

**DEPARTMENT OF ZOOLOGY  
BETHUNE COLLEGE**

**PROGRAM SPECIFIC OUTCOMES (PSO) AND COURSE OUTCOMES (CO)**

**Programme: B.Sc. Zoology (Hons.) (CBCS) under University of Calcutta**

**Year of Introduction: 2018**

**Program Specific Outcomes (PSO):**

**PSO1:** The students will acquire a broad understanding of animal diversity, including knowledge of the scientific classification and evolutionary relationships of major groups of animals. Students should be able to identify, classify and differentiate diverse chordates and non-chordates based on their morphological, anatomical and systemic organization.

**PSO2:** The students will understand the basic concepts of cell biology, genetics, animal physiology and biochemistry, ecology, evolutionary biology, developmental biology, immunology and biostatistics.

**PSO3:** The students will recognize how organisms function at the level of the gene, genome, cell, tissue, organ and organ-system. This will help them to gather knowledge on the physiological adaptations, development, reproduction and behavior of different forms of life.

**PSO4:** The students will be acquiring basic experimental skills in various techniques in the fields of cell biology and genetics, molecular biology; biotechnology and analytical biochemistry. These methodologies will provide an extra edge to our students, who wish to undertake higher studies.

**PSO5:** The skill enhancement courses like aquaculture, sericulture and apiculture will inculcate skills involved in rearing fish, bees and silk moth which would help them in generating self employment making them successful entrepreneurs. Acquired skills in medical diagnosis, hematology, histopathology, staining procedures etc. used in clinical and research laboratories will provide them opportunity to work in diagnostic or research laboratory.

**COURSE OUTCOMES (CO)**

**CORE COURSES (CC)**

**SEMESTER-1**

**ZOOA: CC1- Non Chordata – I (Protists to Pseudocoelomates)**

CO1: An introduction to the vast diversity of non-chordates gaining knowledge on their general characteristics, classification, life-cycle pattern of representative animals of non-chordates.

CO2: Hands-on training on Identification, mounting and staining of some non-chordate specimens.

**ZOOA: CC2- Molecular Biology**

CO1: Introduction the nucleic acids, replication, transcription and translation

CO2: Basic idea on post transcriptional modifications gene-regulation and DNA repair

CO3: Introduction to different molecular techniques like PCR and Blotting techniques.

CO4: Hands-on training on DNA isolation, histological staining of nucleic acids from prepared slides and identification of polytene and lampbrush chromosomes.

## **SEMESTER -2**

### **ZOOA: CC3- Non Chordata – II (Coelomates)**

CO1: A basic concept on the evolution of coelom.

CO2: A knowledge on the general characteristics, classification, life-cycle pattern of representative animals of non-chordates from Annelida to Hemi-chordates.

CO3: Hands-on training on identification and anatomy study of some coelomate specimens.

### **ZOOA: CC4- Cell Biology**

CO1: Introduced to the concept of Plasma membrane, different cell-organelles, cytoskeleton, cell-cycle and cell-signalling.

CO2: Hands-on training in staining and identifying different stages of the cell cycle; staining of DNA and cell viability study.

## **SEMESTER -3**

### **ZOOA: CC5- Chordata**

CO1: Introduction to the vast diversity of chordates gaining knowledge on their general characteristics and classification.

CO2: Special adaptive feature of some classes like parental care in fish and amphibian, poison apparatus of snakes, echolocation in bats etc.

CO3: Hands-on training in identification of some chordate specimens; dissection of digestive and urinogenital systems in fishes etc.; an idea about the habit, habitat or behaviour of any one animal as a focal specimen for ethological analysis.

### **ZOOA: CC6- Animal Physiology: Controlling & Co-ordinating system**

CO1: Introduction to different types of tissues, bones and cartilage in our body and an elaborate knowledge on each type.

CO2: An idea about the different animal physiological systems like muscular, nervous, reproductive and endocrine.

CO3: Hands-on training in preparation of histological sections, their staining and identification.

### **ZOOA: CC7- Fundamental of Biochemistry**

CO1: Introduction to biomolecules like carbohydrates, proteins, lipids, amino acids, nucleic acids.

