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**St. Xavier's College (Autonomous), Mumbai**

**Programme: B.Sc. Botany – Zoology**

**Department of Botany:**

*Programme Specific Outcomes (PSOs) and Course Outcomes (CO) for Botany*

**Department of Zoology:**

*Programme Specific Outcomes (PSOs) and Course Outcomes (CO) for Zoology*



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**St. Xavier's College (Autonomous), Mumbai**  
**Department of Botany**

**Programme: B.Sc. Botany**

*Programme Specific Outcomes (PSOs) for B.Sc. Botany*

Sr. No.	A student completing B.Sc. Botany will be able to:
PSO 1	Understand the diversity of plants, their economic importance, life cycles, classification, morphology, anatomy, basic physiological functions, embryological processes, genetics and ecology.
PSO 2	Possess basic skills in identification of plants, growing plants, basic microbial techniques, learn the use of instruments, environmental laws and scientific communication.
PSO 3	Perform experiments in the field or the laboratory making use of analytical, interpretation and writing skills.
PSO 4	Understand the relationship between different fields of botany and other sciences.
PSO 5	Appreciate nature, and become socially responsible citizens by using the acquired knowledge to help conserve environment.



## Course Outcomes (COs): B.Sc. Botany

### Semester I

**Course Title: Thallophyta**

**Course Code: SBOT0101**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the basis of classification of algae, fungi and bryophytes.	1	R
CO 2	Distinguish between the four major classes of algae.	1, 4	R, U
CO 3	Elaborate the general characters of the classes phycomycetes, ascomycetes, basidiomycetes and deuteromycetes of fungi.	1	R, U
CO 4	Know the importance of studying life cycles of type specimens of algae, fungi and bryophytes.	1, 5	R
CO 5	Illustrate and understand the important morphological and anatomical features of Nostoc, Spirogyra, Rhizopus, Agaricus and Riccia.	1, 5	R, U

**Course Title: Angiosperms**

**Course Code: SBOT0102**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the morphological differences in leaves, inflorescence, flowers, their different parts, and modifications of structure.	1, 2	U
CO 2	Know the various terms required to technically describe the plant, the use of specific characters in identifying families.	1, 2	R
CO 3	Recall the basis of classification in the artificial, natural and phylogenetic classification systems of angiosperms.	1	R
CO 4	Grasp the basis of the Bentham and Hooker's system of classification, and the knowledge of families leguminosae, asteraceae and amaryllidaceae.	1	R, U
CO 5	Know how anatomy helps to understand the simple and compound tissues in plants.	1, 4	R, U



**Course Title: Botany Practicals – I**  
**Course Code: SBOT01PR**

<b>Sr. No.</b>	<b>On completing the course, the student will be able to:</b>	<b>PSOs addressed</b>
CO 1	Morphologically differentiate between different categories of leaves, stems, inflorescence and flowers, and identify few common plants.	2, 3
CO 2	Know preparation of specimens and slides for observation under compound microscope.	2



## Semester II

**Course Title: Plant Physiology**

**Course Code: SBOT0201**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Associate the components of water potential to the maintenance of turgidity in plants, transpiration and movement of water from root to the leaves.	1, 4	U
CO 2	Measure the transpiration rates, understand stomatal movements, and gain knowledge of plant anti-transpirants.	1, 2	R, U, Ap
CO 3	Picturize and understand passive and active transport, pinocytosis, and phenomenon of sieve-tube translocation.	1, 4	U
CO 4	Understand enzyme nomenclature, properties, classification, mode of action and kinetics, with an emphasis on how enzymes control all cellular metabolic pathways.	1, 4	R, U
CO 5	Know the structure, function, classification, biosynthesis and degradation of major cellular compounds.	1	R

