

DINABANDHU ANDREWS COLLEGE

AFFILIATED TO UNIVERSITY OF CALCUTTA

Department of Zoology

UNDERGRADUATE SECTION

Model Reference: University of Calcutta, Syllabus for Zoology (Advanced) (CBCS)

[with effect from July 2018 (2018-19)] (Notification No. CSR/12/18)

The Undergraduate Honours Course in B.Sc. Zoology (CBCS) strictly follows the syllabus of the affiliating University, i.e. The University of Calcutta. The CBCS course came into effect from August 2018. The Syllabus includes fourteen core papers (CC1 to CC 14), two Skill Enhancement Course papers (with two option for each SEC A1 or A2 & SEC B1 or B2) and two Discipline Specific Elective (with two option for each DSE A1 or A2 & DSE B1 or B2).

Further, the syllabi according to New Education Policy (NEP) for semester wise four-year (Honours & Honours with Research)/ three-year (Multidisciplinary) programme of U.G. courses of studies came into effect from July 2023. The First Batch of UG students following the NEP Course are awaiting their Semester I examination. Therefore, it is too early to indicate the impact of the projected POs & PSOs for the NEP syllabus designed by the University of Calcutta.

PROGRAMME OUTCOME OVERVIEW OF B.SC. IN ZOOLOGY

Programme Outcomes Nos	Programme Outcomes (PO)
PO A	To provide a sound knowledge and skill in the fundamentals of animal sciences, understands the complex interactions among various living organisms, belonging to different phyla, their distribution and their relationship with the environment
PO B	To understand various concepts of genetics and its importance in human health and the internal structure of cell, its functions in control of various metabolic functions along with knowledge of organ systems and their role in various physiological processes.
PO C	Understanding of environmental conservation processes and its importance, pollution control and biodiversity and protection of endangered species.
PO D	Gain knowledge of Agro based Small Scale industries like sericulture, fish farming, animal husbandry, poultry farming and vermicompost preparation. Further, to develop an opportunity to work in interdisciplinary groups or areas
PO E	To develop the ability to communicate and comprehend; documentation and effective writing of laboratory notebooks, field reports and environmental

	audit reports, prepare effective presentations, and give and receive clear instructions while working as an individual and being in team.
PO F	Ability to use modern techniques and handle sophisticated instruments for experimental work; apply current software for data analysis while inculcating scientific temperament in the young minds.
PO G	To prepare the students for a successful career in Research, Teaching, Wildlife as well as industries, etc.
PO H	Apply ethical principles and commit to professional ethics and responsibilities in delivering her/his duties.
PO I	Develop leadership and managerial skills and understanding the need for lifelong learning to be a competent professional while applying the knowledge and understanding of Zoology to one's own life and work

PROGRAMME SPECIFIC OUTCOME OF B.SC. IN ZOOLOGY

Programme Specific Outcomes Nos	Programme Specific Outcomes (PSO)
PSO 1	Understand the basic and applied concepts of Cell biology, Genetics, Taxonomy, Physiology, Biochemistry, Microbiology, Immunology, Biotechnology, Molecular Biology, Developmental Biology, Ecology, Applied Zoology, etc.
PSO 2	Understand the complex evolutionary processes and behaviour of animals
PSO 3	Understand biodiversity and protection of endangered species, environmental conservation processes and its importance, pollution control
PSO 4	Perform procedures as per laboratory standards in the areas of Taxonomy, Physiology, Ecology, Cell biology, Genetics, Applied Zoology, Clinical science, tools and techniques of Zoology, Toxicology, Entomology, Nematology Sericulture, Biochemistry, Fish biology, Animal biotechnology, Immunology and research methodology
PSO 5	Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine
PSO 6	To be acquainted with and apply good ethical principles and commit to professional ethics and responsibilities

Mapping of PO & PSO for Zoology Honours Syllabus (CBCS) of University of Calcutta