CO2: Introduction to enzymes and some metabolic pathways along with oxidative phosphorylation.

CO3: Hands-on training in qualitative analysis of the biomolecules and quantitative estimation of water-soluble proteins; paper chromatographic technique.

### **ZOOA: CC8- Comparative Anatomy of Vertebrates**

CO1: Comparative anatomy of different organs like stomach, respiratory organs, heart and aortic arches, kidney and urinogenital ducts, brain; axial and appendicular systems.

CO2: Idea about the different scales and bones, study of disarticulated skeleton of toad, pigeon and guinea pig.

## **SEMESTER -4**

### **ZOOA: CC9- Animal Physiology: Life Sustaining Systems**

CO1: Physiological aspects of the important systems like digestive, respiratory, circulatory, osmoregulatory and excretory.

CO2: Hands-on training on ABO Blood group determination, haemoglobin estimation and blood cell identification of human and cockroach.

**ZOOA: CC10- Immunology**

CO1: Gives a comprehensive idea on the immune system of our body encompassing knowledge on antigen- antibody, MHC, cytokines, complement system, hypersensitivity

CO2: Provides a clinical application of immunology i.e. vaccination.

CO3: Identification of the immunological organs of body and hands on training on immunological techniques like ELISA.

**SEMESTER -5****ZOOA: CC11- Ecology**

CO1: Elementary concept of ecology, population, community, eco-system etc.

CO2: Knowledge pertaining to applied ecology is also gained by the students.

CO3: Ability to determine population density and to calculate ecological indices like Shannon-Weiner index; ability to measure the different physico-chemical and biological parameters of an aquatic ecosystem.

CO4: Study of animal biodiversity *in situ*.

**ZOOA: CC12- Principle of Genetics**

CO1: Introduction to Mendelian genetics and its extension.

CO2: Elementary idea on linkage, crossing over, linkage mapping, mutation, sex-determination.

CO3: Concept building on Extra-chromosomal Inheritance, Genetic Fine Structure and Transposable Genetic elements.

CO4: Chi-square analysis, pedigree analysis and identification of chromosomal aberration.

**SEMESTER -6****ZOOA: CC13- Developmental Biology**

CO1: A comprehensive idea on early, late and post embryonic development.

CO2: Concept building on IVF, applications of stem cell therapy.

CO3: Knowledge on identification of developmental stages of chick embryo, drosophila life cycle; placental sections and invertebrate larva.

**ZOOA: CC14- Evolutionary Biology**

CO1: Concept on the origin of life and the RNA world hypothesis.

CO2: Knowledge on evolutionary concepts, geological time scale, natural selection and species and speciation.

CO3: Idea of population genetics, extinction.

CO4: Construction and interpretation of phylogenetic trees using Parsimony and dendrogram construction following the principles of Phenetics and Cladistics.

CO5: Study of fossils, homology and analogy from specimens.

**DISCIPLINE SPECIFIC ELECTIVES (DSE)****ZOOA-DSE(A)-5-1- Parasitology**

CO1: Introduction to the different concepts of parasitism

CO2: Concept building on different parasitic forms belonging to different species, their life-cycle patterns, pathogenicity etc.

CO3: Ability to identify different stages of parasites through slides.

CO4: Hands-on training in isolation of parasites from fishes and poultry birds.

CO5: Idea of vertebrate parasites through literature review.

**ZOOA-DSE(A)-5-2- Biology of Insect**

CO1: Concept building on taxonomy, morphology and physiology of insects.

CO2: Introduction to insect society and their role as vectors.

CO3: Hands-on training in identifying the life cycle of mosquito and different body parts of insects.

CO4: Knowledge on how to collect, preserve and identify insects of economic interest.

**ZOOA-DSE(B)-5-1- Endocrinology**

CO1: Concept building on role of hormones and their controlled secretion.

CO2: Insight into the non-mammalian vertebrate hormone.

CO3: Hands-on training on dissection of endocrine glands in laboratory bred rat.

CO4: Ability to prepare, stain and identify histological section of endocrine glands.

**ZOOA-DSE(B)-5-2- Reproductive Biology**

CO1: Concept building on how endocrine system controls reproduction.

