable to pursue advance research in the field of biotechnology.

Course No: ZOO 104: Cell Biology & Cytogenetics

Cell Biology

Course outcome: Students will be well informed with the membrane structure and composition, transport and trafficking of protein, the cytoskeleton, cell movement and extra cellular matrix. The mechanism of cell division and their regulation through different check points will be thoroughly understood. Cell cycle, apoptosis, signal transduction and cancer biology are the important part of the course.

Cytogenetics

Course outcome: The course will provide an understanding of genetic analysis at the gene, genome and population levels. Understanding the Drosophila genetics. Evaluation of the various aspects of structural, functional and comparative genomics. Designing and development of experiments using Drosophila and their evaluation through genetic analysis and interpretations.

1 st YEAR SEMESTER- II

Course No: ZOO 201: Biosystematics & Ecological principles

Biosystematics

Course outcome: This course will describe the importance of taxonomy in biology, historical resume of systematics and stages of taxonomy. The course would be dealt with biological classification, basic principles and rules for the classification of organisms. The course would enlighten the students with modern trends in biosystematics-concepts of different conventional and newer aspects.

Ecological principles

Course outcome: The subject ecology dealing with the relationship among different life forms in respect of their environment is a blend of concepts and contents (information). In order to understand the applicability of this subject, the students must have an acquaintance with the different definitions, terminologies, scientific principles, hypothesis, theories etc. with proper examples. The contents of this syllabus have been identified with an eye to make the students understand the basics of ecology putting more emphasis on the system ecology, habitat ecology, population and community ecology and evolutionary ecology so that ecology students can not only understand the ongoing ecological processes but also can contribute to the proper eco-management.

Course No: ZOO 202: Biophysics & Biochemistry

Biophysics

Course outcome: At the end of the course the student will be able to understand fundamental concepts in biophysics that underlie biological processes. Thorough knowledge of biophysics of membrane and laws of thermodynamics. The course would be dealt with principle of thermodynamics, electromagnetic and ionizing radiation and principles of biophysical chemistry.

Biochemistry

Course outcome: 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 are able to: Understand about the agencies responsible for Production of various products using biochemistry. Understand the term pH, Buffer. Understand the structure and function of carbohydrate, amino acids, proteins, and lipids. The students will understand the fundamental energetic of biochemical processes and chemical logic of metabolic pathways. The course also deals with the integration of metabolic process in cellular systems and organization of cellular pathways.

Course No: ZOO 203: Molecular Biology & Parasitology

Molecular Biology

Course outcome: The course will 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 between cell including the central dogma will be assured at the end of this course.

Parasitology

Course outcome: The course will provide an understanding of the diversity and biology of parasites, besides the epidemiological aspects of different parasitic diseases would be explored and students will able to gain knowledge regarding the mode of transmission of parasitic diseases and preventive measures.

Course No: C-ZOO 204: Wildlife & Eco-management and Aqua informatics

Wildlife & Eco-Management

Course outcome: The syllabus of this subject includes some pertinent aspects on biodiversity dealing with identifying the threats and conservation of biodiversity alongside highlighting some basic aspects of wildlife and its conservation with special reference to the diversity, distribution and conservation of wildlife of South West Bengal, India. This course is expected to generate interest to the students across the disciplines so that they can become a part of wildlife and biodiversity conservation.

Aqua informatics

Course outcome: Aquaculture is now viewed as a strong option to increase fish production as it plays a vital role in providing food security in India. Aquaculture informatics can be described as the scientific application of Information technology in biological concepts that enhance the productivity and economic viability of aquaculture sectors. Advances in electronic communication, combined with specific cooperative efforts, should be used to increase the information exchange in the region. It is nation's part to educate the fish farmers through community based organization and to provide an information system, in low cost, to fulfill their requirements.

2 nd YEAR SEMESTER- III

Course No: ZOO 301: Basic & Applied Entomology and Ecotoxicology

Basic & Applied Entomology

Course outcome: The subject entomology dealing with the study of different aspects of insects, the largest animal taxa of the world has been included in the general syllabus of Zoology in

third semester mainly to give the students an understanding on three different aspects of entomology—morphology and classifications, insects' physiology and some unique phenomena in the insects life such bioluminescence, pheromones, secondary adaptation aquatic insects, insects-plants interactions , integrated management of insects pests etc. so that the students can develop not only the interest on this interesting and important faunal components but can undertake measures for the conservation of beneficial insects and control of the harmful ones.

Ecotoxicology

Course outcome: The purpose of toxicity testing is to generate information about a substance's toxic properties so that the health and environmental risks it poses can be adequately evaluated. In aquatic sector toxicological study may ensure the health of the local aquatic organism and related to human health.

Course No: ZOO 302: Molecular Evolution and Microbiology

Molecular Evolution

Course outcome: The curriculum in evolution includes modern aspects of evolution and molecular phylogenetic tree. DNA and amino acid sequences study by genomics and proteomics data analysis and find out the similarities and dissimilarities between different species of same group or different group. By nearest neighbor analysis and by principle of parsimony a gene tree could be made. PG students are benefitted by study of genome analysis and by finding the sequences they may be able to find out the molecular systematic position.