Programme Specific	Programme Outcomes (PO)
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Outcomes (PSO) Nos	A	B	C	D	E	F	G	H	I
PSO 1	√	√	√	√	√	√	√	√	√
PSO 2	√	√		√	√	√	√	√	√
PSO 3		√		√	√	√	√		
PSO 4	√	√	√	√	√	√	√	√	√
PSO 5	√	√	√			√	√	√	
PSO 6		√	√	√	√				√

Programme Outcome mapping for CBCS Courses in Zoology Honours under University of Calcutta

TABLE I

COURSE DURATION	COURSE DETAIL	PROGRAMME OUTCOME (PO)								
		A	B	C	D	E	F	G	H	I
PART 1 (1 year)	SEMESTER I: CORE COURSE 1 Non Chordata – I (Protists to Pseudocoelomates)	√	√			√	√	√	√	√
	SEMESTER 1: CORE COURSE 2 Molecular Biology		√			√	√	√	√	√
	SEMESTER 2: CORE COURSE 3 Non Chordata – II (All Coelomate Phyla)	√	√			√	√	√	√	√
	SEMESTER 2: CORE COURSE 4 Cell Biology		√			√	√	√	√	√
PART 2 (1 year)	SEMESTER 3: CORE COURSE 5 Chordata	√	√			√	√	√	√	√
	SEMESTER 3: CORE COURSE 6 Animal Physiology: Controlling & Co-ordinating System	√	√		√		√	√	√	√
	SEMESTER 3:		√			√	√	√	√	√

	CORE COURSE 7 Fundamentals of Biochemistry									
	SEMESTER 3: Skill Enhancement Course A (1/2) Apiculture / Sericulture		√	√	√	√	√	√	√	√
	SEMESTER 4: CORE COURSE 8 Comparative Anatomy of Vertebrate	√	√	√		√	√	√	√	√
	SEMESTER 4: CORE COURSE 9 Animal Physiology: Life sustaining system	√	√			√	√	√	√	√
	SEMESTER 4: CORE COURSE 10 Immunology		√		√	√	√	√	√	√
	SEMESTER 4: Skill Enhancement Course B (1/2) Aquarium Fisheries/ Medical Diagnosis	√	√			√	√	√	√	√
PART 3 (1 year)	SEMESTER 5: CORE COURSE 11 Ecology			√		√	√	√	√	√
	SEMESTER 5: CORE COURSE 12 Principle of Genetics		√	√		√	√	√	√	√
	SEMESTER 5: Discipline Specific Elective A (1/2) Parasitology/Biology of Insect	√		√		√	√	√	√	√
	SEMESTER 5: Discipline Specific Elective B (1/2) Endocrinology/Reproductive Biology		√	√		√	√	√	√	√
	SEMESTER 6: CORE COURSE 13 Developmental Biology		√			√	√	√	√	√

	SEMESTER 6: CORE COURSE 14 Evolutionary Biology	√	√	√		√	√	√	√	√
	SEMESTER 6: Discipline Specific Elective A (1/2) Animal Biotechnology/ Animal Cell Biotechnology		√	√		√	√	√	√	√
	SEMESTER 6: Discipline Specific Elective B (1/2) Animal Behaviour & Chronology/Fish & Fisheries		√	√		√	√	√	√	√

COURSE OUTCOME

PART 1 SEMESTER I:

CORE COURSE 1

Non Chordata – I (Protists to Pseudocoelomates)

After successfully completing this course, students will be able to:

CO1	Describe general taxonomic rules on animal classification and specifically the Classification of invertebrates till Nematodes.
CO2	Have an idea of animal architecture and Bauplan concept of invertebrates
CO3	Have knowledge on locomotion and reproduction in Protozoa, Polymorphism in Cnidaria, Coral reefs, pathogenicity and control measures of nematodes.
CO4	Imparts conceptual knowledge of invertebrates, their adaptations and associations in relation to their environment.