**Course Title: Cytology and Ecology**

**Course Code: SBOT0202**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Correlate the structure and functions of major cell organelles.	1	U
CO 2	Characterize the cell wall, plasma membrane, mitochondrion and chloroplast.	1	R, U
CO 3	Solve problems based on Mendel's laws, allelic and non-allelic gene interactions, and sex determination in plants.	1, 2	R, Ap
CO 4	Describe the components of ecosystem, and understand various interactions in the food chain and the food web.	1	R
CO 5	Elaborate the role of ecological adaptations in hydrophytes, xerophytes and halophytes.	1, 2	R, U



**Course Title: Botany Practicals – II**  
**Course Code: SBOT02PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Learn basic laboratory skills to perform qualitative tests to detect different organic compounds; perform basic enzyme assays.	3
CO 2	Take plant part sections and prepare slides of different ecologically adapted plants, use microscope to observe them and note anatomical differences; solve problems on Mendelian genetics.	1, 2



### Semester III

#### Course Title: Algae and Fungi

Course Code: SBOT0301

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Utilize properties of bacterial cell wall and other characteristics to identify and distinguish different forms of bacteria.	1, 2	U, Ap
CO 2	Demonstrate the techniques of sterilization, culture media preparation for culturing of bacteria and for obtaining pure bacterial cultures.	1, 2	U, Ap
CO 3	Compare, draw and describe the life cycle of algae Vaucheria, Sargassum, and Batrachospermum.	1, 2	U
CO 4	Explain the structure and methods of reproduction in lichens.	1	U
CO 5	Diagnose the symptoms of common fungal plant diseases.	1, 2	U, Ap

#### Course Title: Photosynthesis and Respiration

Course Code: SBOT0302

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Examine and draw glycolysis, pentose phosphate pathway, anaerobic respiration and TCA cycle.	1, 4	R
CO 2	Understand the interactions involving light during photosynthesis, and the role of ATP and NADPH in CO <sub>2</sub> fixation.	1, 4	R, U
CO 3	Identify the path of carbon during photosynthesis in C <sub>3</sub> , C <sub>4</sub> and CAM pathways, and factors influencing photosynthesis.	1, 4	R, U
CO 4	Diagnose nutritional disorders of plants with respect to essentiality of nutrients.	1, 2	U
CO 5	Comprehend the biochemistry of photorespiration in C <sub>3</sub> and C <sub>4</sub> plants.	1, 4	U



**Course Title: Anatomy and Embryology**  
**Course Code: SBOT0303**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Describe the anomalous growth behavior of plant stem and root, and their anatomical differences.	1	U
CO 2	Understand the transformation of vasculature during root to stem transition, and the components and development of apical, lateral and root meristems.	1	R
CO 3	Describe the structures of microsporangium, megasporangium and the development of male and female gametophytes and dicot embryo.	1	R, U
CO 4	Identify and categorize pollen grains based on their exine ornamentation.	1, 2	U, Ap
CO 5	Understand the applications of palynology in honey industry, coal and oil exploration, forensic sciences and allergy.	1, 4	U

**Course Title: Botany Practicals – III**  
**Course Code: SBOT03PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Know sterilization of glassware, staining of bacteria and basic microbiological techniques.	2, 3
CO 2	Use laboratory techniques to perform various estimations of plant compounds, handle glassware, chemicals, instruments, note down observations, analyze and interpret results.	2, 3





### Semester IV

#### Course Title: Lower Vascular Plants

#### Course Code: SBOT0401

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Know the classification and salient features of major groups of bryophytes, pteridophytes, and gymnosperms.	1	R
CO 2	Differentiate between apospory and apogamy, in addition to thallus organization in bryophytes.	1, 4	R, U
CO 3	Recall the structures, life cycles and systematic positions of type specimens of bryophytes, pteridophytes and gymnosperms.	1, 5	R
CO 4	Comprehend the process of fossil formation correlated with the geological time scales.	1, 4	U
CO 5	Analyse and categorize the structures seen in fossil form genera.	1, 4	An

