Department of Zoology

Suren Das College, Hajo, Kamrup, Assam

Program Outcome, Program Specific Outcome & Course Outcome

CBCS Core, SEC & DSE-Course under Gauhati University

B. Sc. Zoology (HONOURS)

PROGRAM OUTCOMES (POS)

Department of Zoology	After successfully completion of three years degree program in Zoology under, a student should be able to
Program Outcomes (POs)	**POs-1.** Students enrolled in B.Sc. (Hons.) CBCS degree program in Zoology will study and acquire complete knowledge of disciplinary as well as allied biological sciences. At the end of graduation, they should possess expertise which will provide them competitive advantage in pursuing higher studies from India or abroad; and seek jobs in academia, research or industries. **POs-2.** To impart basic knowledge of various disciplines of Zoology and General biology meant for a graduate and make them understand the unity of life with the rich diversity of organisms and their ecological significances. **POs-3.** To inculcate interest in nature and its living creatures, enable them to describe economic, ecological and medical significance of various animals in human life and impart awareness for the conservation of the biosphere **POs-4.** To acquire basic skills in the observation and study of nature, biological techniques, experimental skills and scientific investigation. **POs-5.** To inculcate the scientific temperament in the students and outside the scientific community. **POs-6.** Inculcate a holistic approach towards amalgamating and applying the acquired knowledge, ideas and views towards formulating a model that would not only encourage financial stability of the person concerned but also generate employability and strengthen the socioeconomic aspect of a region or locality as a whole.

COURSE CONTENT (HONOURS-CBCS)

Semester-I

ZOO-HC-1016: Non-chordates 1:Protista to Pseudocoelomates (Credits: Theory-04, Lab-02)

ZOO-HC-1026: Principles of Ecology (Credits: Theory-04, Lab-02)

Semester-II

ZOO-HC-2016: Non-chordates II:Coelomates (Credits: Theory-04, Lab-02)

ZOO-HC-2026: Cell Biology (Credits: Theory-04, Lab-02)

Semester-III

ZOO-HC-3016: Diversity Of Chordates (Credits: Theory-04, Lab-02)

ZOO-HC-3026: Physiology: Controlling and Coordinating Systems (Credits: Theory-04, Practicals-02)

ZOO-HC-3036: Fundamentals Of Biochemistry (Credits: Theory-04, Lab-02)

ZOO-SE-3024: Apiculture (Credits: 04)

Semester-IV

ZOO-HC-4016: Comparative Anatomy Of Vertebrate (Credits: Theory-04, Lab-02)

ZOO-HC-4026: Physiology: Life Sustaining (Credits: Theory-04, Lab-02)

ZOO-HC-4036: Biochemistry Of Metabolic Process (Credits: Theory-04, Lab-02)

ZOO-SE-4014: Non-Mulberry Sericulture (Credits: 04)

Semester-V

ZOO-HC-5016: Developmental Biology (Credits: Theory-04, Lab-02)

ZOO-HC-5026: Evolutionary Biology (Credits: Theory-04, Lab-02)

ZOO-HE-5016: Computational Biology And Biostatistics (Credits: Theory-04, Lab -02)

ZOO-HE-5036: Endocrinology (Credits: Theory-04, Lab -02)

Semester-VI

ZOO-HC-6016: Developmental Biology (Credits: Theory-04, Lab-02)

ZOO-HC-6026: Evolutionary Biology (Credits: Theory-04, Lab -02)

ZOO-HE-6026: Fish And Fisheries (Credits: Theory-04, Lab -02)

ZOO-HE-6056: Dissertation (Credits: Theory-04, Lab -02)

PROGRAMME SPECIFIC OUTCOMES

Programme Specific Outcomes (PSOs)	**PSOs-1.** To explain physiological and biochemical activities and its impact on human bodies **PSOs-2.** To provide a platform for classical genetics in order to understand distribution or inheritance of different traits and diseases among populations, their ethnicity and correlate with contemporary and modern techniques like genomics, metagenomics, genome editing and molecular diagnostic tools **PSOs-3.** To identify and understand vertebrate as well as invertebrate. **PSOs-4.** Make aware and handle the sophisticated instruments/ equipment's. **PSOs-5.** To increase in-depth Knowledge of the Core Areas and about the complexity of life systems. **PSOs-6.** To obtain knowledge in wildlife, specifically recognize the existing conservation issues with regards to both animal and environment and develop strategies to address these issues through ecologically sustainable methods. **PSOs-7.** To apply and analyse the various research techniques through minor dissertation projects, thus inculcating the fundamentals for future scientific studies. **PSOs-8.** To acquire practical skills in biotechnology, biostatistics, bioinformatics and molecular biology can be used to pursue career as a scientist in drug development industry in India or abroad.

