

Department of Zoology, Sonamukhi College PO, PSO, CO

SONAMUKHI COLLEGE

DEPARTMENT OF ZOOLOGY

**Programme Outcome, Programme Specific Outcome and
Course Outcome for B.Sc. Core (CBCS Pattern) in Zoology**

Affiliated to Bankura University

2020-21

Programme Outcomes

After successful completion of 6 Semesters with Zoology as Core subject a student should be able to:-		
P O	Programme Outcome	Description
PO. 1	Proper knowledge in different fields of Zoology	Students are expected to learn the fundamental concepts, principles and processes underlying the academic field of Zoology and its different subfields (animal diversity, principles of ecology, comparative anatomy and developmental biology of vertebrates, physiology and biochemistry, genetics and evolutionary biology, animal biotechnology, applied Zoology, aquatic biology, immunology, reproductive biology, and insect, vectors and diseases, apiculture, aquarium fish keeping, medical diagnostics, and sericulture).
PO.2	Development of Professional skills in Zoology	To develop the basics of professional skills in the field of Zoology and related fields such as, apiculture, aquarium fish keeping, medical diagnostics, and sericulture as well as skills related to specialization areas within Zoology as well as within subfields of Zoology, including broader interdisciplinary subfields (Chemistry, Physics and Mathematics).
PO.3	Scientific endeavor	The student will be able to find differences within the same breed of an animal species and will develop fundamental knowledge in other related branches of animal science.
PO.4	Environmental awareness	Students will be able to explain the complexity of life processes and their molecular, cellular and physiological basis and their interrelationships with the environment.
PO.5	Design and conduct experiments to test a	The programme will fortify the students to design and conduct experiments to test a hypothesis, to understand and interpret data

	hypothesis	to reach a conclusion as well as to understand the scientific principles underlying animal health, management and welfare.
PO. 6	Acquaintance with recent developments in related fields	To help the students for development of essential academic skills like critical thinking, analytical reasoning, research skills, basic laboratory and analytical skills, use of effective methods, participating in various programmes, statistical analysis of data gained from experiments, citing & referencing work appropriately.
PO. 7	Development of Job opportunity	To empower the students for getting an employment in their relevant discipline or to succeed in further study such as higher degrees or research activities.

Programme Specific Outcomes

PSO	Description
PSO. 1	The core courses would fortify the students with in-depth subject knowledge
PSO. 2	The discipline specific electives will add additional knowledge about applied aspects of the programme as well as its applicability in both academia and industry.
PSO. 3	The skill enhancement courses would further add additional skills related to the subject as well as other than subject.
PSO. 4	The students graduated with this type of curriculum would be able to disseminate subject knowledge along with necessary skills to suffice their capabilities for academia, entrepreneurship and Industry
PSO. 5	Students will be capable of identifying various Invertebrate and Vertebrate fauna and their classification as well as to understand the relations among these organisms with an evolutionary perspective
PSO. 6	Students will be capable of explaining the process of evolution (unicellular cells to complex, multicellular organisms)
PSO. 7	Students will be able to analyze and solve the problems related to animal sciences without relying on assumptions and guesses.
PSO. 8	Students will be able to make solutions of biological problems by experimentation and subsequent data processing by modern technologies and computer applications.
PSO. 9	The programme will fortify the students to develop fundamental knowledge in biodiversity and their conservation, pollution of environment and their control measures.

PSO. 10	They will be able to understand the basic zoological principles with critical understanding and analytical skills as well as to develop effective methods for experimentation and problem solving.
PSO. 11	The programme will help the students to learn the safety measures in animal handling and management programmes in laboratories
PSO. 12	Students will be able to learn the field survey for ecological studies as well as they will be capable of designing precise experimental setup for studying animal behaviour.
PSO. 13	The programme will strengthen the students for developing laboratory skills for Genetics and Molecular Biology. The laboratory programme will enable them to learn the techniques for the qualitative as well as quantitative assays of biomolecules.
PSO. 14	They will understand the importance and role of biodiversity and can recognize the economically important animals around us
PSO. 15	Students will be able to learn about different diseases, causative organisms, parasites, hosts, vectors as well as the basic principles of immunology including vaccinations and genetic basis of several diseases like cancer.