#### Course Title: Angiosperm Families

#### Course Code: SBOT0402

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Compare the morphology of different fruits.	1	U
CO 2	Know the economic importance of spices, condiments, and paper- and fiber-yielding plants.	1, 5	R
CO 3	Classify the plants into given families according to Bentham and Hooker's system of classification.	1	R, U
CO 4	Use the characters of taxonomic importance in anatomy, palynology and embryology in classification and identification of plants.	1	R, Ap
CO 5	Master the techniques used in preparation of herbarium specimens.	1, 4	Ap



**Course Title: Analytical Tools**  
**Course Code: SBOT0403**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Evaluate the common crude plant drugs and detect adulterants in them.	1, 4	R, E
CO 2	Summarize the basis of development of Kampoh (Chinese) and Ayurvedic system of medicines, and of classification system of crude drugs.	1	R
CO 3	Understand the principle and working of pH meter, colorimeter, light microscope, and paper-, thin layer- and column- chromatography.	1, 3, 4	R, U
CO 4	Solve and explain the common problems using frequency distribution, standard deviation, student's t-test and correlation coefficient.	1, 3, 4	R, U, Ap
CO 5	Be conversant with bioinformatics tools, and be well-versed with the services offered by various online bioinformatics database resources.	1, 3, 4	R, U, Ap

**Course Title: Botany Practicals – IV**  
**Course Code: SBOT04PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Collect, treat, label plant specimen and use it to prepare herbarium sheet; carry out pharmacognostic study of common crude drugs from plants.	2, 3
CO 2	Solve basic statistical problems manually as well as by using a computer; use online tools and databases to perform bioinformatics exercises.	2, 3



### Semester V

#### Course Title: Cytogenetics and Biotechnology

Course Code: SBOT0501

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Compare the cytoplasmic inheritance involving sensitivity to drugs and CO <sub>2</sub> .	1	R, U
CO 2	Understand the central dogma of molecular biology, and the transcription and translation processes.	1	R, U
CO 3	Enumerate the types of gene and chromosome mutations.	1	R, U
CO 4	Explain the role of enzymes in gene cloning, and of various DNA vectors used in transferring desired genes using different methods.	1, 2, 4	R, U
CO 5	Use methods to map, identify, amplify and sequence genes.	1, 2, 4	R, U

#### Course Title: Plant Systematics

Course Code: SBOT0502

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Select timber-, oil- and dye-yielding plants, tea, coffee through family and botanical name; and identify the parts used.	1,2,5	R
CO 2	Compare and contrast the various classifications systems of angiosperms: Cronquist, Takhtajan and APG I-III, their merits, demerits and relevance in today's time.	1	R, U
CO 3	Use literature available on BSI website and in IUCN-red data book, and understand the methods of plant conservation, stressing their role in preservation of biodiversity.	1, 2	R, U, Ap
CO 4	Compare and classify selected plant families according to Bentham and Hooker's system, and their current position in APG III system of classification; identify genus and species using floral specimens.	1, 2	R, U
CO 5	Know different levels of biodiversity, reasons for its loss, and different measures to conserve it.	1, 2, 5	R



**Course Title: Botany Practicals – V**  
**Course Code: SBOT05PR**

<b>Sr. No.</b>	<b>On completing the course, the student will be able to:</b>	<b>PSOs addressed</b>
CO 1	Use the laboratory techniques and instruments to perform basic molecular biology experiments.	3
CO 2	Identify genus and species of plant specimen using taxonomic literature; identify plants in the field.	2



## Semester VI

### Course Title: Plant Growth Physiology

Course Code: SBOT0601

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the biochemistry of nitrogen fixation and effects of nitrogen assimilation on carbohydrate utilization in plants, leading to appreciation of how fertilizers are absorbed and used by plants.	1	U, Ap
CO 2	Analyse quantitative aspects of vegetative growth of annual plants, and interpret factors affecting growth.	1	R, U
CO 3	Deduce the role of environment in flower initiation through phenomenon of photoperiodism and vernalization.	1, 2	R, U
CO 4	Use the knowledge of growth hormones and growth-retarding hormones at different stages of plant growth and for various parts of plant to optimise plant growth and yields in practice.	1, 2, 3	R, U, Ap
CO 5	Know morphological and biochemical changes accompanying seed development, seed germination, dormancy, aging and senescence.	1, 4	R, U