COURSE OUTCOMES (ZOOLOGY CORE CBCS)

Semester-I	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-HC-1016: NON CHORDATES 1 : Prostista to Pseudocoelomates	**CO-1.** The students will develop understanding on the diversity of life with regard to protists, from the unicellular organisms to the psedocoelomate organisms. **CO-2.** The students will be enable to group animals on the basis of their morphological characteristics. **CO-3.** Develop a critical understanding that how animals changed from a primitive cell or a unicellular beings to a collection of simple cells to form a complex body plan**.** **CO-4.** Understand how morphological change due to change in environment helps drive evolution over a long period of time. **CO-5.** The practicals will also give them a idea of classification of the animals and the basis on which they are classified into groups or taxa.
ZOO-HC-1026: PRINCIPLES OF ECOLOGY	**CO-1.** The students will have a broad idea on the functional basis of ecology. **CO-2.** Understanding the various aspects of population dynamics and the various models used for population studies. **CO-3**. Engage in field-based research activities and praticals for the application of the theoretical aspects besides learning techniques for gathering data in the field. **CO-4.** Understand the basics of wildlife management, human – animal interaction. **CO-5.** The students will be able to analyse and solve the environmental problems involving human and natural interactions at local or global level.
Semester-II	
Course	**Outcome**(After completion of these courses students should be able to)

ZOO-HC-2016: NON CHORDATES II : Coelomates	**CO-1.** The students will learn about the true coelomate animals from phylum annelida to echinodermata. **CO-2.**Thestudents will gain knowledge on the different types of body plan and will learn about the grouping of animals based on morphological characters. **CO-3.** The students will develop an insight how the different morphological characters in different environments have lead to evolution in long run. **CO-4.** The course will help to identify the different unique characters of a particular phylum that distinguishes the phylum. **CO-5.**Have hands on experience of materials demonstrating the diversity of eucoelomates.
ZOO-HC-2026: CELL BIOLOGY	**CO-1.** Students will develop an insight into basic concepts of cellular structure and function. **CO-2.** Understand the function of nucleus and understand the intricate cellular mechanisms involved. **CO-3.** The students will develop an understanding on the different cell organelles and the various mechanisms involved in maintenance of the cell. **CO-4.** Acquire the detailed knowledge of different pathways related to cell signalling and cell death. **CO-5.** It also gives an account of the complex regulatory mechanisms that control cell function. **CO-6.** The students will have detailed knowledge on histology through study of temporary slides and permanent slides.
Semester-III	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-HC-3016: DIVERSITY OF CHORDATES:	**CO-1.**The students would be able to understand the basis of classification of animals into chordates. **CO-2.**Students will gain knowledge on protochordates, hemichordates and urochordates.

	CO-3. Students will be able to gain knowledge on the evolution of chordates through different theories. **CO-4.** They will acquire knowledge on the various classes of chordates from agnatha to mammalia. **CO-5.** The students will have insight on studies of zoogeography and the various concepts associated with it. **CO-6.** The students will gain knowledge on the morphology and characteristics of chordates through different museum specimens and animal model study
ZOO-HC-3026:PHYSIOLOGY Controlling and coordinating systems	**CO-1.** Acquire knowledge of the coordinated functioning of complex human body machine. **CO-2.** The students will be able to compare and realize similar physiological mechanisms that are seen in diverse organisms. **CO-3.** The students will learn about the various types of cells and the aggregation of cells into tissues. **CO-4.** The students will also be able to learn about the control and coordinating mechanisms in mammalian body and the various endocrine glands. **CO-5.** They will also be able to have an insight on the various life sustaining systems in an animal body.
ZOO-HC-3036:FUNDAMENTALS OF BIOCHEMISTRY	**CO-1.** The students will be able to understand about the importance and scope of biochemistry. . **CO-2.** They will be able to develop an insight on the structure and biological significance of carbohydrates, amino acids, proteins, lipids and nucleic acids **CO-3.** They will be able to understand the structure,types, functions of immunoglobulins. **CO-4.** The students will be able to understand the mechanism of enzyme action , functioning of enzymes, Michelis- Menten equation, plotting of different curves for the enzyme kinetics. **CO-5.** The students will also learn biochemical tests for amino acids, carbohydrates, proteins and nucleic acids.