Course Outcomes of B. Sc. Zoology

Papers	Title	Course outcome
Course Outcomes of B. Sc. Zoology (Core) Semester-I		
CT-1	Non-chordates I	Students will be able to identify the non chordate organisms with an emphasis on animals and be able to classify them within a phylogenetic framework. Students will be able to compare and contrast the characteristics of animals that differentiate them from other forms of life and skill in the fundamental principles of Taxonomy, Systematics and some Invertebrate phyla (Protozoa to Nematoda) and will understand the basic biology and complex interactions among various living organisms.
CT-2	Perspectives In Ecology	Students will be able to gather information on ecosystem, population, community, energy flow and biogeochemical cycle. A special unit is also introduced through which students will be able to know about conservation strategy.
CP-1	Non-chordates I Lab	Students will be able to study the parameters of aquatic ecosystem and can measure the biodiversity indices of a population. In this paper an excursion is also included as a part of lab to land visit.

CP-2	Perspectives In Ecology Lab	Students will able to study the parameters of aquatic ecosystem and can measure the biodiversity indices of a population.. Further, the students get a chance to visit a biodiversity rich land (National Park/Biodiversity Park/Wild life sanctuary) to enrich their knowledge.
GE T	Animal Diversity	The course considers a diverse range of chapters of Animal Diversity, through which students will be able to gather information on a wide range of fauna and will help them to learn their salient features and some basic structural organization with taxonomic details.
GE P	Animal Diversity Lab	This practical course will enable them to be familiarized with a wide range of Invertebrate and Vertebrate fauna and will help them to learn their salient features and some basic structural organization with taxonomic details.
Core T1	Animal Diversity	The course considers a diverse range of chapters of Animal Diversity, through which students will be able to gather information on a wide range of fauna and will help them to learn their salient features and some basic structural organization with taxonomic details.
Core T1	Animal Diversity Lab	The course will allow them to learn about a wide range of Invertebrate and Vertebrate fauna and will help them to learn their salient features and some basic structural organization with taxonomic details.
Course Outcomes of B. Sc. Zoology (Core) Semester-I I		
CT-3	Non-chordates II	The course enables the students to gather information on some Invertebrate kingdoms and Phylum (Annelida to Echinodermata) and Hemichordata.
CT-4	Cell-Biology	Students will be able to gather information on cell and details about cellular organelle and plasma membrane. Students will also gather information on Cell cycle, Apoptosis and cancer.
CP-3	Non-chordates II Lab	Students will able to gather the information about the identification of various Invertebrates specimens along with tissue preparation, mounting, staining and also know how to prepare a project report on any larval forms.
CP-4	Cell-Biology Lab	This practical course will enable them to be familiarized with the student's light microscope and stereo-binocular microscope, preparation of various stains, preparation and identification of various stages of mitosis and meiosis as well as permanent slides of Barr body from cheek epithelium.

GE T2	Aquatic Biology	The theory course would fortify the students with in-depth subject knowledge about aquatic organisms as well as marine biology and management of aquatic resources.
GE P2	Aquatic Biology Lab	This practical course will enable them to identify the important zooplanktons present in a lake ecosystem and to determine the amount of Turbidity/transparency, dissolved Oxygen, and Free Carbon dioxide, alkalinity in water collected from a water body.
Prog Core T2	Comparative anatomy and Dev. Biology of Vertebrate	The course considers a diverse range of chapters of Comparative anatomy and Developmental Biology of Vertebrate, through which students will be able to gather information on the fundamental concepts in these subjects.
Prog Core P2	Comparative anatomy and Dev. Biology of Vertebrate Lab	This practical course will enable them to learn about osteology, identification of limb bones and girdles of Vertebrates as well as identification of their developmental stages.