Microbiology

Course outcome: To gain knowledge on importance of microorganisms as primary decomposers, produce food products, produce Antibiotics, synthesize chemicals that our body needs, as test organisms, prevent potential pathogens, Insect Pest Control, Bioremediation, Genetic Engineering. With this exposure, students can be employed in testing/pathology laboratories alternatively.

Course No: ZOO 303A: Fish Taxonomy & Biology and Oceanography

Course outcome: A sustainable approach to fisheries and aquaculture will help to protect our natural resources and ensure that fish stocks are available for future generations. Currently, overfishing, ineffective management practices, industrial development and agricultural pollution have reduced fish stocks.

Course No: ZOO 303B: Biodiversity & Conservation Ecology and Aquatic Ecology

Course outcome: 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 Ecological but also on modern developments in the sphere of ecological sciences: system, mathematical, molecular, urban, restoration and aquatic ecology.

Course No: ZOO 303C: Genetics and Molecular Biology

Course outcome: The course will acquaint the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology. A sound knowledge on methodological repertoire allows students to innovatively apply these in basic and applied fields of biological research. Students will introduced to properties, application and limitation of versatile DNA modifying enzymes, gene cloning, sequencing and genetic transformation etc. This course may be deemed as a foundation course serving as a platform for introduction of more advanced cutting-edge technologies that essentially are an amalgamation of basic techniques combined in diverse forms of modern applications. Understand and apply the principles and techniques of molecular biology which prepares students for further education and/or employment in teaching, basic research, or the health professions.

Course No: ZOO 303D: Diversity & Biology of Parasite and Immunoparasitology

Course outcome: The course will acquaint the students to understand host parasite interactions, complement activation, mode of recognition by TLR and its signaling, hypersensitivity with special reference to asthma. The course will enlightened the students regarding different modern diagnostic methods to identify parasitic infections. Vector biology and epidemiology will be another focus to know the propensity of the vector borne diseases and proper formation of vector control.

Course No: C-ZOO 304: Genetics and Haematology

Genetics

Course outcome: The course will provide an understanding of genetic analysis at the gene, genome and population levels. Understanding the Drosophila genetics. Evaluation of the various aspects of structural, functional and comparative genomics. Designing and

development of experiments using *Drosophila* and their evaluation through genetic analysis and interpretations.

Haematology

Course outcome: The course will provide a reflection of physiological homeostasis of human.

2 nd YEAR SEMESTER- IV

Course No: ZOO 401: Environmental Pollution & Management and Biostatistics

Environmental Pollution & Management

Course outcome: The students would be provided with current status of environmental pollution and global environmental change. The course would cover biodiversity: status, monitoring and documentation; major drivers of biodiversity change and biodiversity management approaches.

Biostatistics

Course outcome: To learn about key biostatistical concepts and efficient tools for summarizing and plotting data, make decisions in the presence of uncertainty. Student will be acquainted with parametric and nonparametric statistics, sample and data. The will be able to understand t test, Chi square, correlation, regression and anova.

Course No: ZOO 402: Developmental Biology and Neuroendocrinology

Developmental Biology

Course outcome: The course will provide a broad area from embryology to developmental biology. The students will be able to understand the embryonic development, reproductive function and fertilization.

Neuroendocrinology

Course outcome: The course will provide an understanding of basic concept of neural system. Students would be acquainted with electrical signaling and mechanism. The course will cover evolutionary perspective nervous system, functional organization of the CNS and endocrine disorder .

Aquaculture & Fish Technology and Inland & Marine fisheries

Course outcome: A sustainable approach to fisheries and aquaculture will help to protect our natural resources and ensure that fish stocks are available for future generations. Currently, overfishing, ineffective management practices, industrial development and agricultural pollution have reduced fish stocks.

Course No: ZOO 403B: Systems Ecology & Human Ecology

Systems Ecology

Course outcome: 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 Ecological but also on modern developments in the sphere of ecological sciences: system, mathematical, molecular, urban, restoration and aquatic ecology.

Course No: ZOO 403C: Genetic diseases & Molecular Analysis and Applied Genetics

Course outcome: The course will acquaint the students to versatile tools and techniques employed in genetic engineering and recombinant DNA technology. A sound knowledge on methodological repertoire allows students to innovatively apply these in basic and applied fields of biological research. Students will be introduced to properties, application and limitation of versatile DNA modifying enzymes, gene cloning, sequencing and genetic transformation etc. This course may be deemed as a foundation course serving as a platform for introduction of more advanced cutting-edge technologies that essentially are an amalgamation of basic techniques combined in diverse forms of modern applications. Understand and apply the principles and techniques of molecular biology which prepares students for further education and/or employment in teaching, basic research, or the health professions.

Course No: ZOO 403D: Vector Biology & Vector borne Parasites and Molecular Diagnosis & Clinical Parasitology

Course outcome: The course will acquaint the students to understand host parasite interactions, complement activation, mode of recognition by TLR and its signaling, hypersensitivity with special reference to asthma. The course will enlighten the students

regarding different modern diagnostic methods to identify parasitic infections. Vector biology and epidemiology will be another focus to know the propensity of the vector borne diseases and proper formation of vector control.

PROJECT/DISSERTATION

Course outcome: Project report should include introduction, methodology, techniques, results, discussion and bibliography. Institutional and study tour report emphasizing theoretical aspects should be included. Evaluation of the project report and viva-voce will be open defense type through PowerPoint presentation and evaluated by external examiner.