

Department of Zoology

Pandu College

B.Sc. in Zoology (CBCS)

PROGRAMME OUTCOMES

- Broad knowledge of animal diversity, including scientific classification; evolutionary relationships among the animals and the adaptations among animals.
- Understanding of ecology and relationship between biological, chemical and physical factors of the environment; the need of wildlife conservation and management.
- Understanding of how organisms' function at the level of the gene, genome, cell, tissue, organ and organ-system. Drawing upon this knowledge, they are able to study the histology and comprehend the comparative anatomy of the organisms.
- Understanding of the development, growth, reproduction, various structural and physiological adaptations as well as behaviour of different forms of animal life.
- Understanding the relationships between structure and functions at different levels of biological organization (e.g., molecules, cells, organs, organisms, populations, and species) in animals and their coordinated function (Physiological, Biochemical, Endocrine and Immune system).
- Understanding the Biological Techniques, Bioinformatics and the application of statistics in biological science.
- Understanding of the applied biological sciences or economic Zoology such as sericulture, apiculture, aquaculture, lac culture, pest and its management for their career opportunities.
- Make able to think logically from the knowledge gathered undertaking research project, assimilate and analysis of the data and ideas and concluding in the form of project report.

BSc Zoology Syllabus (CBCS)

Semester	Course Code	Course Name	Course Outcome
I	ZOO-HC-1016	Non-Chordates	CO 1: Students will be familiar with the non chordates up to Annelida that surround us. CO 2: The course will enable the students to understand the process of evolution (unicellular cells to complex Multicellular organisms). CO 3: At the end of the course, the students are expected to be able to identify the invertebrates and classify them up to the class level with the basis of systematic. CO 4: The course will enable students to understand the basis of life processes in the

			selected species of non chordates and recognize the economically important invertebrate fauna
		Practical	Prepare whole mount, life cycle of various organism included under above mentioned kingdoms and phyla
	ZOO-HC-1026	Principle of Ecology	<p>CO 1: Know the evolutionary and functional basis of animal ecology.</p> <p>CO 2: Understand what makes the scientific study of animal ecology a crucial and exciting endeavour.</p> <p>CO 3: Engage in field-based research activities to understand well the theoretical aspects taught besides learning techniques for gathering data in the field.</p> <p>CO 4: Analyse a biological problem, derive testable hypotheses and then design experiments and put the tests into practice.</p> <p>CO 5: Solve the environmental problems involving interaction of humans and natural systems at local or global level.</p> <p>CO 6: Understand, anticipate, analyse and evaluate natural resource issues and act on a lifestyle that conserves nature.</p> <p>CO 7: Understand and appreciate the diversity of ecosystems and apply beyond the syllabi to understand the local lifestyle and problems of the community.</p> <p>CO 8: Link the intricacies of food chains, food webs and link it with human life for its betterment and for non-exploitation of the biotic and abiotic components.</p> <p>CO 9: Develop leadership skills among them to promote betterment of the environment.</p>
		Practical	Through the practical study Students will come to know about the practical use of various population characteristics, community and ecosystem services. Visit to National park/ Biodiversity Park/wildlife sanctuaries will give them live study of ecology.
	ZOO-HG-1016/ZOO-RC-1016	Animal Diversity	<p>CO 1: Develop understanding on the diversity of life with regard to protists, non-chordates and chordates.</p> <p>CO 2: Group animals on the basis of their morphological characteristics/ structures and to understand the differences and similarities in the various aspects of classification.</p> <p>CO 3: Develop critical understanding of how animals changed from a primitive cell to a</p>