	CO-6. The students will learn about the measurement of enzyme activity and its kinetics.
Semester-IV	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-HC-4016: COMPARATIVE ANATOMY OF VERTEBRATE	**CO-1.** Develop an understanding of the evolution of vertebrates thus integrating structure, function and development. **CO-2.**. Have an overview of the evolutionary concepts including homology and homoplasy, and detailed discussions of major organ systems. **CO-3.** They will develop an understanding on the different structure , function and evolutionary changes in the different systems of vertebrates. **CO-4.** The students will be able to develop a hands on experience on the different types of skeleton, its parts and its modifications. **CO-5.** The students will develop an insight on the different types of integuments and its modifications.
ZOO-HC-4026: PHYSIOLOGY : Life sustaining processes	**CO-1.**Students will gain knowledge on the various life sustaining processes in mammalian body. **CO-2.**Students will gain knowledge on the physiological processes of digestion, respiration and their regulation. **CO-3.**Students will be able to understand the renal physiology, components of blood and the various mechanisms associated with it. **CO-4.** The students will have a detailed idea on the cardiac system of the mammals. **CO-5.** The students will have hands on experience on blood grouping, blood pressure measurement, and estimation of haemoglobin. **CO-6.** They will develop an insight on the histological sections of the vital organs of the body.
ZOO-HC-4036: BIOCHEMISTRY OF METABOLIC PROCESSES	**CO-1.**In this course students will gain insights about the process of metabolism.

	CO-2. Students will also understand some very important topics such as carbohydrate metabolism, protein metabolism and lipid metabolism. **CO-3.**The students will also learn the various aspects of oxidative phosphorylation and mitochondrial respiration. **CO-4.**The students will also gain hand on experience on the estimation of biomolecules from a given sample. **CO-5.** The students will also gain practical knowledge on the estimation of enzymatic activity from biological samples.
Semester-V	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-HC-5016: MOLECULAR BIOLOGY	**CO-1.**Through this course the students are expected to Develop an understanding of concepts, mechanisms and evolutionary significance and relevance of molecular biology in the current scenario. **CO-2.** Students will learn about nucleic acids, its types and significance. **CO-3.**Students are introduced to the concepts of recombinant DNA technology which holds application in various aspects of biological sciences.
	CO-4. Students will also learn about the concepts of transcription and translation mechanisms. **CO-5.** Students will gain knowledge on the post transcriptional mechanisms, gene regulation, DNA repair mechanism and regulatory RNA. **CO-6.** The students will gain knowledge on the study of chromosomes, biochemical estimation of DNA and RNA.
ZOO-HC-5026: PRINCIPLES OF GENETICS	**CO-1.**The course helps in introducing the students to the main concepts of genes and heredity. **CO-2.** Understand how DNA encodes genetic information and the function of mRNA and tRNA. **CO-3.** Apply the principles of Mendelian inheritance

	CO-4. Understand the cause and effect of alterations in chromosome number and structure. **CO-5.** The students will have an idea on sex determination, extra chromosomal inheritance, recombination and transposable elements **CO-6.** The students will have practical knowledge on linkage maps, karyotyping and pedigree analysis.
Semester-VI	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-HC-6016: DEVELOPMENTAL BIOLOGY	**CO-1.** The students will develop critical understanding how a single-celled fertilized egg becomes an embryo and then a fully formed adult by going through three important processes of cell division, cell differentiation and morphogenesis. **CO-2.** Understand how the field of developmental biology has changed since the beginning of the 19th century with different phases of developmental research predominating at different times. **CO-3.** The students will develop an idea on the early embryonic, late embryonic and post embryonic development. **CO-4.** They will have an insight on the practical applications of developmental biology in present day world. **CO-5.** The students are expected to develop a practical knowledge on the whole mounts of chick embryo at different time phases of incubation at different stages of development. **CO-6.** The students will gain knowledge through practical classes on development of *Drosophila* life cycle, studies on placenta types.
ZOO-HC-6026: EVOLUTIONARY BIOLOGY	**CO-1.**Students will learn about the theories of origin of life **CO-2.** Students will be able to examine the evolutionary history of the taxa based on developmental affinities. **CO-3.**Students shall be apprised with the evidences of evolution and the sources of variation in different times. **CO-4.** Students will learn about population genetics, various products of evolution, mass extinction reasons.

	CO-5. Students will develop an insight on the evolution of man, construction of phylogenetic trees of different taxa. **CO-6.** Students will have a practical understanding on the different types of fossils, Hardy Weinberg Law, Construction of phylogenetic trees.