Course Outcomes of B. Sc. Zoology (Core) Semester-III

CT-5	Diversity of Chordates	The course would strengthen the students with in-depth subject knowledge about the world of Chordates, their classification, and some important features of them in details
CT-6	Animal physiology controlling & Coordinating Systems	This core course will provide the students better understanding of the basics of animal physiology including the structure and functions of epithelial, connective, muscular and nervous tissue, histology of reproductive System as well as basic concept of the endocrine system and the mechanism of hormone action.
CT-7	Fundamentals of Biochemistry	Fundamentals of Biochemistry course provides knowledge of basic principles and mechanism of biochemistry including structure and importance of biological macromolecules like carbohydrates, protein, lipid, nucleic acid as well as the basic understanding of enzyme function, kinetics and oxidative phosphorylation in mitochondrial matrix.
CP-5	Diversity of Chordates lab	This course provides students to identify the diverse animal specimens from Agnatha to Mammals, along with dissection of pecten from fowl head and pituitary of fish.

CP-6	Animal Physiology: Controlling & Coordinating Systems lab.	This practical course will fortify the students with in-depth practical skills in microtomy, slide preparation of mammalian tissue, recording of simple muscle twitch by Kymograph as well as identification of histological slides of various Mammalian tissue section.
CP-7	Fundamentals of Biochemistry lab	This practical course on Biochemistry will enable students to learn a number of experimental techniques like qualitative test of functional groups in biological macromolecules, quantitative estimation of protein, basic principles of paper chromatography of amino acid as well as estimation of enzymatic activity.
SECT	Apiculture	This Apiculture course provides knowledge on biology of bees, Social Organization of Bee Colony, Rearing of Bees, Methods of Extraction of Honey, diseases and enemies as well as Economic importance of Apiculture industry and its uses.
GE T3	Environment and Public Health	This course provides knowledge on sources of environmental hazards, hazard identification and accounting, climate change, pollution as well as waste management technologies.
GE P3	Environment and Public Health Lab	This practical course on Biochemistry will enable students to determine pH, Cl, SO ₄ , NO ₃ in soil and water samples from different locations by using soil and water testing kit
Prog Core T3	Physiology and Biochemistry	This course provides knowledge on basic principles of physiology and biochemistry including digestion, excretion, reproduction, neuroscience, metabolism as well as the basic understanding of enzyme function.
Prog Core P3	Physiology and Biochemistry Lab	This practical course on Biochemistry will enable students to learn a number of experimental techniques like qualitative test of functional groups in biological macromolecules, quantitative estimation of protein, as well as estimation of enzymatic activity.
Prog SEC-1	Apiculture (Economic Zoology)	This Apiculture course provides knowledge on biology of bees, Social Organization of Bee Colony, Rearing of Bees, Methods of Extraction of Honey, diseases and enemies as well as Economic importance of Apiculture industry and its uses.
Course Outcomes of B. Sc. Zoology (Core) Semester-IV		
CT-8	Comparative Anatomy of Vertebrates	The course would strengthen the students with in-depth subject knowledge in comparative anatomy of Vertebrate Integumentary System, Structure, Skeletal System, Digestive System, Respiratory System, Circulatory System.

CT-9	Animal Physiology: Life Sustaining System	The course will enable students to learn about basic principles Animal Physiology including physiology of digestion, respiration, circulation, heart.
CT-10	Immunology	This course on Immunology will allow students to learn about basic principles innate and adaptive Immunity, Antigenicity and immunogenicity, Immunoglobulins, Immunoassays, Major Histocompatibility Complex, Cytokines, Complement System.
CP-8	Comparative Anatomy of Vertebrates Lab	This practical course will enable students to identify disarticulated skeleton, skull and vertebrae of Toad, Pigeon and Guinea pig, carapace and plastron of turtle, to learn about staining and mounting of placoid, cycloid and ctenoid scales to develop basic skill in Vertebrate dissection.
CP-9	Animal Physiology: Life Sustaining System Lab	This practical course will enable students to enumerate the red blood cells and white blood cells using haemocytometer, estimation of haemoglobin using Sahli's haemoglobinometer, determination of ABO Blood group, preparation of haemin crystals and recording of blood pressure using a sphygmomanometer.
CP-10	Immunology Lab	This practical course will enable students to identify lymphoid organs of human, histological slides: T.S of spleen, thymus and lymph nodes, preparation of stained blood film to study various types of white blood cells and evaluation of clotting time and bleeding time of human blood
SECT	Sericulture	The course will enable students to study the fundamentals of sericulture including rearing of silk worms, biology of silk worms, processing and management of silk industry.
GE T4	Insect Vectors and Diseases	The course would strengthen the students with in-depth subject knowledge in Concept of Vectors, host-vector relationship, general features of insects as vectors, disease vectors and study of vector-borne diseases like Malaria, Dengue, Chikungunya, Filariasis, Leishmaniasis.
GE P4	Insect Vectors and Diseases Lab	This practical course will enable students to identify insect vectors through permanent slides or photographs, mounting of different kinds of mouth parts of insects and study of different diseases transmitted by above insect vectors.
Prog Core T4	Genetics and Evolutionary Biology	The course provides in-depth subject knowledge in Genetics and Evolutionary Biology including principles of inheritance, extension of Mendelian Genetics, Linkage, Crossing Over and Chromosomal Mapping, Mutations, Sex Determination, Geological time scale, Lamarckism, Darwinism, Neo-Darwinism, Modern Synthetic Theory.