PART 1 SEMESTER I:

CORE COURSE 2

Molecular Biology

After successfully completing this course, students will be able to:

CO1	To familiarize students with the concept of Molecular Biology which chiefly deals with interactions among various systems of the cell, including those between DNA, RNA and proteins and how these are regulated.
CO2	Have a concept of different types of microscopy used for cellular studies
CO3	To gain an understanding of chemical and molecular processes that occurs in and between cells.
CO4	Know the Molecular basis of DNA replication, protein synthesis, post transcriptional modifications, RNA processing

CO5	To gain insight into the most significant molecular and cell-based methods used today to expand our understanding of biology
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PART 1 SEMESTER 2:

CORE COURSE 3

Non Chordata – II (All Coelomate Phyla)

After successfully completing this course, students will be able to:

CO1	Explain the diversity of higher invertebrates and understand the Classification of invertebrates till Echinoderms
CO2	To appreciate the diversity in higher invertebrates including arthropods, molluscs and echinoderms along with their characters.
CO3	Counting of haemocytes in cockroach. Identify and classify invertebrates and vertebrates by studying their external characters and prepare keys.
CO4	Create the awareness of the economic importance and significance of arthropods and molluscs. Discuss the biological methods of pest management

PART 1 SEMESTER 2:

CORE COURSE 4

Cell Biology

After successfully completing this course, students will be able to:

CO1	Describe the structure and function of cell, cell organelles and plasma membrane
CO2	Have a concept of different types of microscopy used for cellular studies
CO3	To describe the structure and functions of Endoplasmic Reticulum, Golgi apparatus, Lysosome, Mitochondria, Peroxisomes, Cytoskeleton/ Nucleus.
CO4	Learn about an account on cell division and cell signalling. To know the process of apoptosis and role of it.
CO5	Students will understand how these cellular components are used to generate and utilize energy in cells.

PART 2 SEMESTER 3:

CORE COURSE 5

Chordata

After successfully completing this course, students will be able to:

CO1	Evolutionary significance of protochordates. Discuss the taxonomic position, characteristic features and distribution of different orders of the protochordates to Mammal
CO2	Details of the structure and function of the skeletal system, respiration, circulation, excretion, sense organs and nervous system
CO3	Structural adaptations for different modes of life in chordates

CO4	Identify and distinguish between poisonous and non-poisonous snakes by observing characteristic features. Discuss the composition and significance of snake venom.
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PART 2 SEMESTER 3:

CORE COURSE 6

Animal Physiology: Controlling & Co-ordinating System

After successfully completing this course, students will be able to:

CO1	Principles of Animal Physiology and its relation to size and scale of organisms
CO2	Physiology of respiration, excretory system, thermal regulation, blood and body fluids and sense organs
CO3	Physiology of animal behaviour
CO4	Explain the physiological functions of various organ systems of the mammalian physiology. Discuss the correlation between histology, anatomy and physiology

PART 2 SEMESTER 3:

CORE COURSE 7

Fundamentals of Biochemistry

After successfully completing this course, students will be able to:

CO1	To impart the knowledge of biomolecules and their involvement in chemical reactions in living cells in order to maintain homeostasis.
CO2	Concept of protein, carbohydrate and lipid metabolism, vitamins and minerals : Free radicals and anti-oxidants.
CO3	Students will get acquainted with the knowledge of Enzymes: classification, nomenclature, mechanism of action and Bioenergetics.
CO4	Oxidation of lipids: beta oxidation, oxidation of unsaturated and odd chain fatty
CO5	Do qualitative tests for carbohydrates, proteins, urea, uric acid and fats and quantify the amount of protein in a sample. Prepare Normal, molar and standard solutions, phosphate buffers, and do serial dilutions

PART 2 SEMESTER 3:

Skill Enhancement Course A (1/2)

Apiculture / Sericulture

After successfully completing this course, students will be able to:

CO1	Knowledge about honey bee and bee rearing. Knowing beehives, bee keeping equipment, methods of extraction of honey and processing of honey.
CO2	Bee enemies and diseases. Bee economy and entrepreneurship in apiculture
CO3	Gives knowledge of silk worm rearing. Mulberry cultivation.