COURSE OUTCOMES (ZOOLOGY SKILL ENHANCEMENT COURSES)

Course Objective: *To introduce students to bee hive colony, individuals comprising the beehive, their ethology. The students are to have an idea on how to rear bees in a domestic environment, identify its potential enemies and correlate all of them for commercial purpose.*

Semester-III	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-SE-3014: Ornamental Fish & Fisheries (Credits: 04)	**CO-1.** The students will have an idea on the ornamental fish diversity of NE India. **CO-2.** The students will gain knowledge on the maintenance of an aquarium, natural fish feed for aquarium. **CO-3.** They will understand the strategies for natural breeding of ornamental fish, maintenance of their colour and preparation of their artificial feed. **CO-4.** They will also learn about the culture of planktons and development of biological filtration for aquarium. **CO-5.** They will also have practical knowledge on the identification of indigenous ornamental fishes and plankton culture.
Must Read	
1. Prost, P. J. (1962). Apiculture. Oxford and IBH, New Delhi. 2. Bisht D.S., Apiculture, ICAR Publication. 3. Singh S., Bee keeping in India, Indian council of Agricultural Research, NewDelhi.	

Course Objective:*This course introduces students to the different types of non-mulberry silk worms mainly indigenous to NE India. The students will have a clear understanding of the life cycle , host plants and the domesticated rearing of silkworms. At the completion of this course, the students will have a detailed idea on the future prospects of sericulture and to implicate this cottage industry for commercial purposes.*

Semester-IV	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-SE-4014: Non-Mulberry Sericulture(Credits: 04)	**CO-1.** The students will gain knowledge on the varieties of silk and the indigenous sericigenous insects found in NE India. **CO-2.** They will also learn about the life cycle of non mulberry silk worms, nature of the silk and their silk glands. **CO-3.** The students will develop insight on the methods of rearing silkworms , equipments associated with it , pests and diseases in sericulture and the ways to control it. **CO-4.** This course will enable the students to develop sericulture as an income earning source and develop entrepreneurship abilities.
Must Read	
1. Jolly, M. S., S. K. Sen, T.N. Sonwalkar and G.K. Prashad 1979. Non-Mulberry Sericulture. In: Manual ofSericulture, Rome, FAO, 4 (29) 2. Chowdhury, S.N. 1981. Muga Silk Industry. Directorate of Sericulture, Govt. of Assam, Guwahati781005, Assam. 3. Chowdhury, S.N. 1982. Eri Silk Industry. Directorate of Sericulture, Govt. of Assam, Guwahati781005, Assam. 4. Chowdhury, S.N. 1992. Silk and Sericulture. Directorate of Sericulture and Weaving, Govt. of Assam, Guwahati-781005,	

COURSE OUTCOMES (ZOOLOGY DISCIPLINE SPECIFIC ELECTIVE CBCS)

Semester-V	
Course	**Outcome**(After completion of these courses students should be able to)

ZOO-HE-5016: Computational Biology and Biostatistics (04+02)	**CO-1.** The students will be introduced to bioinformatics and its scope in present day world. **CO-2.** The students will develop an understanding on the different biological databases. **CO-3.** The students will also be able to understand the various aspects of data generation and data retrival. **CO-4.** They will develop an insight on the basics of concepts of sequence alignment and application of bioinformatics. **CO-5.** They will gain knowledge on accessing different biological databases, structure prediction and alignment. **CO-6.** The students will be able to perform statistical test like T-test from given data and graphical representation of data using computer
ZOO-HE-5036: Endocrinology	**CO-1.** The students will be introduced to endocrine glands, hormones secreted by the glands and their functions. **CO-2.** The students will gain knowledge on epiphysis, hypothalamo-hypophyseal axis. **CO-3**. The students will acquire knowledge on peripheral endocrine glands. **CO-4.** They will also learn about the details of hormone action and their regulation. **CO-5.** The students will have hands on exposure on the dissection of endocrine glands ,castration etc. **CO-6.** The students will practically understand the designing of primers of hormones.
Semester-VI	
Course	**Outcome**(After completion of these courses students should be able to)
ZOO-HE-6026: Fish and Fisheries	**CO-1.** The students will be introduced to different classes of fish, their feeding and reproductive behaviour, their morphological and physiological characteristics. **CO-2.**Thestudents will gain knowledge on fisheries, their types and the various types of equipments and gears used in fish culture.

	CO-3. The students will develop an insight on the aquaculture types like induced breeding, composite fish culture etc. **CO-4.** The course will help to understand the different types of fish diseases, preservation and processing of fish. **CO-5.** The students will be introduced to transgenic fish, the use of fish in research etc. **CO-6.** The students will have practical knowledge on the various types of fish, gears used in fisheries, visit to aquaculture labs etc.
ZOO-HC-6056: DISSERTATION	**CO-1.** The Students will learn about the basics of research, literature review. **CO-2.** The students will gain knowledge on collection and tabulation of data, interpretation of data. **CO-3.** They will attain knowledge on analysis of data, preparing results and discussion. **CO-4.** Acquire the detailed knowledge of preparing a full report on research work.