

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI
UG COURSES – AFFILIATED COLLEGES B.Sc. Zoology (Choice Based Credit System)
 (with effect from the academic year **2017-2018** onwards)
B.Sc ZOOLOGY-COURSE STRUCTURE

Sem	Pt.I/ II/III IV/V	Subject Status	Subject title	Course /paper	Contact Hrs./ Week	Credits
I	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Animal Diversity-I Invertebrata	1	4	4
	III	Core	Animal Diversity-II Chordata	1	4	4
	III	Major Practical-I	Animal Diversity-I Invertebrata & Animal Diversity-II Chordata	1	2	2
	III	Allied-I	Cell Biology, Genetics and Bio-Technology	1	4	3
	III	Allied Practical- I	Cell Biology, Genetics and Bio-Technology	1	2	2
	IV	Common	Environmental Studies	1	2	2
			Sub total	8	30	25
II	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Developmental Zoology	1	4	4
	III	Core	Ecology & Toxicology	1	4	4
	III	Major Practical-I	Developmental Zoology & Ecology & Toxicology	1	2	2
	III	Allied-I	Developmental Zoology, Ecology, Animal Physiology & Evolution	1	4	3
	III	Allied Practical- I	Developmental Zoology, Ecology, Animal Physiology & Evolution	1	2	2
	IV	Common	Value based education	1	2	2
			Sub total	8	30	25
	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4

III	III	Core	Cell and Molecular Biology	1	4	4
	III	Major Practical-III	Cell and Molecular Biology	1	4	4
	III	Allied-III	Cell Biology, Genetics and Bio-Technology	1	2	2
	III	Allied Practical-III	Cell Biology, Genetics and Bio-Technology	1	4	3
	III	Skilled based-core	Home aquarium	1	2	2
	IV	Non-Major Elective	Bee Keeping	1	2	2
		Common	YOGA		2	2
				Sub-total	8	30
IV	I	Language	Tamil/Other Language	1	6	4
	II	Language	English	1	6	4
	III	Core	Genetics	1	4	4
	III	Major Practical-III	Genetics	1	4	4
	III	Allied-III	Developmental Zoology, Ecology, Animal Physiology and Evolution	1	2	2
	III	Allied Practical-III	Developmental Zoology, Ecology, Animal Physiology and Evolution	1	4	3
	III	Skilled based-core	VermiTechnology	1	2	2
	IV	Non-Major Elective	Public Health and Hygiene	1	2	2
	V	Extension Activity	NCC/NSS/YRC/YW/PE			1
		Common	Computer for Digital Era		2	2
				Sub-total	8	30

V	III	Core	Animal Physiology	1	5	4	
	III	Core	Animal Biotechnology	1	5	4	
	III	Elective	Sericulture	1	5	4	
	III	Elective	Apiculture	1	5	4	
	III	Major Practical- V	Animal Physiology	1	3	4	
	III	Major Practical- VI	Animal Biotechnology	1	3		
	IV	Major Practical- VII	Sericulture and Apiculture	1	2		
			Skill based common	Personality Development	1	2	2
				Sub-total	8	30	22
VI	III	Core	Evolution	1	5	4	
	III	Core	Immunology and Microbiology	1	5	4	
	III	Elective	Biostatistics, Computer applications & Bioinformatics	1	5	4	
	III	Major Practical- V	Evolution	1	3	4	
	III	Major Practical- VI	Immunology and Microbiology	1	3		
	III	Major Practical- VII	Biostatistics, Computer applications & Bioinformatics	1	2		
	III	Project Group		1	7	7	
				Sub-total	8	30	23

All practical examinations are at end of each semester

*Extra credit for extra hours

Total number of hours: 180

Total number of Credits : 142

PROGRAMME OUTCOME -ZOOLOGY

After successfully completing B. Sc. (Zoology) Programme students will be able to:

PO Number	PO statement
PO1	Apply the scientific knowledge in daily life and to develop scientific temper
PO2	Understand and solve the problems of relevance to society to meet the specified needs using the knowledge, skills and attitudes acquired from learning zoology.
PO3	Assess the scope of Zoology and select particular areas for further study.
PO4	Understand the issues of environmental contexts and aim for sustainable development.
PO5	Develop communicative skill and to connect people, ideas, books, media and technology.
PO6	Equip students with hands on training through various courses to enhance entrepreneurship skills.
PO7	Conduct basic scientific research and provide inputs for societal benefits.
PO8	Understand the Applied Biological sciences such as Sericulture, Apiculture, aquaculture, Vermitechnology, Home aquarium, Microbiology and Biotechnology for their career opportunities.
PO9	Apply the knowledge of Zoology to understand the complex life processes and phenomena.
PO10	Develops empathy and love towards the animals.