CO2: Idea about the functional anatomy of male and female reproduction and reproductive health.

CO3: Hands-on training in setting up of animal house, breeding techniques and care of animals.

CO4: Ability to prepare, stain and identify histological section of structures and glands associated with reproduction.

**ZOOA-DSE(A)-6-1- Animal Cell Biotechnology**

CO1: Concept building techniques in gene manipulation, animal cell culture, fermentation and knowledge about its application in health.

CO2: Hands-on training in sterilization of glass and plastic wares for cell culture, preparation of culture media.

CO3: Idea of preparation of genomic DNA, plasmid DNA isolation and DNA quantitation.

CO4: Introduction to basic techniques like Western Blot etc by photograph.

**ZOOA-DSE(A)-6-2- Animal Biotechnology**

CO1: Introduction to the concept of genome.

CO2: Concept building on molecular techniques in gene manipulation and genetically modified organisms.

CO3: Idea about culture techniques and applications.

CO4: Hands-on training in genomic and plasmid DNA isolation and introduction to basic techniques like Western Blot etc.

**ZOOA-DSE(B)-6-1- Animal Behaviour & Chronobiology**

CO1: Concept building on patterns of behaviour, social and sexual behaviour and chronobiology & biological rhythm.

CO2: Idea of different types of rhythms, biological clock, bird migration, role of melatonin etc.

CO3: Hands-on training in habitat and behavioural study; idea on preparation of comprehensive ethograms.

**ZOOA-DSE(B)-6-2- Fish & Fishery**

CO1: Introduction and classification, feeding habit, habitat and manner of reproduction of fishes.

CO2: Concept building in aquaculture and research in this field.

CO3: Knowledge on morphometric and meristic characters of fishes.

CO4: Ability to identify different fishes, analysis of water quality etc.

## **SKILL ENHANCEMENT COURSES (SEC)**

### **ZOOA-SEC(A)-3-1- Apiculture**

CO1: Concept building on culture of bees, their biology, artificial rearing, their diseases and enemies and their economic importance.

### **ZOOA-SEC(A)-3-2- Sericulture**

CO1: Concept building on culture of silkworms, their biology, artificial rearing, their diseases and enemies and their economic importance.

### **ZOOA-SEC(A)-4-1- Aquarium Fishery**

CO1: Concept building on culture of aquarium fishes, their biology, artificial rearing, their diseases and enemies and their economic importance.

### **ZOOA-SEC(A)-4-2- Medical Diagnostic Technique**

CO1: Concept building on diagnostics methods used for analysis of blood, urine, diseases etc.

## **COURSE OUTCOME -UNDERGRADUATE ZOOLOGY (GENERAL)**

### **ZOOG-CC1-1- Animal diversity**

CO1: Introduction to the vast diversity of non-chordates and chordates.

CO2: Knowledge on the general characteristics, classification, life-cycle pattern of representative animals of non-chordates and Chordates.

CO3: Hands-on training in identification of some non-chordate and chordate specimens.

CO4: Hands-on training in dissection of some systems of cockroach.

### **ZOOG-CC2-2- Comparative Anatomy & Developmental Biology**

CO1: Introduction to the different systems like digestive, nervous etc of vertebrates and comparison among them.

CO2: Concept building on the different aspects of reproduction and development.

CO3: Idea about the different bones, histological section and larval stages.

### **ZOOG-CC3-3- Physiology and Biochemistry**

CO1: Physiological aspects of all the important system like digestive, respiratory etc.

CO2: Introduction to biomolecules like carbohydrates, proteins, lipids, amino acids and enzymes.

CO3: Idea about the different histological sections.

CO4: Ability to quantify carbohydrates.

### **ZOOG-CC4-4- Genetics and Evolutionary Biology**

CO1: Introduction to Mendelian genetics and its extension, chromosomes, mutation, sex-determination.

CO2: Concept building on the origin of life and different evolutionary theories.

CO3: Analysis for genetic ratio test, identification of chromosomal aberration, idea of phylogenetic analysis.

*T. K. Misra*

16.05.2022

(T.K. Misra)

HOD of Zoology

Bethune College, Kolkata