CO4	Pests and diseases associated with silk worm and mulberry. Various process involved in silk production
CO5	Application of biotechnology in Sericulture and Apiculture

PART 2 SEMESTER 4:

CORE COURSE 8

Comparative Anatomy of Vertebrate

After successfully completing this course, students will be able to:

CO1	Obtain comprehensive knowledge of comparative anatomy of chordates and to recognize their evolutionary trends
CO2	Comparative knowledge of Integumentary, Digestive, Circulatory, Urinogenital, Nervous and Skeletal system of various classes of vertebrates.
CO3	Structural adaptations for different modes of life in chordates

PART 2 SEMESTER 4:

CORE COURSE 9

Animal Physiology: Life sustaining system

After successfully completing this course, students will be able to:

CO1	Learn about animal physiology and the various physiological pathways and its importance
CO2	To describe the digestion and absorption of carbohydrate, fats and protein.
CO3	To explain the structure of neuron and its propagation, blood components, transport of gases, mechanism of urine formation, structure of heart, various endocrine glands
CO4	Know the physiology of digestion, excitable tissue, respiration, excretion, circulation, endocrine and reproduction.

PART 2 SEMESTER 4:

CORE COURSE 10

Immunology

After successfully completing this course, students will be able to:

CO1	To describe the overview, types of immunity, Cells and organs associated with immune system; Innate and adaptive immunity
CO2	Concept of Antigens, Antibody, Cytokines, adjuvants, Complement proteins – pathways and activation, MAC formation
CO3	Humoral and cell mediated immunity, T-cell and B-cell, Macrophage, MHC
CO4	Elucidation of immunodiagnostic procedures and monoclonal antibodies

PART 2 SEMESTER 4:
Skill Enhancement Course B (1/2)
 Aquarium Fisheries/ Medical Diagnosis

After successfully completing this course, students will be able to:

CO1	Provides knowledge of ornamental fish breeding which is highly professional and attractive avenue for youth.
CO2	Aquarium fish keeping, aquarium setup and accessories. Aquarium fishes, their food and feeding. Maintenance of aquarium.
CO3	Fish transportation and management. Different types of feed formulation and development of disease diagnostic tools.
CO4	To distinguish various diagnostic methods in blood and urine analysis; know infectious and noninfectious diseases.
CO5	Get an extensive impression of tumours and their impact on health.
CO6	General concept of communicable diseases, mechanism of pathogenesis and their control measures.

PART 3 SEMESTER 5:
CORE COURSE 11
 Ecology

After successfully completing this course, students will be able to:

CO1	Conceptual knowledge of ecology and its important attributes; biodiversity and its conservation and scope.
CO2	Understand mechanisms by which organisms interact with other organisms and with their physical environment.
CO3	To explain the biotic and abiotic factors that influence the dynamics of populations and its attributes, characteristics of community, structure and functions of ecosystem and concept of biodiversity and wildlife conservation.
CO4	Ecology of biological and industrial invasion (Eutrophication, Acidification). Biodegradation and Bioremediation. Wastes in Ecosystem and management (Agricultural wastes, Biomedical wastes and Domestic waste)
CO5	To perform various physico-chemical experiment. Determine pH, dissolved oxygen and carbon dioxide of water samples.
CO6	Study micro arthropods of water and soil samples and Zooplankton count by standard methods.

PART 3 SEMESTER 5:
CORE COURSE 12
 Principle of Genetics

After successfully completing this course, students will be able to:

CO1	Mendelian and non-mendelian inheritance. Understanding of basic concepts of genetics and laws of inheritance.
CO2	Organisation of genes and chromosomes. Imprinting of genes,
CO3	Concept behind genetic disorder, gene mutations- various causes associated with inborn errors of metabolism.
CO4	Epigenetic regulation by DNA methylation . Somatic Cell Genetics and hybridoma

PART 3 SEMESTER 5:
Discipline Specific Elective A (1/2)
Parasitology/Biology of Insect

After successfully completing this course, students will be able to:

CO1	Describe the life cycle, morphology, infection of various parasites.
CO2	Vector Biology and Biology of Protozoan parasites, Helminthic parasites, Nematode parasites and Arthropod Parasites
CO3	Host–parasite relationship, environmental and host factors regulating parasitic diseases and to recognize the general outlines of parasite treatment and control.
CO4	Know the classification of insect, morphological characters, physiology, structure, functions and metabolism. Describe the structure and variation of mouthparts, antennae etc of insects various insect physiology.
CO5	Describe the mechanism of caste differentiation in eusocial insects, life cycle of economic insect, concept of IPM, types of insect injury to plant, venom and allergens.