PROGRAMME SPECIFIC OUTCOME-ZOOLOGY

PSO Number	PO statement	PO
PSO1	To impart basic knowledge of various branches of Zoology like Cell Biology, Genetics, Physiology, Developmental Biology, Ecology, Evolution, Immunology, Microbiology, Biostatistics and Computer applications. and to understand the unity of life with the rich diversity of organisms and their ecological and evolutionary significance.	PO1
PSO2	To acquire basic skills in the observation and study of nature, biological techniques, experimental skills and scientific investigation.	PO10
PSO3	To address the socio-economical challenges related to animal sciences and to facilitate students for taking up and shaping a successful career in Zoology and its related subjects.	PO3
PSO4	Inculcate transformational impact on the quality of education and to inspire the students to adopt scientific temper and live with scientific <i>values and to understand the environmental issues and aim for a sustainable environment.</i>	PO4
PSO5	Communicate effectively, in a scientific context using current technology.	PO5
PSO6	Understand animal interactions with the environment and identify the major groups of organisms with an emphasis on animals and classify them within a phylogenetic framework.	PO7
PSO7	Explain the origin of life with context to the origin of eukaryotic cell , fossil records, Darwinism and Neo-Darwinism, experimental evidences	PO3
PSO8	Acquire knowledge on microbes, biotechnology, bioinformatics and biostatistical tools and apply it in medical and biological fields.	PO2
PSO9	Gains knowledge about research methodologies, effective communication and skills of problem solving methods	PO9
PSO10	Make the students aware of applications of Zoology and to highlight the potential of various branches of Zoology like Aquaculture, Sericulture, Apiculture and Vermitechnology, to become an entrepreneur	PO6,PO8

Course Outcomes –Zoology

Semester : I

Major Core I

Name of the Course : Animal Diversity –I Invertebrata

Course code : SMZO11

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Describe the distinguishing characteristics of the major taxa	PSO - 1	U
CO-2	Understand biodiversity, habitat, adaptation organization and taxonomic status of invertebrates	PSO -2	U
CO-3	Recall certain morphological attributes and physiological processes that are distinct and significant to each Phyla	PSO -3	R
CO-4	Understand the systemic and functional morphology of various groups of invertebrates	PSO -4	U,Ap
CO-5	Interpret the affinities, evolutionary relationships and adaptation of the major taxa and to explain their economic importance with respect to invertebrates	PSO -6	Ap,C

Semester : I

Major Core II

Name of the Course : Animal Diversity –II Chordata

Course code : SMZO12

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Identify the general and specific characteristics of the different classes and the organization of the representative types.	PSO - 1	U
CO-2	Recognize and describe the major groups of chordates	PSO -2	U
CO-3	Understand the diversity of Chordates and its outline systematic. Discuss their affinities and adaptations to different modes of life.	PSO -3	R
CO-4	Understand the unique features, taxonomy and functional morphology of different classes of chordates	PSO -4	U,Ap
CO-5	To infer the affinities, evolutionary relationships and adaptation of the major taxa and to explain their economic importance with respect to Chordates.	PSO -6	Ap,C

Semester : I

Major Practical-I

Name of the Course : Animal diversity I& II- Invertebrata & Chordata

Course code : SMZOP1

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Identify and list the salient features of selected invertebrate and chordate types through the observation of both living and preserved specimens.	PSO - 1	U
CO-2	Apply laboratory skills including microscopy, dissection and careful observation.	PSO -2	U
CO-3	Assess the anatomy of few invertebrates and chordates based on the dissection.	PSO -3	R,An
CO-4	Apply the skill of handling animals and identification in higher studies.	PSO -4	U,Ap
CO-5	Record the observation.	PSO -6	Ap,C

Semester : I

Allied paper-I

Name of the Course : Cell Biology, Genetics and Bio-Technology

Course code : SAZO11

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Elucidate the structure and functions of the cell organelles .	PSO - 1	U
CO-2	Exemplify the concept of genetics, the principles of inheritance and the role of genes in determining characters	PSO -2	U
CO-3	Understand the application of the innovative technology to manipulate living organisms or parts of organisms to make products useful to human.	PSO -3	R
CO-4	Interpret the various genetic diseases and the factors responsible for them	PSO -4	U,Ap
CO-5	Understand the scope and importance of Biotechnology, Basic concepts of genetic engineering and Restriction and modification of cloning vectors	PSO -6	Ap,C

Semester : I

Allied Practical

paper-I

Name of the Course : Cell Biology, Genetics and Bio-Technology

Course code : SAZOP1

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Demonstrate the mounting of Giant	PSO - 1	U

	Chromosome in Chironomous larva		
CO-2	Gain knowledge about simple Mendelian Triats among the students.	PSO -2	U
CO-3	Demonstrate the skills to explain and summarize the concepts of Cell biology, Genetics and Bio-technology.	PSO -3	R
CO-4	Understand the structure of cells and cell organelles in relation to the functional aspects and understanding of the working principles and applications of microscopes	PSO -4	U,Ap
CO-5	Gain practical knowledge on the observation of specimens and models.	PSO -6	Ap,C

Semester : II

Major Core III

Name of the Course : Developmental Zoology

Course code : SMZO21

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	explain gametogenesis, fertilization and parthenogenesis.	PSO - 1	U
CO-2	Describe cleavage, morphogenetic movements and gastrulation.	PSO -2	U
CO-3	acquire knowledge on Organizer, gradient system foetal membranes and placentation in mammals	PSO -3	R
CO-4	Demonstrate metamorphosis and regeneration.	PSO -4	U,Ap
CO-5	Discuss Nuclear cytoplasmic interaction, assisted reproductive technology and birth control measures.	PSO -6	Ap,C