			collection of simple cells to form a complex body plan. CO 4: Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree.
		Practical	Students will learn to identify different specimens. They will also learn to identify poisonous and non-poisonous snakes.
II	ZOO-HC-2016	Non-Chordates II: Coelomates	Understand the diversity and classification and functional aspects of different systems of phylum Annelida, Arthropoda, Mollusca and Echinodermata.
		Practical	Students are able to understand about the museum specimen, anatomical and morphological structure and preparation of slide.
	ZOO-HC-2026	Cell Biology	CO 1: Understand the functioning of nucleus and extra nuclear organelles and understand the intricate cellular mechanisms involved. CO 2: Understand the structure of cells and cell organelles. CO 3: Describe the composition and comparison of prokaryotic and eukaryotic cells. CO 4: Understand the structure and functions of chromosomes; mitotic and meiotic cell divisions and their significance. CO 5: Explain the cell cycle, cell signalling and their regulation
		Practical	Students are able to understand about the preparation of various stains and fixatives, determination of protein, mucopolysaccharides.
	ZOO-HG-2016 ZOO-RC-2016	Comparative anatomy & developmental biology of Vertebrates	CO 1: Get ample knowledge about the comparative structures of heart, aortic arches, kidney, balancing organ, hearing organ, respiratory organs, brain of different animals. CO 2: Gain knowledge of functional anatomy of the organ system. CO 3: Understand the evolution and changes that occur in each organ system of organisms according to their need and environment. CO 4: Understand the mechanism of pre and post embryonic development of mammals and their control system
		Practical	Students will learn about developmental stages of frogs through permanent slides, will study about different types of placenta through permanent slides etc.
III	ZOO-HC-3016	Diversity of Chordata	CO 1: Describe the diversity in form, structure and habits of chordates.

			CO 2: Explain general characteristics and classification of different classes of vertebrates. CO 3: Get the knowledge on ecology of some important fishes, amphibians, reptiles, birds and mammals.
		Practical	Students are able to understand about the general characteristics, classification, animal distribution.
	ZOO-HC-3026	Animal Physiology: Controlling and Coordinating Systems	Students are able to understand the entire animal's functions of the body which includes nutrition., respiration, heart, excretion, nerve physiology etc
		Practical	Students are able to understand and learned about the various microscopic procedures including microtomy, permanent slides study
	ZOO-HC-3036	Fundamentals of Biochemistry	CO 1: Understand about the importance and scope of biochemistry. CO 2: Understand the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids. CO 3: Understand the structure and function of immunoglobulins. CO 4: Understand the concept of enzyme, its mechanism of action and regulation. CO 5: Learn the preparation of models of peptides and nucleotides. CO 6: Learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.
		Practical	Students are able to understand and learned various technique of separation and determination of protein, lipid, carbohydrates etc.
	ZOO-SE-3014	Ornamental Fish & Fisheries	CO 1: Described the ornamental fish and their diversity in NE India. CO 2: Understand the various type's aquatic plants necessary for aquaculture practices. CO 3: Understand the physiology and Reproductive mechanisms of ornamental fishes. CO 4: Understand the modern techniques and methods of aquarium preparation and maintenance. CO 5: Get the knowledge of ornamental fish breeding which is a highly professional and attractive avenue for youth.
		Practical	Students will learn about different ornamental fishes, their maintenance etc. They will also learn to make and maintain aquarium
	ZOO-HG-3016	Physiology And	CO 1: Understand the entire animal's functions of the body. It includes Digestion, Excretion,

	ZOO-RC-3016	Biochemistry	<p>Respiration, Cardiovascular, Reproductive and Endocrine etc in which all structure, function, process and control are studied.</p> <p>CO 2: Explain various aspects of physiological activities of animals with special reference to humans.</p> <p>CO 3: Explain the various mechanisms of carbohydrate, protein, lipid metabolism and enzyme action.</p> <p>CO 4: Explain the basic principles of biochemistry and bioenergetics useful for biological studies for illustrating different structures, function and metabolism.</p>
		Practical	<p>Students will learn about preparation of hemin crystals, will examine histological sections of mammalian endocrine glands. They will learn to perform qualitative tests to identify functional groups of carbohydrate, and to estimate total protein in a given solution.</p>
IV	ZOO-HC-4016	Comparative Anatomy of Vertebrates	<p>CO 1: Develop an understanding of the characters used to classify besides being able to differentiate the organisms belonging to different taxa.</p> <p>CO 2: Realise that very similar physiological mechanisms are used in diverse organisms.</p> <p>CO 3: Get ample knowledge about the comparative account of Integumentary system, Skeletal system, Digestive system, Respiratory system, Circulatory system, Urinogenital system, Nervous system, Sense Organ, aortic arches, kidney, balancing organ, hearing organ, respiratory organs, brain of different, animals.</p> <p>CO 4: Gain knowledge of functional anatomy of the organ system.</p> <p>CO 5: Understand the evolution and changes that occur in each organ system of organisms according to their need and environment.</p>
		Practical	<p>Students are able to understand and learned various skeletal parts of different organisms and their structural component.</p>
	ZOO-HC-4026	Animal Physiology: Life Sustaining Systems	<p>CO 1: Understand the basic functions of the body with reference to humans. It includes Digestion, Excretion, Respiration, Cardiovascular, etc in which all structure, function, process and control are studied.</p> <p>CO 2: Explain various aspects of Physiological activities of animals with special reference to human.</p> <p>CO 3: Understand the details of blood composition, blood corpuscles type structure function, blood groups, blood coagulation etc.</p>