### Course Title: Environmental Botany

Course Code: SBOT0602

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the function and importance of biotic and abiotic environmental factors in the sustenance of plant life and the local ecology.	1	U
CO 2	Evaluate the diverse biotic interactions among organisms helping them to survive in an ecosystem.	1, 5	U, E
CO 3	Devise various methods to mitigate pollution caused by light, noise, water, soil and air, and their effects on plants.	1, 2	U
CO 4	Understand deforestation, afforestation, reforestation, and be aware of various existing institutions for forest research, education and training.	1	R
CO 5	Know the different acts of the country which provide the legal framework to protect and conserve forests, environment and the associated wildlife.	1, 2	R



**Course Title: Botany Practicals – VI**  
**Course Code: SBOT06PR**

<b>Sr. No.</b>	<b>On completing the course, the student will be able to:</b>	<b>PSOs addressed</b>
CO 1	Perform plant physiology experiments, and use chromatographic techniques to carry out estimations of phytochemicals.	3
CO 2	Use ecological instruments to detect weather and soil parameters; identify phytogeographical area from a map.	2



**St. Xavier's College (Autonomous), Mumbai**  
**Department of Zoology**

**Programme: B.Sc. Zoology**

***Programme Specific Outcomes (PSOs) for B.Sc. Zoology***

Sr. No.	A student completing B.Sc. Zoology will be able to:
PSO 1	Develop a wholistic understanding of the diversity of life with respect to identification, unique aspects and conservation status of organisms.
PSO 2	Have an in-depth understanding of the basics of zoology, with evolution being the overall theme stitching together the fundamental areas in zoology.
PSO 3	Have a strong grounding in the fundamentals of the modern trends and applied areas of biology, and be equipped with the skill sets needed in these areas.
PSO 4	Develop critical thinking skills augmented by strong conceptual foundation in biology.
PSO 5	Be familiar with digital learning – use online databases to gather, curate and analyse data; form opinions based on facts, and have enhanced problem-solving skills.
PSO 6	Aim for a multifaceted career, either in industry, higher education, research or entrepreneurship.
PSO 7	Conduct basic research, design and perform experiments, present results in front of the peers and write a research paper; develop skills in experimental design, scientific writing and defense of results using proper statistical analyses.
PSO 8	Learn the basics of evolutionary theory and how this explains various phenomena in biology, through the cross-faculty course 'The Secret Lives of Animals', developed for the students of humanities; obtain glimpses of evolution of animal societies, adaptations and survival strategies evolved by animals in extreme environments.



## Course Outcomes (COs): B.Sc. Zoology

### Semester I

**Course Title: Invertebrate Systematics and Biomolecules**

**Course Code: SZOO0101**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Recount the physical characteristics of the various invertebrate phyla and their classes.	1, 2	U, R
CO 2	Identify and classify various invertebrate specimens up to the phylum level.	1, 2	U, R
CO 3	Classify various biomolecules, draw their structures and state differences between them.	3, 4	U, R, Ap
CO 4	Understand the biological significance of the biomolecules and their role and importance in our day-to-day living.	3, 4	U, R, Ap

**Course Title: Genetics and Evolution**

**Course Code: SZOO0102**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Analyse and understand the relationship between genes and phenotypes; solve basic mathematical problems in genetics.	2, 4	U, R, Ap
CO 2	Explain the molecular interactions that lead to a particular phenotypic expression in simple layman terms.	3, 4, 6	U, An, Ap
CO 3	Draw, analyse and interpret pedigree charts for genetic traits; be aware of career options in genetics.	4, 5, 6	U, R, An, Ap, E
CO 4	Have a clear and fundamental understanding of evolution; know what the preliminary evolutionary mechanisms are; acquire knowledge-base for more advanced concepts in evolution.	1, 2	U, R
CO 5	Analyse and answer questions in Mendelian genetics and human pedigree.	4, 5	An, Ap, E