Semester : II

Major Core IV

Name of the Course : Ecology and Toxicology

Course code : SMZO22

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Discuss the abiotic and biotic factors of the natural ecosystem	PSO - 1	U
CO-2	Identify the natural resources and its conservation	PSO -2	U
CO-3	Critically evaluate the environmental degradation and suggest measures for remediation	PSO -3	R

CO-4	Identify hazardous environmental factors and assess their effects	PSO -4	U,Ap
CO-5	Utilize scientific literature and database to effectively communicate aspects of toxicology	PSO -6	Ap,C

Semester : II

Major Practical-II

Name of the Course : Developmental Zoology and Ecology and Toxicology

Course code : SMZOP2

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Identify and list the salient features of embryos of chicks. embryological stages, and ecological characters of organisms through the observation of both living and preserved microbial specimens.	PSO - 1	U
CO-2	Apply laboratory skills including microscopy, dissection and careful observation.	PSO -2	U
CO-3	Assess the microscopic view of sperm,egg and marine and freshwater planktons.	PSO -3	R
CO-4	Apply the skill of handling animals and identification in higher studies.	PSO -4	U,Ap
CO-5	Record the observation.	PSO -6	Ap,C

Semester : II
II

Allied paper-

Name of the Course : Developmental Zoology, Ecology, Animal Physiology and Evolution

Course code : SAZO21

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms.	PSO - 1	U
CO-2	Study the interaction and the interdependence among environmental factors and living organisms	PSO -2	U
CO-3	Gain knowledge about the functional	PSO -3	R

	significance of various organs and organ systems of animals.		
CO-4	Discern the evolutionary significance of the animals, origin of species and effects of mutation.	PSO -4	U,Ap
CO-5	Summarize the concepts of embryological development, dynamics of ecosystem, organ system functions and the theories of evolution.	PSO -6	Ap,C

Semester : II
paper-II

Allied Practical

**Name of the Course : Developmental Zoology, Ecology,
Animal Physiology and Evolution**

Course code : SAZOP2

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Demonstrate the mounting and observation of live sperms of frog.	PSO - 1	U
CO-2	Gain practical knowledge about the estimation of dissolved oxygen in two water samples.	PSO -2	U
CO-3	Attain knowledge of qualitative analysis of macromolecules.	PSO -3	R
CO-4	Demonstrate the effect of temperature on the opercular movement of fish	PSO -4	U,Ap
CO-5	Impart knowledge on the observation of specimens and models	PSO -6	Ap,C

Semester : III

Major Core V

Name of the Course : Cell and Molecular Biology

Course code : SMZO31

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Identify the different types of microscope and analyses the functions.	PSO - 1	U
CO-2	Identify the cell organelles and discuss their functions	PSO -2	U
CO-3	Explain the structural organization of chromosomes and understands special types of chromosomes and their significance.	PSO -3	R
CO-4	Describe the structure and functions of nucleic acids	PSO -4	U,Ap
CO-5	Apply the knowledge of cell biology in cancer and stem cell research and demonstrate cytological techniques	PSO -5	Ap,C

Semester : III

Skill Based Subject

Name of the Course : Home Aquarium

Course code : SSZO3A

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understands the construction and maintenance of aquarium, selection , culture and breeding techniques	PSO - 1	U
CO-2	Gain knowledge about nutritional requirements of aquarium fishes and different kinds of feeds.	PSO -2	U
CO-3	Understands about species of ornamental fishes – Taxonomy and their biology .Biology of live bearers and egg layers	PSO -3	R
CO-4	Identifies common diseases of freshwater and marine aquarium fishes, Treatment ,Prevention and control	PSO -4	U,Ap
CO-5	Understands about the taxonomy and morphology of Fresh water plants and other ornamental fresh water organisms. Starts growing aquarium fishes as hobby and as business.	PSO -6	Ap,C

Semester : III

Non-major Elective

Name of the Course : Bee Keeping

Course code : SNZO3A

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Describe bee biology and anatomy from the perspective of managing bees and types of bees used for apiculture	PSO - 1	U
CO-2	Understands the social behaviors of honey bees and associate apiculture with agricultureand pollination	PSO -2	U
CO-3	Identify apiary equipments and demonstrate the assembling of apiary.	PSO -3	R
CO-4	Discuss the importance of honey, wax and bee venom.	PSO -4	U,Ap
CO-5	Know the nutritive value of Honey and to consume honey as daily food and to start apiculture as a business .	PSO -6	Ap,C

Semester : III

Major Practical-III

Name of the Course : Cell and Molecular Biology

Course code : SMZOP3

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Discuss the basic principles and working mechanism of laboratory instruments	PSO - 1	U
CO-2	Prepare squash and smear of Biological samples and identify the cells.	PSO -2	U
CO-3	Understand the structure of organelles and the Principles of biological processes.	PSO -3	R
CO-4	Develop skills in handling analytical instruments.	PSO -4	U,Ap
CO-5	Develop skills necessary for advanced study or research.	PSO -3	Ap,C