			CO 4: Students gain fundamental knowledge of the physiology of homeostasis.
		Practical	Students will learn about determination of ABO blood group, enumeration of RBCs and WBCs, preparation of haemin crystals. They will also learn to record blood pressure using a Sphygmomanometer
	ZOO-HC-4036	Biochemistry of Metabolic Processes	CO 1: Explain the various mechanisms of carbohydrate, protein, lipid metabolism. CO 2: Explain the basic principles of biochemistry and bioenergetics useful for biological studies for illustrating different structures, function and metabolism. CO 3: Understand the interactions and interdependence of physiological and biochemical processes. CO 4: Explain various biochemical pathways involved in metabolic processes
		Practical	Students are able to learn various essays from serum and tissues.
	ZOO-SE-4024	Non-Mulberry Sericulture	CO 1: Describe Taxonomy and Systematic of different species of silkworms found in NE India. CO 2: Understand the physiology, anatomy and rearing of different non-mulberry silk worms. CO 3: Get the knowledge of food plants of Eri and Muga silk worms. CO 4: Know about the culture methods of Non mulberry silk
		Practical	Students will learn about life cycle of Muga & Eri silkworm. They will be able to identify different stages of life cycles, primary & secondary food plants, also will learn about different diseases.
	ZOO-HG-4016 ZOO-RC-4016	Genetics and Evolutionary Biology	CO 1: Students will comprehend the mechanisms and processes of evolution, including natural selection, genetic drift, gene flow, mutation, and speciation. CO 2: They'll be able to analyse genetic data, including pedigrees, DNA sequences, and genetic maps, using appropriate laboratory and computational techniques. CO 3: Understanding how genetic variation contributes to phenotypic diversity and its role in evolution, disease susceptibility, and human traits. CO 4: Applying genetic principles to understand genetic disorders, genetic engineering, and biotechnology. Student will learn about Mendelian Inheritance and Gene Interaction using suitable examples. They will study linkage,

			recombination and gene mapping using data, also will be able to identify
		Practical	Student will learn about Mendelian Inheritance and Gene Interaction using suitable examples. They will study linkage, recombination and gene mapping using data, also will be able to identify normal and abnormal human karyotypes.
	ZOO-HC-5016	Molecular Biology	<p>CO 1: Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario.</p> <p>CO 2: Get well versed in recombinant DNA technology which holds application in biomedical & genomic science, agriculture, environment management, etc. Therefore, a fundamental understanding of Molecular Biology will help in career building in all these fields.</p> <p>CO 3: Apply their knowledge in problem solving and future course of their career development in higher education and research.</p> <p>CO 4: Get new avenues of joining research in related areas such as therapeutic strategies or related opportunities in industry.</p> <p>CO 5: Understand the fundamentals of micro-molecular structures of cells like DNA, RNA, and Proteins etc.</p> <p>CO 6: Grasp the concept of molecular mechanisms like replication, transcription and translation both in prokaryotic and eukaryotic cells.</p> <p>CO 7: Learn the concept of post transcriptional and post translational modification for maturation of the end product.</p> <p>CO 8: Learn about the DNA repair mechanism and the regulation of gene expression.</p>
		Practical	Students are able to understand about the estimation of DNA, RNA and protein synthesis.
V	ZOO-HC-5026	Principles of Genetics	<p>CO 1: Learn & Apply the principles of Mendelian inheritance.</p> <p>CO 2: Understand the cause and effect of alterations in chromosome number and structure.</p> <p>CO 3: Students will learn about the chromosomal interactions like linkage, crossing over, recombination and chromosomal mapping.</p> <p>CO 4: Students will understand the different types of genetic mutation, their causes and transmission.</p> <p>CO 5: The course will enable students to learn about types of inheritance of genetic information generation after generation.</p>

