

Deccan Education Society's
Fergusson College (Autonomous), Pune

Program Specific Outcomes(PSOs) and Course Outcomes (COs) 2019-20

Department of Zoology
Programme: B. Sc. Zoology

PSO No.	Program Specific Outcomes(PSOs) Upon completion of this programme the student will be able to
PSO1	Academic competence (i) Develop deeper understanding of key concepts of Zoology at biochemical, molecular, cellular, physiological, histological and systematic level. (ii) Understand the ecological impact on the evolutionary history of not only mankind but also unfolding the secrets of origin of life and classical Zoology. (iii) Assess environmental impact on applied and skill-based branches of Zoology
PSO2	Personal and Professional Competence (i) Carry out analysis of biological data, perform laboratory procedure with suitable technique in Histology, Physiology, Immunology, Bio- chemistry, molecular biology, environment biology, organic evolution, animal pathology, Endocrinology and biological techniques. (ii) Identify animals on the basis of comparative morphology and anatomy.
PSO3	Research Competence (i) Integrate and explore biological data. (ii) Use current laboratory setup, instrumentation, statistical and biological techniques in the collection, organization, analysis, interpretation and manipulating the data related to Zoology discipline and allied branches. (iii) Identify and interpret research literature, formulate ideas, write reports and review articles related to the subject.
PSO4	Entrepreneurial and Social competence (i) Empower the students by enhancing their self-sustainability capabilities through a thorough understanding of skill-based subjects and techniques by learning (ii) culturing techniques of economically important animals in applied and classical zoology. (iii) Develop social competence including listening, speaking, observational, effective interactive skills and presenting skills to meet global competencies.

F.Y. B. Sc. Semester I

Title of the Course and Course Code	Life and Diversity of Animals-I (ZOO1101)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define terms related to animal systematics and outline the various systems of classification.	1,2
CO2	Classify the invertebrates on the basis of comparative morphology of animals and justify the reasons.	2,3,5
CO3	Demonstrate the structure and functions of spicule of sponges and classify the sponges on the basis of their skeleton.	3,2
CO4	Define the systematic position and habitat of earthworm. Describe body wall and coelom of earthworm and explain the structure and functions of their organ system.	1,2,4
CO5	Recall the names of protozoan and helminthes parasites of animals and illustrate their life cycles and pathogenicity.	1,2,3
CO6	Carry out the field survey and write the field report on the basis of comparative morphology of animals.	6
Title of the Course and Course Code	Cell Biology (ZOO1102)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe the concept of cell theory, cell-cell signalling, apoptosis and identify and label components of the cells. Describe prokaryotic and eukaryotic cells.	1
CO2	Differentiate plant cell and animal cell and compare their properties. Explain the structure and functions of various cell organelles and the process of cell division.	2,4,5
CO3	Illustrate the mechanism of programmed cell death, cell to cell communication and the process of mitosis and meiosis.	3
CO4	Identify and draw diagrams of cell organelles and analyse their functions.	1,4
CO5	Review the process of apoptosis and cell cycle. Explain characteristics of cancerous cells and define oncogenes and proto-oncogenes.	5,2,1
CO6	Integrate the postulates of the cell theory with cellular activities which leads to repairing and regeneration of the cells and the production of energy.	6
Title of the Course and	Zoology Practical – I (ZOO1103)	Number of Credits : 02

Course Code		
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe fundamental concepts of systematics, cell division and standard operating procedures of compound microscope.	1
CO2	Classify different species of animals from protozoa, porifera, coelenterate, platyhelminthes and aschelminthes.	2
CO3	Demonstrate the procedure of detection of mitochondria, preparation of slide for mitosis and identify various stages of mitosis.	3
CO4	Differentiate the features of prokaryotic and eukaryotic cells and compare plant cell and animal cell.	4
CO5	Justify the identification and classification of animals with the help of their distinguishing features.	5
CO6	Compile the data obtained from observations of animals in the field and organize it as per animal systematics.	6
F.Y. B.Sc. Semester II		
Title of the Course and Course Code	Life and Diversity of Animals-II (ZOO1201)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe the terms related to chordate taxonomy.	1
CO2	Classify and compare the characters of subphylums of protochordates. Explain the characters of classes of pisces and amphibians.	2,4
CO3	Demonstrate the various systems of frogs and describe its organ system.	3,1
CO4	Classify the vertebrate fauna on the basis of shared homologous characters.	4
CO5	Compare the types of scales in fishes and explain parental care in Amphibian.	4,5
CO6	Collect the information and write about neoteny in Amphibia.	6
Principles of Genetics (ZOO1202)		
Title of the Course and Course Code	Principles of Genetics (ZOO1202)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define different terminology of the genetics. Describe the concepts of Genetics, gene interaction, lethal genes, euploidy, aneuploidy, sex linked inheritance and principles of inheritance.	1
CO2	Explain and differentiate between multiple alleles and multiple	2,4