Semester : IV

Major Core VI

Name of the Course : Genetics

Course code : SMZO41

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Describe the fundamental principles of genetics based on Mendelian concepts.	PSO - 1	U
CO-2	Gain knowledge on linkage and chromosome mapping and genetic concepts affecting society.	PSO -2	U
CO-3	Interpret the phenotype, genotype and karyotype and derive conclusions based on genetic data. Understands mutation and syndromes in man.	PSO -3	R
CO-4	Understands about genetic counselling, eugenics and eugenics. Applies the knowledge in daily life by understanding pedigree chart and genetic prognosis.	PSO -4	U,Ap
CO-5	Recognize and develop skills necessary for advanced study or research	PSO -5	Ap,C

Semester : IV

Skill Based Subject

Name of the Course : VermiTechnology

Course code : SSZO4B

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Discuss the classification and categories of earthworms and explain the biology of earthworm	PSO - 1	U
CO-2	Understands the types of earthworm and studies about the collection and preservation of earthworms.	PSO -2	U
CO-3	Design the methodology for vermiculture and for the production of vermicompost and vermiwash.	PSO -3	R
CO-4	Assess the importance of earthworms in soil fertility,medicine and pharmaceuticals.	PSO -4	U,Ap
CO-5	Realises the Financial support extended to Vermiculture fromNGO and non NGO organisation.Prepare and market the vermicompost.	PSO -6	Ap,C

Semester : IV

Non-major Elective

Name of the Course : Public Health and Hygiene

Course code : SNZO4A

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understand the dimensions and determinants of health and changing concepts in public health	PSO - 1	U
CO-2	Identify health problems of the community and to effectively utilize the tools of epidemiology for understanding diseases.	PSO -2	U
CO-3	Describe and realize the components of personal hygiene that are critical for public health concerns.	PSO -3	R
CO-4	Gain knowledge and understanding about the physical, mental and social health and also know the safer disposal of various wastes.	PSO -4	U,Ap
CO-5	Realize about the communicable disease epidemiology, its treatment challenges and prevention and control approaches.	PSO -6	Ap,C

Semester : IV

Major Practical-IV

Name of the Course : Genetics

Course code : SMZOP4

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Demonstrate Mendelian genetic principles in a controlled experimental set up.	PSO - 1	U
CO-2	Identify Mendelain traits in man	PSO -2	U
CO-3	Understands polygenic inheritance in man, identifies different syndromes inman.	PSO -3	R
CO-4	Identify own Blood group and understands the applications of blood grouping	PSO -4	U,Ap
CO-5	Design experiments, collect, analyze, interpret the data statistically and draw conclusion.	PSO -5	Ap,C

Semester : V**Major Core-VI****Name of the Course : Animal Physiology****Course code : SMZO51**

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Gain fundamental knowledge of animal physiology and the different organ systems of the body.	PSO - 1	U
CO-2	Understand about the composition of food and mechanism of digestion absorption and assimilation.	PSO -2	U
CO-3	Summarize the clotting mechanism and cardiac cycle and respiratory processes.	PSO -3	R
CO-4	Evaluate the mechanism of muscle contraction and its energetics,neural and receptor mechanisms and to enumerate various assisted reproductive technologies.	PSO -4	U,Ap
CO-5	Demonstrate the skill of explaining and illustrating the physiology of animals	PSO -6	Ap,C

Semester : V**Major Core-VII****Name of the Course : Animal Biotechnology****Course code : SMZO52**

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understand the history, branches and scope of biotechnology and gene transfer technique.	PSO - 1	U

CO-2	Impart the Knowledge to culture animal cells in artificial media and growth of cell lines.	PSO -2	U
CO-3	Relate the principle of blotting, gene sequencing and micro array techniques with genome analysis.	PSO -3	R
CO-4	Understand the recombinant technology, gene integration into the vector and with host genome and creation of transgenic animals.	PSO -4	U,Ap
CO-5	Describe the applications stem cells and gene therapy and biotechnology devices.	PSO -6	Ap,C

Semester : V

Elective-I

Name of the Course : Sericulture

Course code : SEZO5A

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Explain the structure, life cycle and various species of silkworm .	PSO - 1	U
CO-2	Describe the cultivation, harvest and preservation of mulberry leaves .	PSO -2	U
CO-3	Discuss the different pests infecting silkworm and their control .	PSO -3	R
CO-4	Relate the strategies learnt in silkworm rearing and silk thread reeling in developing silk farms.	PSO -4	U,Ap
CO-5	Gain the ability to explain and analyze the concepts of sericulture.	PSO -6	Ap,C

Semester : V

Elective-II

Name of the Course : Apiculture

Course code : SEZO5B

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Attain knowledge on beekeeping and management.	PSO - 1	U
CO-2	Identify apiary equipments and demonstrate the assembling of apiary.	PSO -2	U
CO-3	Describe bee biology and anatomy from the perspective of managing bees	PSO -3	R
CO-4	Discuss the importance of honey, wax and bee venom.	PSO -4	U,Ap
CO-5	Outline the social behaviors of honey bees and	PSO -6	Ap,C

	associate apiculture with agriculture.		
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Semester : V

