

PROGRAM OUTCOME AND COURSE OUTCOMES OF UNDERGRADUATE COURSE

B.Sc. ZOOLOGY (CBCS)

Programme Outcomes (POs):

PO1. Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2. Problem Solving: Understand and solve the problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired from humanities/sciences/mathematics/social sciences.

PO3. Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

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 behaviour 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, haematology, 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)

I Semester— DSC — IZ

ANIMAL DIVERSITY:

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 specimen

CO3: To demonstrate comprehensive identification abilities of chordate diversity able to explain structural and functional diversity of chordate diversity

CO4: To understand evolutionary relationship amongst chordates.

II Semester - DSC - 2Z

COMPARATIVE ANATOMY AND DEVELOPMENTAL BIOLOGY OF VERTEBRATE:

CO3: To define vertebrate structural principles by studying all body systems of vertebrates in an evolutionary perspective.

CO2: To compare and contrast the anatomical systems of different vertebrates and identify common traits across species and groups.

CO3: Illustrate the early developmental process of egg in Amphioxus, frog, chick and man.

CO4: Explain fate map construction, Spemann's constriction experiments on amphibian embryos, organizers in development, embryonic induction.

III Semester - DSC - 3Z

PHYSIOLOGY AND BIOCHEMISTRY:

CO1: Describe the regulation of digestion in man, nutrition in pregnancy and infancy, nutritional disorders, balanced diet, starvation, fasting and obesity.

CO2: Understand the mechanism of transport and exchange of respiratory gases and its neurophysiological control and physiological problems in diving mammals, new-born and aged individuals.

CO3: Enumerate the properties and classification of amino acids and their standard abbreviations; hierarchical levels of protein structure, classification, separation, purification and sequencing of proteins.

CO4: Explain the classification and functions of lipids and fatty acids; chemistry and structure of nucleic acids and sequencing of DNA.

IV Semester - DSC -4Z

GENETICS AND EVOLUTION:

CO1: Illustrate multiple allelism and solve problems related to blood group inheritance.

CO2: Explain characteristics of linkage groups and linkage map; crossing over and calculation of recombination frequency; sex-linked, sex-influenced and sex-limited characters; sex differentiation and disorders of sexual development.

CO3: Describe the mechanisms of sex determination including chromosomal, genic, haploiddiploid mechanisms; the hormonal and environmental influence on sex determination and gynandromorphism.

CO4: Describe the evidences for evolution and its required corollaries.

CO5: Explain the various theories of evolution.

CO6: Describe the mechanisms by which evolution occurs.

V Semester

SKILL ENHANCEMENT COURSES

SEC 1 APICULTURE:

SEC- 3Z

IMMUNOLOGY:

SEC-4Z

MEDICAL DIAGNOSTICS:

SEC - 4Z

INSECT VECTORS AND DISEASES:

Vth Semester

DSE-1Z CELL AND MOLECULAR BIOLOGY:

CO:1 Perform experiments in cell biology and genetics including demonstration of Barr body in buccal epithelial cells of man, polytene chromosome in the salivary glands of *D. melanogaster* larva, mitotic division in onion root tip cells, micrometry of microscopic objects, prepare whole mounts of microscopic objects, and calculate mitotic and metaphase index from slides.

CO2: Describe the mechanism of DNA duplication and the role of enzymes.

CO3: Understand the concept of gene and gene expression; genetic code and wobble hypothesis.

VI Semester

DSE-2ZE ECOLOGY, WILDLIFE BIOLOGY & ANIMAL BEHAVIOUR:

CO1: Explain the structure of ecosystem and its functioning through energy flow and nutrient cycling.

CO2: Enumerate biogeochemical cycles and understand the concept of limiting factors.

CO3: Describe the ecology of population, community and habitat as a self-regulating system.

CO4: Explain levels of biodiversity, threats to biodiversity, biodiversity hotspots, importance and strategies for conservation of wildlife and sustainable development.