PART 3 SEMESTER 5:
Discipline Specific Elective B (1/2)
Endocrinology/Reproductive Biology

After successfully completing this course, students will be able to:

CO1	Comprehend the study of endocrine system their role in maintaining homeostasis of the human body
CO2	Explain the pathological conditions associated with endocrine imbalances. Explain the patho-physiology of common diseases related to organ systems of the body.
CO3	To describe the gonadal hormones and the mechanism of hormones action in reproduction. Explain the functional anatomy of male and female reproduction. Write the process of fertilization in reproductive biology.
CO4	Endocrinology of female sex cycle, Control of testicular functions Modes and methods of male and female fertility control, Endocrine malfunction induced male and female infertility. Photoperiodism and endocrinology of photosexual activity, Pheromones and interactions

PART 3 SEMESTER 6:

CORE COURSE 13

Developmental Biology

After successfully completing this course, students will be able to:

CO1	To describe the history and different stages of embryonic development and its implications.
CO2	Have knowledge on the basic concepts of the processes of gametogenesis, fertilization, cleavage, gastrulation, development of extraembryonic membranes, eye. Get an idea on different types of placenta and organizer concept
CO3	Concepts of cryopreservation of gametes and embryo of man, IVF and embryo transfer in man
CO4	Knowledge on characteristic features of stem cells, potency and niche, markers in human stem cell, potential application of stem cells as regenerative medicine

PART 3 SEMESTER 6:

CORE COURSE 14

Evolutionary Biology

After successfully completing this course, students will be able to:

CO1	Gain conceptual understanding of evidences, theories and mechanisms of evolution.
CO2	Patterns and trends in evolution, the Origin and Evolution of Primates. Explain the evolutionary history of man and its phylogenetic trees.
CO3	Evolutionary Process, Natural Selection and Adaptation Gene Frequencies in Population

PART 3 SEMESTER 6:

Discipline Specific Elective A (1/2)

Animal Biotechnology/Animal Cell Biotechnology

After successfully completing this course, students will be able to:

CO1	To impart theoretical knowledge on various techniques of animal biotechnology and their application in industries.
CO2	To develop concepts, principles and processes in animal biotechnology. Students will know about different techniques for in vitro fertilization. Elucidation of different methods for the improvement of animals, including poultry production, milk quality, disease resistance etc.
CO3	Cell and tissue culture technology, Biotechnology in improvement of live stock To train the students in gene therapy applications. Students will learn Molecular techniques for disease diagnosis

CO4	Reproductive biotechnology (Cryopreservation, Assisted reproductive technology, In vitro fertilization and embryo transfer, ICSI, Sperm sexing)Gene and Somatic cloning techniques, Animal Production technology & Food security. Environmental and Medical Bio-technology
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PART 3 SEMESTER 6:
Discipline Specific Elective B (1/2)
 Animal Behaviour & Chronology/Fish & Fisheries

After successfully completing this course, students will be able to:

CO1	Gain fundamental knowledge in the concepts of animal behavior which enable the student to conceptualize learning, communication, migration and biological rhythms.
CO2	Gain knowledge of the types of reflexes, types of learning and communication, parental care, circadian rhythm and applied chronobiology.
CO3	Gain knowledge of the modern trends in fish taxonomy, accessory respiratory organs and acid-base balance.
CO4	Comprehend the classification, morphology and physiology of fish; Inland fisheries and its sustainable aquaculture.
CO5	Gain knowledge of the wetland and estuarine fisheries, various types of fish preservation, different types of feed formulation and disease diagnostic tools.