Major Practical-V

Name of the Course : Animal Physiology

Course code : SMZOP5

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Examine and interpret the various physiological parameters.	PSO - 1	U
CO-2	Attain knowledge of qualitative analysis of macromolecules and excretory products.	PSO -2	U
CO-3	Demonstrate the effect of temperature on the opercular movement of fish and estimate the rate of Oxygen consumption in a fish.	PSO -3	R
CO-4	Demonstrate estimation of blood pressure using sphygmomanometer and counting of different kinds of blood cells using haemocytometer.	PSO -4	U,Ap
CO-5	Understand the working principle and applications of physiological instruments	PSO -6	Ap,C

Semester : V

Major Practical-VI

Name of the Course : Animal Biotechnology

Course code : SMZOP6

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understand the tools of gene manipulation and gene transfer	PSO - 1	U
CO-2	Demonstrate CO ₂ estimation in effluent / sewage water samples	PSO -2	U
CO-3	Understand the isolation of genomic DNA technique, isolation of plasmid and isolation of Protein by PAGE .	PSO -3	R
CO-4	Understand protoplast preparation and fusion	PSO -4	U,Ap

CO-5	Identify the Use of recombinant DNA technology, genetic manipulations and in a variety of industrial processes.	PSO -6	Ap,C
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Semester : V

Major Practical-VII

Name of the Course : Sericulture and Apiculture

Course code : SMZOP7

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Attain knowledge on the observation of preserved specimens and instruments of sericulture .	PSO - 1	U
CO-2	Demonstrate the dissection of silk glands, digestive and nervous system and reproductive system.	PSO -2	U
CO-3	Understand the selection of mulberry leaves according to different stages and the life history of silk worm moth.	PSO -3	R
CO-4	Demonstrate the mounting of Legs, mouth parts and sting of honey bee.	PSO -4	U,Ap
CO-5	Gain practical knowledge about Queen, worker, Drone, Artificial hive,Queen excluder, smoker, honey extractor, honey, Bee comb and Comb foundation sheet.	PSO -6	Ap,C

Semester : VI

Major Core-IX

Name of the Course : Evolution

Course code : SMZO61

CO	Upon completion of this course the students will be able	PSO	CL
CO-1	Gain knowledge about direct observation of fossils and evolutionary important specimen by which evolutionary relationship of animal groups.	PSO - 1	U
CO-2	Impart knowledge regarding the various theories of evolution, evolutionary process such as variation, speciation, natural selection, origin of primates and man	PSO -2	U
CO-3	Understand the origin and salient features of evolution of horse and man as seen in the fossil records and the process of cultural evolution.	PSO -3	R
CO-4	Realises the process of variation and Sources of variability , Isolation and	PSO -4	U,Ap

	Isolating mechanisms.		
CO-5	Understands the Animal distribution ,its patterns and Zoogeography of different regions.	PSO -6	Ap,C

Semester : VI

Major Core-X

Name of the Course : Immunology and Microbiology

Course code : SMZO62

CO	Upon completion of this course the students will be able	PSO	CL
CO-1	Provides basics knowledge about immune system and allows the student to create insight as how to improve their immune system and good health.	PSO - 1	U
CO-2	Understands the types of immunity, antigens-antibodies and their properties	PSO -2	U
CO-3	Realize the complement system, MHC's and immune responses and understands the types of hypersensitivity reactions and auto immune diseases.	PSO -3	R
CO-4	Understand the History & Scope of microbiology and general structure of microbes.	PSO -4	U,Ap
CO-5	Explain and analyze the microbes involved in food spoilage, soil microbiology and medical microbiology.	PSO -6	Ap,C

Semester : VI

Major Core-XI

Name of the Course : Biostatistics, Computer Applications & Bioinformatics

Course code : SMZO63

CO	Upon completion of this course the students will be able	PSO	CL
CO-1	Define terminologies applied in biostatistics.	PSO - 1	U
CO-2	Collect, present and analyse biological data by appropriate statistical methods.	PSO -2	U
CO-3	Utilize the computer skill for biological data management,analysis and graphical presentation and develop the skill to apply statistical packages.	PSO -3	R
CO-4	Gain basic knowledge on computer and information technology and use appropriate programme for sequence analysis	PSO -4	U,Ap
CO-5	Apply bioinformatics tools for drug designing for bioinformatics research projects	PSO -5	Ap,C

Semester : VI

Major Practical-VIII

Name of the Course : Evolution

Course code : SMZOP8

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understand the animals of evolutionary significance.	PSO - 1	U
CO-2	Gain knowledge about mimicry in animals and mutation in Peppered Moth	PSO -2	U
CO-3	Demonstrate the skill of explaining and illustrating the ideas and theories of evolution .	PSO -3	R
CO-4	Demonstrate the Gene Frequency : Hardy - Weinberg law- Probability Experiment	PSO -4	U,Ap
CO-5	Demonstrate the process of variation in finger prints	PSO -6	Ap,C