CO5: Describe the patterns and mechanisms of animal behaviour.

CO6: Illustrate biological rhythms and the chemical basis of communication.

**PROGRAM OUTCOME AND COURSE OUTCOME UNDERGRADUATE COURSE
B. Sc ZOOLOGY (NEP)**

Program Outcomes:

POs1-The Programme offers both classical as well as modern concepts of Zoology in higher education.

POs2-It enables the students to study animal diversity in both local and global environments.

POs3-To make the study of animals more interesting and relevant to human studies more emphasis is given to branches like behavioural biology, evolutionary biology and economic zoology.

POs4-More of upcoming areas in cell biology, genetics, molecular biology, biochemistry, genetic engineering and bioinformatics have been also included.

POs5-Equal importance is given to practical learning and presentation skills of students.

POs6-The lab courses provide the students necessary skills required for their employability.

POs7-Skill enhancement courses in classical and applied branches of Zoology enhance enterprising skills of students.

POs8-The global practices in terms of academic standards and evaluation strategies.

POs9- Provides opportunity for the mobility of the student both within and across the world.

POs 10-The uniform grading system will benefit the students to move across institutions within India to begin with and across countries.

POs11-It will also enable potential employers in assessing the performance of the candidates across the world.

Programme specific outcome:

PSO1. Understand the nature and basic concepts of cell biology, genetics, taxonomy, physiology, ecology and applied Zoology

PSO2. Analyse the relationships among animals, plants and microbes

PSO3. 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

PSO4. Understand the applications of biological sciences in Apiculture, Aquaculture, Agriculture and Medicine

PSO5. Gains knowledge about research methodologies, effective communication and skills of problem solving method.

Semester	Paper Code	Paper Name	Course outcomes	
I	DSCC5Z00T1	Cytology, Genetics and Infectious Diseases	CO:1 CO:2 CO:3 CO:4 CO:5	To use simple and compound microscopes. To prepare stained slides to observe the cell organelles. To be familiar with the basic principle of life, how a cell divides leading to the growth of an organism and also reproduces to form new organisms. The chromosomal aberrations by preparing karyotypes. How chromosomal aberrations are inherited in humans by pedigree analysis in families. The antigen-antibody reaction.
I- (OE)	OEC5ZOOT1	Economic Zoology	CO:1 CO:2 CO:3 CO:4 CO:5 CO:6 CO:7 CO:8	Gain knowledge about silkworms rearing and their products. Gain knowledge in Bee keeping equipment and apiary Management. Acquaint knowledge on dairy animal management, the breeds and diseases of cattle and learn the testing of egg and milk quality. Acquaint knowledge about the culture techniques of fish and poultry. Acquaint the knowledge about basic procedure and methodology of vermiculture. Learn various concepts of lac cultivation. Students can start their own business i.e. self-employments. Get employment in different applied sectors
II	DSCC5Z00T2	Biochemistry and Physiology	CO:1 CO:2 CO:3 CO:4 CO:5 CO:6 CO:7	To develop a deep understanding of structure of biomolecules like proteins, lipids and carbohydrates. How simple molecules together form complex macromolecules. To understand the thermodynamics of enzyme catalyzed reactions. Mechanisms of energy production at cellular and molecular levels. To understand various functional components of an organism. To explore the complex network of these functional components. To comprehend the regulatory mechanisms for maintenance of function in the body.
II(OE)	OEC5ZOOT2	Parasitology	CO:1 CO:2 CO:3 CO:4 CO:5	Know the stages of the life cycles of the parasites and infective stages. Develop ecological model to know population dynamics of parasite, establishment of parasite population in host body, adaptive radiations and methods adopted by parasite to combat with the host immune system. Develop skills and realize significance of diagnosis of parasitic infection and treatment. Understand about diseases caused by Protozoa, Helminthes, Nematodes and Arthropods at molecular level. Develop their future career in medical sciences and related administrative services.