Prog Core P4	Genetics and Evolutionary Biology Lab	This practical course will enable students to identify major group of fossils from models/ pictures, Human Karyotypes of Normal karyotype, Down, Klinefelter's, Turner, Cri-du-Chat syndrome as well as verifying the results of Mendelian Inheritance and gene interactions using Chi-square test.
SEC-2	Aquarium Fish Keeping	The course provides in-depth subject knowledge in Aquarium Fish Keeping including Exotic and Endemic species of Aquarium Fishes, Biology of Aquarium Fishes, Food and feeding of Aquarium fishes, Fish Transportation and maintenance of Aquarium.

Course Outcomes of B. Sc. Zoology (Core) Semester-V

CT-11	Molecular Biology	The course would strengthen the students with in-depth subject knowledge in molecular biology. Knowledge on DNA, its structure and functional aspects, RNA and its functions will be developed. Students will be able to gather information on the fundamental concepts like transcription, translation and the flow of genetic code from one generation to the other. Molecular techniques like PCR, western, Northern and Southern blot can generate appropriate knowledge in the students regarding application perspectives of the subject.
CT-12	Principles of genetics	This course provides knowledge about basic principles of genetics including linkage, crossing over and chromosome mapping. The structure and functions of transposable genetic elements and mode of sex determination in different organisms can be understood. Students can generate knowledge on extra-chromosomal mode of inheritance.
DSE-T1	Animal Behaviour and Chronobiology	This course provides knowledge about basic patterns of animal behaviour including orientation, reflexes, instinct and learned behavior. Students will learn about social and sexual behavior of different organisms in animal kingdom. The subject provides in depth knowledge about the biological rhythms and chronobiology can be gathered by students through this subject.
DSE-T2	Biology of Insecta	This course provides knowledge about insect taxonomy and role of insects in human welfare. Students can generate appropriate knowledge on general morphology and physiology of insects. The importance on insect plant interaction and social organization of insects can be incorporated in the minds of the students. Moreover studies on vector borne diseases can fortify the knowledge of students on importance on insect biology in medical sciences.

CP-11	Molecular biology Lab	This practical course will enable students to identify lampbrush chromosome, DNA replication, split gene and transcription. Students will be able to prepare polytene chromosome from larva of <i>Drosophila</i> and learn about microbiological culture media preparation and culture technique of microbes.
CP-12	Principles of genetics Lab	This practical course will enable students to identify the characteristic features of different syndromes of human. Students will be able to solve problems through chi-square analysis and pedigree analysis of humans. Students will gather proper knowledge on model organism <i>Drosophila</i> handling in the laboratory.
DSE-P1	Animal Behaviour and Chronobiology Lab	This practical course will enable students to learn geotaxis and phototaxis behavior of organisms. Students will gather knowledge on the nesting behavior of birds and circadian functions in humans. This course includes a study visit to zoological parks or sanctuaries to observe animal behavior that enables the prospect of field learning for students.
DSE-P2	Biology of Insecta Lab	This practical course will enable students to learn life cycle and different body parts of insects. This course includes learning of vital methods like collection, preservation, mounting of insects. Through the project report submission of this course, students will generate through knowledge on the morphological characters of different insect species.
Prog DSE-T2a	Insect vector and Disease	This course provides knowledge about concept of insect as vectors. Through this students can understand the role of Diptera, Siphonaptera, Siphuncula and Hemiptera as vectors of human diseases. This can fortify the knowledge of students on importance on insect biology in medical sciences.
Prog SEC-T3	Sericulture (Economic Zoology)	This course provides knowledge about concept of types of silkworms and their exotic and indigenous races. Through this, students can understand the biology and rearing methods of silkworm, their different diseases and control measures. The studies on entrepreneurship in sericulture can open new thoughts in the minds of students regarding sericulture as a means of self income generation.
Prog DSE P2a	Insect Vectors and Diseases	This practical course will enable students to learn the mounting of moth parts of different insects, study different insect vectors and the diseases transmitted by them. Through the project report submission of this course students will generate through knowledge on one insect vector of their choice and the transmitted disease.