			CO 6: Relate the conventional and molecular methods for gene detection of gene mutation. CO 7: Discuss and analyse the epigenetic modifications and imprinting and its role in diseases.
		Practical	Students are able to learn about the pedigree analysis, gene interaction study.
	ZOO-HE-5016	Computational Biology And Biostatistics	CO 1: Know the theory behind fundamental Bioinformatics analysis methods. CO 2: Be familiar with widely used bioinformatics databases. CO 3: Know basic concepts of probability and statistics. CO 4: Describe statistical methods and probability distributions relevant for molecular biology data. CO 5: Know the applications and limitations of different bioinformatics and statistical methods. CO 6: Develop understanding in primer designing.
		Practical	Students will be able to perform and interpret bioinformatics and statistical analyses with real molecular biology data.
	ZOO-HE-5036	Endocrinology	CO 1: Students will understand neurohormones and neurosecretions. Students will have the understanding of the history of endocrinology, classification and characteristics of different endocrine glands. CO 2: Learn about hypothalamic and hypophysial axis. CO 3: Students will gain knowledge about the structure, secretion and functions of pineal gland, hypothalamus, and pituitary gland & understand about different endocrine glands and their disorders. CO 4: Students will gain knowledge about the structure, secretion, functions and disorders of several other peripheral glands and about hormone action. CO 5: The students will learn the genetic control and regulation of hormone action at the cellular level.
		Practical	Students will learn to dissect and display endocrine glands in laboratory breed rat. They will be able to identify and differentiate different glands, also be able to design primers for hormones.
	ZOO-RE-5026	Applied Zoology	CO 1: Students will have an understanding of the

			<p>different types of interaction among the host and parasites.</p> <p>CO 2: Students will gain knowledge about the mode of transmission, prevention and control of different diseases caused by bacteria, protozoa, helminthes.</p> <p>CO 3: Students will gain knowledge about the economic and medical importance of some insects associated with human life.</p> <p>CO 4: The students will learn basic techniques of animal husbandry, poultry farming and fish technology.</p>
		Practical	<p>Student will learn about life stages of Plasmodium, Entamoeba etc. through permanent slides. They will also study about Arthropod vectors associated with human diseases.</p>
VI	ZOO-HC-6016	Developmental Biology	<p>CO 1: Get basic concepts of development, pattern formation, growth, differentiation and gene expression.</p> <p>CO 2: Gain knowledge of early embryonic development, late embryonic and post embryonic developmental changes in different organisms & develop critical understanding how a single celled fertilised egg becomes an embryo and then a fully formed adult by going through three important processes of cell division, cell differentiation and morphogenesis.</p> <p>CO 3: Understand how developmental processes and gene functions within a particular tissue or organism can provide insight into functions of other tissues and organisms.</p> <p>CO 4: Realise that very similar mechanisms are used in very diverse organisms; and development is controlled through molecular changes resulting in variation in the expression and function of gene networks.</p> <p>CO 5: Gain knowledge about teratogenic agents and their effects on embryonic development</p> <p>CO 6: Acquire ample knowledge about in vitro fertilisation, Stem cell culture and amniocentesis.</p>
		Practical	<p>Students will be able to learn different developmental stages through microscopic study of permanent slides and also from culture-based study of certain animals</p>
	ZOO-HC-6026	Evolutionary Biology	<p>CO 1: Understand the origin of life, Chemogeny, Biogeny, Origin of photosynthesis etc.</p> <p>CO 2: Describe the fundamental theories of evolution like Lamarckism, Darwinism, Neo-Darwinism.</p>

			<p>CO 3: Aware of the various evidence of evolution and the roles of evidence in evolution and the product of evolution.</p> <p>CO 4: Get the knowledge of molecular analysis of human origin and evolution, construction and interpretation of phylogenetic tree.</p>
		Practical	Students will be given the opportunity to learn about fossils from models and pictures. They will learn about homology and analogy from suitable specimens.
	ZOO-HE-6026	Fish and fisheries	Students will learn about different fish & fisheries of Assam.
	ZOO-HE-6056	Dissertation	<p>CO 1: Students will be able to do small scale research work by themselves.</p> <p>CO 2: The course will give a comprehensive introduction to data collection, data analysis and presentation in the form of a report or research paper.</p> <p>CO 3: The course will give an overview on field survey and scientific data collection.</p> <p>CO 4: Students will have the idea of performing time bound scientific research work and writing reports or dissertations.</p>