III	DSCC5ZOOT3	Molecular Biology, Bioinstrumentation & Techniques in Biology	CO:1 CO:2 CO:3	<p>After successful accomplishment of the course, the learners will be able to acquire better understanding and comprehensive knowledge regarding most of the essential aspects of Molecular Biology subject which in turn will provide a fantastic opportunity to develop professional skill related to the field of molecular biology.</p> <p>The course will mainly focus on the study of principal molecular events of cell incorporating DNA Replication, Transcription and Translation in prokaryotic as well as eukaryotic organisms.</p> <p>Acquiring knowledge on instrumentation and techniques in biology.</p>
IV	DSCC5ZOOT4	Gene Technology Immunology and Computational Biology	CO:1 CO:2 CO:3 CO:4 CO:5	<p>Acquaint knowledge on versatile tools and techniques employed in genetic engineering and recombinant DNA technology.</p> <p>An understanding on application of genetic engineering techniques in basic and applied experimental biology</p> <p>To acquire a fundamental working knowledge of the basic principles of immunology.</p> <p>To understand how these principles, apply to the process of immune function.</p> <p>Use, and interpret results of, the principal methods of statistical inference and design; helps to communicate the results of statistical analyses accurately and effectively; helps in usage of appropriate tool of statistical software.</p>
V	ZOO C-9 T	Non-Chordates and Economic Zoology	CO:1 CO:2 CO:3 CO:4	<p>Group animals on the basis of their morphological characteristics/ structures.</p> <p>Demonstrate comprehensive identification abilities of Non-Chordate diversity.</p> <p>Explain structural and functional diversity of Non-Chordates</p> <p>Develop understanding on the diversity of life with regard to protists, non-chordates and chordates.</p> <p>Examine the diversity and evolutionary history of a taxon through the construction of a basic phylogenetic/ cladistics tree</p>
V	ZOO C-11-T	Chordates and Comparative Anatomy	CO:1 CO:2 CO:3 CO:4 CO:5 CO:6	<p>To demonstrate comprehensive identification abilities of chordate diversity</p> <p>Able to explain structural and functional diversity of chordate diversity</p> <p>To understand evolutionary relationship amongst chordates</p> <p>To take up research in biological sciences.</p> <p>To realize that very similar physiological mechanisms are used in very diverse organisms.</p> <p>To Get a flavor of research by working on project besides improving their writing skills. It will further enable the students to think and interpret individually.</p>

VI	ZOOC15-T	Evolutionary & Developmental Biology	CO:1 CO:2 CO:3 CO:4 CO:5 CO:6	<p>Understand that by biological evolution we mean that many of the organisms that inhabit the earth today are different from those that inhabited it in the past.</p> <p>Understand that natural selection is one of several processes that can bring about evolution, although it can also promote stability rather than change.</p> <p>Understand how the single cell formed at fertilization forms an embryo and then a full adult organism.</p> <p>Integrate genetics, molecular biology, biochemistry, cell biology, anatomy and physiology during embryonic development.</p> <p>Understand a variety of interacting processes, which generate an organism's heterogeneous shapes, size, and structural features.</p> <p>Understand how a cell behaves in response to an autonomous determinant or an external signal, and the scientific reasoning exhibited in experimental life science.</p>
VI	ZOO C17-T	Environmental Biology, Wildlife Management & Conservations	CO:1 CO:2 CO:3 CO:4 CO:5	<p>Develop an understanding of how animals interact with each other and their natural environment.</p> <p>Develop the ability to use the fundamental principles of wildlife ecology to solve local, regional and national conservation and management issues.</p> <p>Develop the ability to work collaborative team-based projects.</p> <p>Gain an appreciation for the modern scope of scientific inquiry in the field of wildlife conservation management.</p> <p>Develop an ability to analyze, present and interpret wildlife conservation management information.</p>