	genes. Explain the pattern of inheritance of complementary, supplementary, inhibitory and duplicate factors.	
CO3	Execute the crosses of sex-linked inheritance, inheritance of blood groups, monohybrid cross, dihybrid cross and the test cross..	3
CO4	Differentiate the autosomes and sex chromosomes, euchromatin and heterochromatin. Outline the cell cycle of <i>Drosophila melanogaster</i> .	4
CO5	Apprise structural and numerical aberrations of chromosomes and give their characteristics and examples.	5
CO6	Specify the importance of genetic basis of life, integrate the principles of inheritance with plant and animal breeding and the medicolegal importance of blood group studies.	6
Title of the Course and Course Code	Zoology Practical – II (ZOO1203)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Recall the fundamental concepts of systematics, genetics, sex linked inheritance, multiple alleles and mutation.	1
CO2	Discuss, identify and classify different species of animals from Hemichordata, Cephalochordata, Urochordata, Cyclostomata, cartilaginous fishes and Bony fishes	2
CO3	Examine different genetic traits in human being and analyze the human karyotype.	3,4
CO4	Detect A, B, AB, O and Rh blood groups.	4
CO5	Appraise and classify the specimens from zoology museum.	5, 4
CO6	Compile the data of different syndromes in human beings and prepare a report.	6
S.Y. B. Sc. Semester III		
Title of the Course and Course Code	Life and Diversity of Animals-III (ZOO2301)	Number of Credits : 02
On completion of the course, the students will be able to :		Bloom's Cognitive level
CO1	Identify and classify the Molluscs, Annelids, Echinodermata on the basis of comparative morphology and describe their evolutionary importance.	1, 2, 3
CO2	Compare characters of invertebrates belongs Annelids, Molluscs ,arthropods, Echinodermata.	4, 5
CO3	Apprise morphology of shell and foots modification in molluscs.	5
CO4	Explain the diversity and adaptive radiations of invertebrates	2, 4
CO5	Articulate the mechanisms and hormonal control of metamorphosis	4, 5

	process in insects. Discriminate the mouth parts of various insects.	
CO6	Carry out the field survey and write the field report on the basis of comparative morphology of animals.	6
Title of the Course and Course Code	Applied Zoology -I (ZOO2302)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe and discuss the basic concept and principals involved in the culture and breeding of common edible freshwater and marine species.	1, 2
CO2	Differentiate between freshwater, estuarine and marine fisheries. Compare the difference between culture fisheries and harvesting	2,4,5
CO3	Demonstrate and explain the use of different crafts and gears; outline the modern and traditional techniques and methods of fishery by-products industry	1,2,3,4
CO4	Explain cage, pen and integrated culture techniques and differentiate between them. Discuss and outline the preservation techniques of fishes.	1,2,3,4
CO5	Compare integrated fish farming, prawn culture with monoculture. Assess and discuss the advantages and disadvantages of different integrated culture techniques.	2,3,5
CO6	Determine the different zoogeographical realms and prepare a world map on the basis of ichthyographical distribution of different species. Design the structure of a fish farm for culture of fishes.	5,6
Title of the Course and Course Code	Zoology Practical III (ZOO2303)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the fishes from freshwater and marine water. Describe external characters and other important systems of sea star. Design the experiment to culture and identify the crustacean larvae.	1, 6
CO2	Classify and explain animals from phylum mollusc, Annelida, Arthropoda, Echinodermata.	2,3,4
CO3	Identify and compare the shell and foots modification in molluscs and mouth parts of different insects..	1, 4
CO4	Identify and demonstrate the use of different crafts and gears.	1, 4
CO5	Determine the age of fishes and measure the length -weight of given fish. Calculate fin formula of the given fish specimen.	3, 5
CO6	Determine the distribution of fishes on world map and carry out morphometric analysis of fish.	3, 6
S.Y. B. Sc. Semester IV		