**Course Title: Zoology Practicals – I**  
**Course Code: SZOO01PR**

<b>Sr. No.</b>	<b>On completing the course, the student will be able to:</b>	<b>PSOs addressed</b>
CO 1	Identify and classify the various invertebrate specimens, and detect macromolecules in tissue samples.	2, 3
CO 2	Build and analyse pedigree charts and genetic issues stemming from family trees.	3, 4



## Semester II

### Course Title: Vertebrate Systematics and Ecology

Course Code: SZOO0201

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Develop an understanding of the diversity of chordate life forms.	1, 2	U, R
CO 2	Classify vertebrate animals on the basis of their morphological characteristics.	1, 2	R, Ap
CO 3	Develop a critical understanding of how animal adaptations enhance survival and drive evolution.	2	U, Ap
CO 4	Be aware of the distribution of life forms and understand the functional basis of animal ecology.	1, 2	U, R, An
CO 5	Understand the consequences of loss of biodiversity; analyse human contribution to this loss.	2	U, An

### Course Title: Biotechniques and Comparative Physiology

Course Code: SZOO0202

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Describe movement, locomotion, digestion, circulation and respiration in different life forms.	1, 2	U, R
CO 2	Understand neural conduction and reproductive systems in different organisms.	1, 2	U, R
CO 3	Demonstrate the skill of explaining and illustrating the physiology of animals.	4, 6	U, Ap
CO 4	Carry out experiments with different chemical solutions.	4, 6	Ap, An, E
CO 5	Classify and compare the types and workings of microscopes.	4, 6	U, Ap, An
CO 6	Illustrate the processes of centrifugation, chromatography and electrophoresis, their types and uses.	4, 6	U, A, E
CO 7	Explain the principles and applications of various biological techniques.	7	A, An



**Course Title: Zoology Practicals – II**  
**Course Code: SZOO02PR**

<b>Sr. No.</b>	<b>On completing the course, the student will be able to:</b>	<b>PSOs addressed</b>
CO 1	Identify and classify vertebrate life forms that are observed in the field, and quantify changes occurring in ecosystems over time.	2, 3
CO 2	Understand the applications of various biological techniques used.	3



### Semester III

#### Course Title: Animal Behaviour and Parasitology

Course Code: SZOO0301

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Develop skills and carry out experiments to understand aspects of animal behaviour.	2, 3	U, An
CO 2	Understand and objectively evaluate information regarding routine animal behaviour.	3, 4	Ap, E
CO 3	Diagnose causative agents and vectors for the parasites studied; describe their pathogenesis, treatment and prophylaxis.	3, 4	U, R, Ap
CO 4	Use the knowledge gained as a foundation for a course in behavioural ecology.	4	U, An

#### Course Title: Biostatistics and Evolution

Course Code: SZOO0302

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Collect data using appropriate sampling techniques.	3, 7	U, Ap, C
CO 2	Describe the data using various aspects of statistics such as measures of central tendency, dispersion and different graphical methods.	5, 6, 7	U, Ap, An, C
CO 3	Formulate a hypothesis, choose an appropriate statistical test for it, and perform the test.	4, 5, 6, 7	U, Ap, An
CO 4	Develop a clear understanding of Darwin's theory, natural selection and modern synthesis of evolution.	2, 3, 4	U, An
CO 5	Understand the different proofs of the theory of evolution.	2, 3, 4	U, R, Ap
CO 6	Construct phylogenetic trees using parsimony analysis and Unweighted Pair Grouped Method with Arithmetic Mean.	2, 3, 4, 5	U, Ap, An, C