Semester : VI

Major Practical-IX

Name of the Course : Immunology and Microbiology

Course code : SMZOP9

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Demonstrate ABO and Rh blood grouping.	PSO - 1	U
CO-2	Gain practical knowledge about simple staining, gram staining and serial dilution techniques.	PSO -2	U
CO-3	Examine living bacteria by hanging drop method.	PSO -3	R
CO-4	Demonstrate counting of microbes using haemocytometer and micrometers	PSO -4	U,Ap
CO-5	Gain experience in preparing cultural media and understands aseptic transfer of microbes , pure culture of bacteria and cultural characteristics of Micro-organisms.	PSO -6	Ap,C

Semester : VI

Major Practical-X

Name of the Course : Biostatistics, Computer applications & Bioinformatics

Course code : SMZOPA

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Describe and calculate mean, median, mode, standard deviation and Co-efficient of variance using Neem leaf.	PSO - 1	U
CO-2	Explain and calculate correlation to infer on the given data	PSO -2	U
CO-3	Demonstrate the skill to explain biochemical aspects of living systems and biostatistical methods .	PSO -3	R
CO-4	Understand and analyze various bioinformatics tools.	PSO -4	U,Ap
CO-5	Gain the skill to utilize biostatistics and bioinformatics in solving problems and scientific data analysis	PSO -6	Ap,C

Semester : VI

Group Project

Name of the Course : Project

Course code : SMZO6P

CO	Upon completion of this course the students will be able to	PSO	CL
CO-1	Understand the data collection, analysis & interpretation of data and allows student to present the research data in scientific method	PSO - 1	U
CO-2	Gain skill to solve problems using inferential statistical tools	PSO -2	U
CO-3	Learn to collect literature collection, literature citation, and components of research report – Text, tables, figures, bibliography.	PSO -3	R
CO-4	Learn fieldwork modalities and understands the basic concept of writing project reports and research papers.	PSO -4	U,Ap
CO-5	Provide wide knowledge about research, experimental and sampling design.	PSO -6	Ap,C

Teaching Plan–Zoology

Semester : I

Major Core I

Name of the Course : Animal Diversity –I Invertebrata

Course code : SMZO11

Lecture hours: 60 hrs

OBJECTIVE: To elucidate the importance of taxonomy, to know the methods of nomenclature, to realize the differences between Protozoa and Metazoa and to study the structure, functional organization, adaptations and the economic importance of lower and higher Invertebrates.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Phylum Protozoa-Type study-Paramecium Phylum Porifera-Type study-Leucosolenia	1.To develop an understanding of the principles of taxonomy and Binominal nomenclature 2. To acquaint with the different type study under each Phyla. 3. To understand the general Characters and classification up to classes	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	12 hrs	Phylum Coelenterata - Type study- Obelia Phylum Platyhelminthes- General characters and classification			
III	12 hrs	Aschelminthes (Nematoda)- External morphology and pathogenesis Annelida			
IV	12 hrs	Arthropoda-Type study- Penaeus			
V	12 hrs	Mollusca-Type study- Pila globosa Echinodermata-Type study-Star fish			

Semester : I

Major Core II

Name of the Course : Animal Diversity –II Chordata

Course code : SMZO12

Lecture hours: 60 hrs

OBJECTIVE: To exemplify the intermediary position of Prochordates between invertebrates and vertebrates, and to study the structure, functional organization, adaptations and the economic importance of lower and higher chordates

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Chordata-General characters Phylum Prochordata: - Type study-Amphioxus. Agnatha-Petromyzon	1.To develop an understanding of the characters and classification up to subclasses with the names of the examples.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	12 hrs	Pisces -Type study- Shark	2.To gain knowledge about the type study of the different classes of Chordates.		
III	12 hrs	Amphibia and Reptilia: General characters and classification up to orders	3. To understand the structure, functional organization of chordates		
IV	12 hrs	Aves-Type study- Pigeon			
V	12 hrs	Mammalia: -Type study- Rabbit			

Semester : I

Major Practical-I

Name of the Course : Animal diversity I& II- Invertebrata & Chordata

Course code : SMZOP1

Practical hours: 2 hrs/week

OBJECTIVE: To develop practical knowledge of the live and preserved specimens of Invertebrata and Chordata.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
2 hours/week	Dissection and mountings of Cockroach- Nervous system, Digestive System, Trachea, Salivary apparatus., Shark – Placoid Scales. Observation of Museum Specimens, slides of Invertebrata and Chordata	1.To develop practical knowledge of the invertebrate and chordate specimens.. 2. To gain knowledge about the Museum Specimens, slides of Invertebrata and Chordata.	Observation Demonstration cum Lecture method Dissection	Practical test