Title of the Course and Course Code	Life and Diversity of Animals-IV (ZOO2401)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify and describe the characters of class – Reptilia, aves and mammals.	1
CO2	Differentiate and interpret the morphological characters of class reptilia, aves and mammals.	2, 4
CO3	Classify the reptiles, aves and mammals.	3
CO4	Compare and interpret the structure and functions of organs of Scoliodons.	4
CO5	Discriminate the poisonous and non-poisonous snakes with the help of identification key	5
CO6	Carry out the field survey and write the field report on the basis of comparative morphology of vertebrate animals.	6
Title of the Course and Course Code	Applied Zoology II (ZOO2402)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Articulate the basic concept of Apiculture and Sericulture, its importance, history and present status. Describe the taxonomy, morphological sex differences in pupa, larvae and adult of silkworm and honey bee.	1,2
CO2	Differentiate between different life stages of silkworm and honey bee and explain their life cycle. Discuss control and prevention of pests and diseases.	2,4
CO3	Demonstrate and discuss the culture methods of B.mori and Apis species. Outline the silkworm rearing technology, bee pollination and management of bee colonies for pollination.	2,3
CO4	Differentiate diseases of silk worms and honey bees, and different methods for control. Outline the important tools and equipment's used in apiculture and sericulture	2,3,4
CO5	Compare and explain bee behaviour and bee communication. Review of bee colony, castes, natural colonies, their yield and types of montages, spinning, harvesting.	2,4,5
CO6	Evaluate, appreciate and specify the importance of embarking on self-employment through rearing of silkworms, rearing honey bee and write about judicious use of their by-products and moriculture.	5,6
Title of the Course and Course Code	Zoology Practical III (ZOO2403)	Number of Credits : 02
On completion of the course, the students will be able to:		Bloom's Cognitive

		level
CO1	Identify the birds on the basis of beak and feet. Discriminate, poisonous and non-poisonous snakes with the help of identification key.	1,4,5
CO2	Classify the vertebrates, reptiles, aves, mammals.	2,3
CO3	Demonstrate external characters and other important systems of Scoliodon.	3
CO4	Describe the life cycle of honey bee and silk worm. Identify and explain mouth parts, wings legs and sting of honey bee.	1,4
CO5	Assess the quality of soil and interpret its suitability for moriculture.	2,3,5
CO6	Identify the various instruments used in apiculture and sericulture. Prepare sericulture maps indicating mulberry and non –mulberry belts in India. Prepare a report on bird diversity in Fergusson College campus.	1,4,6
T.Y. B. Sc. Semester V		
Title of the Course and Course Code	ZOOLOGY PAPER - I Title: Life and Diversity of Animals-V (ZOO3501)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the systematic position, habit and habitat and external characters of Pila globosa. Describe the body wall and pallial complex and organ system of Pila globosa.	1
CO2	Explain the methods of locomotion, nutrition and reproduction in various species of Protozoa. Distinguish the general features of Paramecium.	2,4
CO3	Apply the knowledge in study of various types of canal system in Porifera. Compare the skeletal spicules in sponges.	3,4,5
CO4	Analyse the polymorphism in various coelenterates and summarize the process of corals and coral reef formation in them.	4,2
CO5	Evaluate the parasitism and parasitic adaptation of helminths and explain the process of regeneration in Planaria. Compare the knowledge of metamerism in Annelida and describe the process of torsion and detorsion in Mollusca.	5,2,4,1
CO6	Compile the information and develop skill in identification and classification of rotifers. Explain the general characters and affinities of hemichordates.	6,4
Fundamentals of Histology (ZOO3502)		
Title of the Course and Course Code	Fundamentals of Histology (ZOO3502)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe concept of histology, basic structure of tissues and also identify and label microscopic structure of organs.	1

CO2	Differentiate between histological structure of different regions of alimentary canal and explain the structure of skin, lungs and kidney.	2
CO3	Illustrate histological structures of various cell types, tissues and organs.	3
CO4	Explain the histological organization of endocrine, exocrine glands, gonads and correlate it with the health issues.	4
CO5	Compare the characteristics of epithelial, connective, muscular, nervous tissues and also the types of blood vessels.	5
CO6	Specify the importance of histological studies for the services provided by clinical and pathological laboratories.	6

Title of the Course and Course Code	ZOOLOGY PAPER - III Title: Bio – Chemistry (ZOO3503)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline concept of pH and buffer, its importance and explain types of bond and buffers in biological system. Describe structure and properties of water.	1,2
CO2	Classify types of sugars and demonstrate stereochemistry of carbohydrates and their properties.	2,3
CO3	Classify amino acids on the basis of their structures and tell their types. Differentiate structures of proteins , state examples and tell bonds responsible for protein structures	3,1
CO4	Analyze amino acids on the basis of tests .	4
CO5	Grade lipids based on the structure, and functions and explain triglycerides, saponification.	5,4
CO6	Explain the role of vitamins in metabolism, learn structures and develop the knowledge to relate vitamins to the type of deficiency diseases.	5,6