**Course Title: Advanced Genetics and Bioinformatics**  
**Course Code: SZOO0303**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Statistically compute and analyse gene frequencies from the data provided.	3,4,5	U, An, Ap, E
CO 2	Access biological databases, extract information and analyse it using bioinformatics software.	3,4,5	An, Ap, E
CO 3	Use the knowledge gained as a foundation for a course in molecular biology.	2,3	U, R Ap
CO 4	Join research in related areas such as genetic engineering, genetic disorders, human fertility programme, genotoxicity and bioinformatics.	3, 6	An, Ap, C

**Course Title: Zoology Practicals – III**  
**Course Code: SZOO03PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Understand and evaluate animal behaviour in the feral animals encountered in the field; be aware of the common parasites that could affect humans; be equipped with information regarding basic prophylactic measures to be taken for field visits.	3
CO 2	Perform basic descriptive statistics and basic inferential statistics; understand concepts in evolutionary biology and draw a phylogenetic tree.	2, 3, 4, 5
CO 3	Do a hands-on project in bioinformatics; develop basic microbiology laboratory skills.	3, 4, 5



### Semester IV

**Course Title: Developmental Biology and Information Flow**

**Course Code: SZOO0401**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Possess a strong foundation in developmental biology.	2, 3	U
CO 2	Understand the general features of development of multicellular organisms.	2, 3, 4	U, R, An
CO 3	Understand the basic features of early development such as fertilization, zygote formation, blocks to polyspermy, blastulation, gastrulation and cell differentiation including the fundamental molecular events behind cell differentiation.	2, 3, 4, 7	U, R, Ap, An
CO 4	Understand the four basic types of regeneration.	2, 3, 4	U, R, An
CO 5	Understand the details of prokaryotic and eukaryotic DNA transcription and translation including the factors required for the processes, different phases of the processes; know the similarities and differences between these processes in prokaryotes and eukaryotes.	2, 3, 4, 6	U, R, An
CO 6	Understand differential gene regulation in prokaryotes using lac operon as a system.	2, 3, 4	U, R, Ap
CO 7	Understand differential gene regulation in eukaryotes at different levels such as DNA-binding proteins, DNA transcription, post-transcription, translation and post-translation.	2, 3, 4, 6	U, R, An



**Course Title: Cell Biology**  
**Course Code: SZOO0402**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the structure and functions of plasma membrane and endo-membrane systems.	3, 4	U, R
CO 2	Explain the detailed structures and functions of mitochondria and nucleus.	3, 4	U, R
CO 3	Describe the cell cycle and stages of cell division; distinguish between mitosis and meiosis.	3, 4, 6	U, An
CO 4	Categorise types of cell culture; know the requirements for establishment and maintenance of primary cell culture and cell lines.	3, 4, 6, 7	U, Ap, An, C
CO 5	Explain types of cancer, its hallmarks, and carcinogens.	4, 6, 7	U, Ap, C

**Course Title: Biochemistry and Applied Zoology**  
**Course Code: SZOO0403**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Apply the knowledge of importance of buffers in the day-to-day living and solve problems related to the topic.	3, 4, 5	U, Ap, An
CO 2	Understand the different metabolic pathways, and represent them schematically; know terminologies and disorders associated with metabolism of carbohydrates, lipids and proteins.	3, 4	U, R, Ap, An
CO 3	Possess knowledge of the types of fishery in India, methods of capture, preservation and uses; be conversant with various types of local commercial fish.	1, 2, 3	U, R, Ap
CO 4	Understand the technicalities, conditioning factors and environmental impacts of culturing fish, prawn and pearl; understand the maintenance of dairy farm, along with the knowledge of various diseases associated with it.	1, 2, 3, 4	U, R, Ap, An, E
CO 5	Know broad areas of career options in applied zoology (aquaculture and dairy science).	6, 7	U