Semester : II

Major Core III

Name of the Course : Developmental Zoology

Course code : SMZO21

Lecture hours: 60 hrs

OBJECTIVE : To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Gametogenesis, Structure	1.To develop an		

		of sperm and Egg, Fertilization Process	understanding of the pathway of development of multicellular organisms.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	12 hrs	Cleavage and Gastrulation in Chick. In vitro fertilization in man	2. To gain knowledge about the developmental processes of animals particularly man.		
III	12 hrs	Organogenesis and Organizer. Morphogenetic fields and gradient hypothesis.	3. To understand the basic concepts in embryological processes.		
IV	12 hrs	Amphibian metamorphosis, Extra-embryonic membranes in chick and Placenta in Mammals.			
V	12 hrs	Regeneration – Types, Birth control measures			

Semester : II

Major Core IV

Name of the Course : Ecology and Toxicology

Course code : SMZO22

Lecture hours: 60 hrs

OBJECTIVE: To study the interaction and interdependence among environmental factors and living organisms – To enumerate the ill-effects and the health hazards of toxic agents released to the environment – To discern the evolutionary significance of animals, theories origin of species and significance.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Abiotic and Biotic factors. Ecosystem	1. To develop an understanding of		

II	12 hrs	Food chain, Food web, Trophic levels, Energy flow, Ecological Pyramids. Animal Relationships.	ecosystems such as marine, freshwater and terrestrial ecosystems.. 2.To gain knowledge about wild life conservation strategies.. 3. To understand the basic concepts of toxicology.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
III	12 hrs	Population Ecology, Community Ecology and Adaptation.			
IV	12 hrs	Wild life Conservation, Remote sensing and Urbanization.			
V	12 hrs	Toxic agents and mode of action of Pesticides. Environmental toxicology and public health.			

Semester : II

Major Practical-II

Name of the Course : Developmental Zoology and Ecology and Toxicology

Course code : SMZOP2

Practical hours: 2 hrs/week

OBJECTIVE : To develop practical knowledge of the concepts of Developmental Zoology and Ecology and Toxicology

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
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2 hours/week	Mounting and observation of live sperms and egg of frog. Temporary mounting and observation of chick embryo – 24,48,72,96 Hrs. Plankton mounting- any two fresh water/marine Observation of Museum Specimens and slides	1.To develop practical knowledge of the mounting of live sperm and egg of frog. 2. To gain knowledge about the Museum Specimens, slides . 3.To observe and study the animals in their natural habitat through study tour to ecologically significant places.	Observation Demonstration cum Lecture method Dissection Study tour	Practical test
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Semester : I/III

Allied paper-I

Name of the Course : Cell Biology, Genetics and Bio-Technology

Course code : SAZO11

Lecture hours: 60 hrs

OBJECTIVE: To elucidate the structure and functions of the cell organelles; to exemplify the concept of genetics, the principles of inheritance and the role of genes in determining characters; to understand the application of the innovative technology to manipulate living organisms or parts of organisms to make products useful to human..

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Ultra structure and functions of cell organelles	1.To develop an		

II	12 hrs	Structure of DNA and RNA. Cancer cells and carcinogenesis.	understanding of the functions of cells. 2.To gain knowledge about the multiple gene inheritance and syndromes. 3. To understand the basic concepts of biotechnology	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
III	12 hrs	Multiple alleles and Multiple gene inheritance			
IV	12 hrs	Sex determination in man Non disjunction, Syndromes and Inborn errors of metabolism in man.			
V	12 hrs	Definition, scope and basic concepts of Biotechnology. Cloning vectors and transgenesis			

Semester : I/III

Allied Practical

paper-I

Name of the Course : Cell Biology, Genetics and Bio-Technology

Course code : SAZOP1

Practical hours: 2 hrs/week

OBJECTIVE: To develop practical knowledge of the concepts of Cell Biology, Genetics and Bio-Technology

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
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2 hours/week	Mounting of Giant Chromosome in Chironomous larva / onion root tip Observation of Simple Mendelian traits among the students Observation of Museum Specimens and slides	1.To develop practical knowledge of the mounting of giant chromosome in Chironomous larva. 2. To gain knowledge about the Museum Specimens, slides .	Observation Demonstration cum Lecture method Dissection	Practical test
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Semester : II/IV

Allied paper-II

**Name of the Course : Developmental Zoology, Ecology,
Animal Physiology and Evolution**

Course code : SAZO21

OBJECTIVES: To understand the sequential changes from cellular grade of organization to organ grade of organization in the development of multicellular organisms. To study the interaction and the interdependence among environmental factors and living organisms; To understand the functional significance of various organs and organ systems of animals. To discern the evolutionary significance of the animals, origin of species, effects of mutation.