Title of the Course and Course Code	Ecology and Environmental Biology (ZOO3504)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe basic concept of ecology, structure and function of ecosystem and its management. Define, differentiate and explain the large-scale patterns of temperature regulation. Describe and write about different types of pollutants, their effects, control measures and how they interact in the environment.	1,2,4,6
CO2	Interpret and explain how interactions between organisms and their environments drive the dynamics of individuals, populations, communities, and ecosystems.	2,3
CO3	Demonstrate the characteristics of population and its dynamics and illustrate how population data can be analysed using statistics,	3,4

	graphs, life tables, and survivorship curves.	
CO4	Differentiate between environmental conditions of aquatic ecology, terrestrial ecology and desert ecology. Outline the ecological classification of organisms. Describe and analyse remote sensing for sustainable development and its application in environmental biology,	1,3,4
CO5	Enable the learner to understand, compare, think and evolve strategies for wildlife management and causes of wildlife depletion. Discuss and evaluate the renewable and non-renewable resources, compile different measures for forest conservation and determine different energy sources: conventional and non-conventional.	2,4,5,6
CO6	Develop an in-depth understanding of the interdisciplinary relationship of global environmental issues related to acid rain, ozone depletion and global warming and explain them. Compile data of endangered, rare and extinct species from red data books. Design and evaluate strategies, technologies, and methods for assessment and sustainable management of environmental systems.	2,4,6

Title of the Course and Course Code	General Endocrinology (ZOO3507)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe endocrine glands and physiological functions of hormones synthesized and secreted by them.	1
CO2	Explain hormonal regulations of different hormones.	2
CO3	Illustrate feedback mechanism of hormones secreted by Pituitary gland, other endocrine glands and neuroendocrine system.	3
CO4	Classify different classes of hormones and their mechanism of action.	4
CO5	Review different Assisted Reproductive technologies.	5
CO6	Write a report on hormonal dysfunctions and disorders.	6

Title of the Course and Course Code	Zoology Practicals – I (ZOO3511)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify and describe the process of cyclosis, binary fission, conjugation in paramecium and life cycle of different helminth parasites	1
CO2	Identity and explain the permanent slides of Balanoglossus.	1, 2
CO3	Demonstrate the method for preparation of paramecium culture medium and the study of Rotifers from the fresh water.	3
CO4	Compare the histological structures of different organs and explain their characteristics.	4
CO5	Apprise the procedures of preparation of various fixatives and outline	5

	the method of preservation of tissues.	
CO6	Assemble the set of microtomy to prepare permanent slides of different tissues and prepare a flowchart for staining the permanent slides.	6

Title of the Course and Course Code	ZOOLOGY PAPER Title: Immunology (ZOO3515)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the basic terms and concepts of immunological processes at cellular and molecular level and identify the main mechanisms and types.	1
CO2	Explain autoimmune disorders and exemplify the adverse effect of autoimmunity. Illustrate various mechanisms that regulate immune responses.	2,4
CO3	Articulate principle of antigen-antibody reaction and outline basic techniques for identifying them	2,3
CO4	Explain the activities of cells of immune system and discuss their types, formation process and function.	4
CO5	Compare and contrast innate and adaptive immunity.	5
CO6	Design a model of Immunoglobulins, discriminate and explain their types.	6
T.Y. B. Sc. Semester VI		
Title of the Course and Course Code	ZOOLOGY PAPER - II Title: Life and Diversity of Animals-VI (ZOO3601)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Define the systematic position, habit, habitat and external characters of Amphioxus. Describe the organ system of Amphioxus.	1
CO2	Compare the evolution and structures of aortic arches, heart, kidney and brain of vertebrates.	2,4,5
CO3	Define the systematic position, habit, habitat and external characters of Calotes versicolor. Explain the structure of body skin, various types of scale and coelom of Calotes versicolor and describe its organ system	1,2 ,4
CO4	Differentiate the modifications in habit and habitat and morphological characters of lung fishes. Describe the accessory respiratory organs, compare electric organs and explain the various types of migration in fishes. Compute the knowledge of parental care and neoteny in various species of amphibia.	1,4,3
CO5	Discriminate the temporal vacuities in skull type of reptiles. Explain the general characters of Rhynchocephalia.	5,4