**Course Title: Secret Lives of Animals**  
**Course Code: ASPC04018**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Develop a basic understanding of evolutionary biology and how it applies to various phenomena seen in biology.	8	U, R, Ap
CO 2	Understand that the theory of evolution has been proven with ample evidence, and it is not just a hypothesis yet to be proven.	8	U, Ap, An
CO 3	Understand forms and functions of different animal societies.	8	U, R, Ap
CO 4	Understand theories that explain evolution of sociality in animals.	8	U, Ap
CO 5	Understand the challenges posed by extreme environments to animals living there.	8	U, R
CO 5	Understand adaptation and survival strategies evolved by the animals living in extreme environments.	8	U, R

**Course Title: Zoology Practicals – IV**  
**Course Code: SZOO04PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Know the importance of fishery and dairy science which could be used for entrepreneurship.	3, 6
CO 2	Identify embryonic stages of organisms such as frog, chick and fruit-flies; make permanent slides of the early embryonic stages of chick.	2, 3, 4
CO 3	Maintain primary cell lines.	4, 6





### Semester V

#### Course Title: Vertebrate Ontogeny, Behaviour and Ecology

Course Code: SZOO0501

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the evolution of vertebrate systems, integrating structure and function.	1, 2	R, U
CO 2	Understand and objectively evaluate the role of behaviour in the survival of wild species.	4, 7	U, Ap
CO 3	Understand different methods to estimate population size and population dynamics including models of population growth, life tables and population pyramids; know interactions among populations of different species on spatial and temporal scales.	1, 2, 3, 4, 6	U, R, Ap, An, C
CO 4	Use the principles of wildlife management to reduce local/national human-animal conflicts; and contribute to conservation of wildlife.	1, 5	An, E
CO 5	Be aware of the opportunities in the tourism sector (tourism writing, package tour operation) or institutes / NGOs involved in curtailing illegal wildlife trade.	6	Ap, C

#### Course Title: Physiological Adaptations

Course Code: SZOO0502

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Develop an understanding of form, function and adaptation in organ systems central to the maintenance of life and its interaction with the environment.	2	U, R, Ap, C
CO 2	Illustrate the role of signalling pathways and their components in adaptation.	3, 4, 6	U, A, An
CO 3	Understand the basics of astrobiology including origin and evolution of life on Earth, habitable zones, search for exoplanets and for life on other-than-Earth systems.	1, 2, 3, 4, 6	U, R, An
CO 4	Understand the basics of meteorites and their role with respect to life on Earth.	2	U, R
CO 5	Understand the effect of space environment on human physiology, including adverse effects and the counter-measures for the same.	1, 2, 3, 6	U, R, An



**Course Title: Zoology Practicals – V**  
**Course Code: SZOO05PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Identify bones of vertebrate life forms encountered in the field; know animals that belong to different zoological realms, and be aware of their conservation status and related problems; understand the importance of environment in shaping adaptations required for survival.	2, 3, 5
CO 2	Identify and understand different types of meteorites; understand different parts of astronauts' suits and their functions.	2, 3
CO 3	Make life history tables, and use population estimation techniques.	5,

**Course Title: Insect Taxonomy and Applied Entomology**  
**Course Code: SZOO05AC**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Apply the knowledge of taxonomy to identify and classify insects.	1, 2	U, R
CO 2	Understand anatomical features and their variations in different insects.	1, 2	U, R
CO 3	Know the parts and the working of the various systems within an insect, and adaptive modifications seen in different insects.	1, 2	U, R, Ap
CO 4	Realise how insects are affected by various ecological factors such as temperature, light and humidity, and how they adapt to variations in these factors.	1, 2, 3	U, R, Ap, An
CO 5	Know the different types of honeybees, their nesting habits, apiculture methods, harvest of commercial products from them, and their role in pollination services.	1, 2, 3, 6	U, R, Ap, An
CO 6	Understand the life cycle and culturing of mulberry silkworm, lac insect, cochineal bug and blister beetle; know products of commercial importance associated with them.	1, 2, 3, 6	U, R, Ap