Course Outcomes of B. Sc. Zoology (Core) Semester-VI		
CT-13	Developmental biology	The course provides in-depth subject knowledge about early embryonic development of frog and chick and the mode of fertilization in humans. This course includes study of early embryonic and late embryonic development of organs that clears the knowledge of students on several aspects of embryology. Most importantly studies on application perspectives of embryology like IVF, stem cell therapy and amniocentesis that help them in generating practical knowledge of the subject.
CT-14	Evolutionary Biology	The course provides in-depth subject knowledge about Lamarckism, Darwinism and the concept of geological time scale. Students can come to know the sources of heritable variations, population genetics and genetic drift mechanisms. The concept of species, adaptive radiation and phylogenetic trees will enrich the understanding of students about this course.
DSE -T3	Endocrinology	The course provides detailed knowledge about the control of hormonal regulation in human system. Students can come to know the peripheral endocrine glands and their physiological role. The study of mechanisms of hormone action will enrich the subject understanding of students. Study of different bioassays like RIA and ELISA will fortify the knowledge of students from a practical perspective.
DSE -T4	Fish and Fisheries	The course provides detailed knowledge about the characteristic features of fishes and the inland and marine fisheries. Students can come to know the different modes of fish culture and their role in economy. The application of remote sensing and GIS in fisheries opens up the understanding of students regarding modern technologies in the subject. The role of fish as an experimental model enriches the importance of this subject for human welfare.
CP-13	Developmental Biology Lab	This practical course will enable students to identify the different developmental stages of organisms like Chick and Drosophila. Students will be able to identify the different sections of placenta and the practical project work on Drosophila/Chick development will help them in gathering hands on knowledge on developmental biology.
CP-14	Evolutionary Biology Lab	This practical course will enable students to learn the different fossil records in human evolution. This course includes learning of Hardy-Weinberg principle and its validation through Chi-square analysis. Practical knowledge in students can be generated through live models for homologous and analogous organs.

DSE-P3	Endocrinology Lab	This practical course will enable students to learn the location and identification of endocrine glands of laboratory model organism. Practical experience on tissue fixation and microtomy will enable great skills in them. The demonstration of ELISA methodology will enable them to gather important knowledge on a vital diagnostic technique.
DSE-P4	Fish and Fisheries Lab	This practical course will enable students to identify different inland and marine fishes and their different types of scales. Students will come to learn the estimation of water quality parameters. Practical dissection of breathing organs of fishes will help them to understand fish anatomy. This course includes field visit to a fish-farm that enables students to gather practical knowledge on fish rearing.
Prog DSET-2b	Aquatic biology	The course provides detailed knowledge about the aquatic biomes, freshwater biology, marine biology and the management of aquatic resources. The knowledge on water quality assessment can help the students in understanding the pollution aspects that need control in the scenario of India.
Prog SEC-T4	Medical Techniques	From this course students can learn about the diagnostic methods used for analysis of blood and urine sample. The knowledge on non-infectious and infectious diseases will help the students to understand the detection of such medical concerns. Studies on clinical biochemistry like LFT, lipid profiling will create practical knowledge in the minds of students regarding diagnostic methods.
Prog DSE P2b	Aquatic Biology lab	Through this practical course, students can come to know the important phyto and zooplanktons present in lake ecosystem. They can learn to determine the water quality parameters and the instruments used in limnology. The project report on a fisheries institute will not give them practical exposure but also enrich their knowledge on fish culture.