CO6	Compile the knowledge of flight adaptation of birds. Explain the dentition in mammals and design the dental formulae of various mammals.	4,6
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Title of the Course and Course Code	Physiology: Life sustaining processes (ZOO3602)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe the concepts of physiology, its importance, functions of organs and organ systems. Explain the process of digestion, respiration, excretion and thermoregulation.	1, 4
CO2	Discuss the mechanism of muscular contraction, disorders related to muscular contraction, cardiac cycle and urine formation.	2
CO3	Apply the knowledge of physiology to interpret BMR, respiratory quotient and temperature changes in the body.	3
CO4	Explain and analyse the causes, changes in the physiological parameters, respiratory quotient; outline the process of vision, hearing and sense of olfaction.	4
CO5	Compare the methods of heat gain mechanism and heat loss mechanism, Bohr's effect and Haldane effect,	5
CO6	Compile the physiological data related to digestive, respiratory, circulatory, excretory systems.	6

Title of the Course and Course Code	Molecular Biology (ZOO3603)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Describe concept of chromatin, DNA packaging and its importance.	1
CO2	Classify types of DNA and explain prokaryotic and eukaryotic DNA and plasmids structure and function.	2,3
CO3	Explain mechanism of DNA replication, transcription and translation in prokaryotes and eukaryotes.	2,4
CO4	Categorize the types of DNA damage and explain DNA repair mechanisms.	4,2
CO5	Explain and assess the processes of post transcriptional and post-translational modifications and their importance.	4,5
CO6	Specify the processes of gene regulation and operon concepts.	6

Title of the Course and Course Code	Organic Evolution (ZOO3604)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level

CO1	Describe Darwin's theory and show how the principles of natural selection can lead to speciation. Define and explain different theories of organic evolution.	1,2
CO2	Differentiate and compile different evidences of organic evolution and explain how they help in studying origin of life.	2,4,6
CO3	Illustrate aspects and patterns of animal distribution. Outline and describe the factors influencing animal distribution and discuss about barriers to dispersal.	1,2,3
CO4	Differentiate and compare between micro-evolutionary changes, speciation and adaptive radiation. Compile descriptive knowledge regarding origin and evolution of man. Distinguish, and identify extinct species of different archaic human in detail.	1,4
CO5	Compare morphological similarities and difference between man and ape. Discuss, classify and evaluate role of different kinds of adaptations in evolutionary.	2,4,5
CO6	Create/ prepare a world map of Zoogeographical distributions of different animals. Describe and compare the data of different realms. Write about ancient and medieval beliefs of origin of life and discuss origin of eukaryotic cell.	1,2,4,6
Title of the Course and Course Code	ZOOLOGY PAPER - Title: Animal Pathology (ZOO3605)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify the functions of the whole body organs and their mechanisms in diseased states.	1
CO2	Explain various health conditions and their effects in diseased state. Discuss the pathophysiology of diseases.	2
CO3	Define pathological conditions and apply their basic concepts to understand deformities and diseases in human body.	1,3
CO4	Differentiate between health and diseased state and discriminate the diseases and their pathogenesis.	4
CO5	Review the pathological diseases and their processes in fishes, cattle and birds.	5
CO6	Write about the mechanisms, mode of infection, pathogenesis and effects of communicable and non-communicable diseases on animals.	6
Title of the Course and Course Code	ZOOLOGY PAPER - Title: Biological Techniques and BioInformatics (ZOO3607)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Outline principle and applications of biological techniques.	1
CO2	Explain and illustrate the concepts of separation techniques.	2
CO3	Apply different Separation techniques and Microscopic techniques.	3
CO4	Analyze different blood related parameters and their clinical	4

	significance.	
CO5	Determine the concentration and strength of chemicals/solutions for an experiment.	5
CO6	Prepare a report on different Biological databases.	6
Title of the Course and Course Code	Zoology Practicals – IV (ZOO3611)	Number of Credits : 03
On completion of the course, the students will be able to:		Bloom's Cognitive level
CO1	Identify and label organs of digestive system, reproductive system, arterial, venous system of Calotes and neotenic forms of Axolotl larva.	1
CO2	Explain external characters of Branchiostoma, sectional view of buccal cavity, pharynx, intestine and tail.	2
CO3	Illustrate the activity of salivary amylase, demonstrate measurement of blood pressure and estimation of haemoglobin, preparation of the haemin crystals from haemoglobin	3
CO4	Compare the structure and functions of heart and brain of shark, frog, calotes, pigeon and rat.	4
CO5	Test the urine for physical and chemical properties.	5
CO6	Compile the information obtained from the visit to biodiversity spot and write a report on diversity of life in that area.	6