**Course Title: Applied Component Practicals – I**  
**Course Code: SZOO05ACPR**

<b>Sr. No.</b>	<b>On completing the course, the student will be able to:</b>	<b>PSOs addressed</b>
CO 1	Take up further studies in taxonomy of insects with the basic understanding of anatomy and morphology of insects.	2, 3
CO 2	Understand the basic biology and rearing of insects of economic importance such as honeybees, silkmoths and lac insects.	3, 6



### Semester VI

#### Course Title: Basics of Enzymes, Toxicology, Histology and Nanoscience

Course Code: SZOO0601

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand the concept of enzymes, their role in chemical reactions, and how various factors affect enzymes and enzyme kinetics.	3, 4	U, R, Ap, An
CO 2	Understand the basic concept of toxicology; know the mechanisms of systemic and organ toxicity as a result of various toxicants entering a living system.	3, 4, 6	U, R, Ap, An
CO 3	Know how toxicants disrupt normal functioning at the cellular, genomic and proteomic level.	3, 4, 6	U, R, Ap, An, E
CO 4	Describe the histological structure of various exocrine and endocrine glands, their functions and their abnormalities.	2, 3, 4	U, R, Ap
CO 5	Understand the concept of nanoscience and apply this knowledge to various fields in the day-to-day living.	3, 4, 5, 6, 7	U, R, Ap, An, C
CO 6	Apply the knowledge of toxicology and nanoscience for career development in higher education and commercial research and development.	6, 7	U

#### Course Title: Immunology and Recombinant DNA Technology

Course Code: SZOO0602

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Understand how immune responses are initiated and regulated by T cells and B cells.	2, 3	U, R, Ap
CO 2	Understand how hypersensitivity reactions are activated and the responses shown by the host.	2, 3	U, An, AP
CO 3	Explain misunderstandings about vaccines to laymen, and educate them about the importance of vaccines in public health.	3, 4, 5	U, An, E
CO 4	Join research laboratories; conduct immunological assays.	3, 5, 6	An, Ap, E
CO 5	Be well versed in recombinant DNA technology with applications in biomedical science, agriculture and environmental science.	2, 3, 5, 6	U, R, An, Ap
CO 6	Independently work on a research project, analyse data and defend the conclusions.	4, 5, 6, 7	An, Ap, E, C



**Course Title: Zoology Practicals – VI**  
**Course Code: SZOO06PR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Pursue research in the field of toxicology relating it to enzymes and histology of various tissues; enter the field of nanoscience.	3, 6
CO 2	Perform experiments in molecular biology and immunology to complement the theory; know useful techniques required for further education.	3, 4, 6

**Course Title: Forensic Entomology and Pest Management**  
**Course Code: SZOO06AC**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed	Cognitive levels
CO 1	Develop the skills of observation, collection and preservation of insects as evidence from a crime scene.	3, 4	U, R
CO 2	Estimate the PMI using the evidence, and critically analyse the crime scene.	3, 4, 6	An, Ap
CO 3	Devise a strategy for control of insect pests; and develop data collection methodology.	3, 4, 6	U, An, Ap
CO 4	Integrate technology with biology and come up with innovative pest-control solutions.	3, 5, 6	U, An, Ap, C
CO 5	Develop the basic skills needed for the concerned industry or set up a start-up company.	2, 5, 6	An, Ap
CO 6	Write a field report based on a visit, and carry out a small project in the area of forensic entomology, or pest control.	4, 6, 7	An, Ap, E, C

**Course Title: Applied Component Practicals – II**  
**Course Code: SZOO06ACPR**

Sr. No.	On completing the course, the student will be able to:	PSOs addressed
CO 1	Develop the skill of observation and the knowledge regarding what and how to collect and preserve insects of forensic importance.	3, 4
CO 2	Know the basics of toxicity testing in animals and the calculations for quantification of toxicity of a chemical pesticide.	3, 4