Lecture hours: 60 hrs

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
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I	12 hrs	Early development in Man. Fertilization and Cleavage . Test tube babies – Twins – Amniocentesis.	1.To develop an understanding of Early developmental stages of man. 2.To gain knowledge about ecosystem and its components. 3. To understand the basic concepts of organ systems and theories of evolution.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	12 hrs	Abiotic and Biotic factors. Animal relationship. Community and Ecosystem.			
III	12 hrs	Nutrition, Digestion, Absorption and Metabolism.			
IV	12 hrs	Excretion, Nervous co-ordination, Reproduction.			
V	12 hrs	Theories of Evolution, Adaptive radiation in birds. Mimicry and Colouration			

Semester : II/IV

Allied Practical paper-II

Name of the Course : Developmental Zoology, Ecology, Animal Physiology and Evolution

Course code : SAZOP2

Practical hours: 2 hrs/week

OBJECTIVES: To develop practical knowledge of the concepts of Developmental Zoology, Ecology, Animal Physiology and Evolution.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
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2 hours/week	<p>Mounting and observation of live sperms of a vertebrate.</p> <p>Estimation of dissolved oxygen in two water sample and discuss the result .</p> <p>Qualitative test for glucose, protein and lipid.</p> <p>. Effect of temperature on the opercular movement of fish; Calculation of Q₁₀</p> <p>Observation of Museum Specimens and slides</p>	<p>1.To develop practical knowledge of the mounting of live sperms of frog.</p> <p>2. To estimate the dissolved oxygen and to test biomolecules qualitatively.</p> <p>3. To gain knowledge about the Museum Specimens, slides .</p>	<p>Observation</p> <p>Demonstration cum Lecture method</p> <p>Dissection</p>	Practical test
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Semester : III

Major Core V

Name of the Course : Cell and Molecular Biology

Course code : SMZO31

OBJECTIVE: To understand the ultrastructure and functions of various cell organelles.

Lecture hours: 60 hrs

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Cell types, Microscopy and its types, Cytological techniques.	<p>1.To develop an understanding of the functions of cells.</p> <p>2.To gain knowledge</p>	Historical method	Group Discussion,
II	12 hrs	Ultrastructure & functions of the cell organelles			

III	12 hrs	Nuclear components, Chromosomes, Cancer cells and Carcinogenesis. Cell signaling.	about the basic concepts of cell biology. 3. To inculcate the techniques of cell and molecular biology	Integrating ICT Lecture-discussion e- learning	Involvement in Debates, Seminar Presentations, Assignments and Internal Test
IV	12 hrs	Nucleic acids – DNA and RNA. DNA finger printing, DNA as genetic material, Protein Synthesis – Lac Operon			
V	12 hrs	Cell Division – Mitosis, Meiosis. Genetic code – codon, anticodon & control of gene expression.			

Semester : III

Major Practical-III

Name of the Course : Cell and Molecular Biology

Course code : SMZOP3

Practical hours: 2 hrs/week

OBJECTIVE: To develop practical knowledge of the concepts of cell and molecular biology.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
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2 hours/week	<p>Mitosis in Onion root tip cells./ Garlic rootcells.</p> <p>Meiosis in Grasshopper testis</p> <p>Giant chromosome in Chironomouslarva.</p> <p>Preparation of a) Squamous epithelium</p> <p>Preparation of human blood smear</p> <p>Preparation of frog blood smear</p> <p>Observation of models and charts</p>	<p>1.To develop practical knowledge of the cell division and chromosome study..</p> <p>2. To understand the structure of squamous epithelium and human and frog blood cells.</p> <p>3 To gain knowledge about the models and charts of cell biology.</p>	<p>Observation</p> <p>Demonstration cum Lecture method</p> <p>Dissection</p>	Practical test
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Semester : III

Skill Based Subject

Name of the Course : Home Aquarium

Course code : SSZO3A

Lecture hours: 60 hrs

OBJECTIVES: To understand the construction and maintenance of aquarium, selection , culture and breeding techniques.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Construction of Home Aquarium. Water quality requirements.	1.To develop an		

II	12 hrs	Setting up aquarium. Different kinds of feeds. Culture of food organisms.	understanding of different aquarium fishes and its rearing methods. 2.To gain knowledge about about the culture practices of aquarium fishes. 3. To inculcate the techniques of fish rearing.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
III	12 hrs	Species of ornamental fishes. Fresh water species – live bearers and egg layers.			
IV	12 hrs	Reproductive biology of gold fish and angel fish. Common diseases of freshwater and marine aquarium fishes .			
V	12 hrs	Fresh water plants – their taxonomy and morphology. Other Ornamental organisms – Anemones, Lobsters, Shrimps, Octopus, Star fish etc			

Semester : III

Non-major Elective

Name of the Course : Bee Keeping

Course code : SNZO3A

Lecture hours: 30 hrs

OBJECTIVES: To know the knowledge of rearing of honey bees and extraction of honey.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	6 hrs	Comparative study of Rock bee, Indian bee, Little bee and Dammer bee. Life history of Apis indica.	1.To develop an understanding of different types of honey bees and their life cycle. 2.To gain knowledge	Historical method Integrating ICT	Group Discussion, Involvement in Debates,
II	6 hrs	Food of the bee Relationship of plants and Bees. Arranging an			

		apiary	about about the culture practices of honey bees. 3. To inculcate the techniques of apiculture and encourage the students to develop self employment.	Lecture-discussion e- learning	Seminar Presentations, Assignments and Internal Test
III	6 hrs	Acquiring bees . Different kinds of cells. Swarming			
IV	6 hrs	Primitive hives – Different types of bee hive and its architecture. Appliances used in Apiaries.			
V	6 hrs	Honey – Collection and Extraction of honey , preservation, storage. Honey as Daily Food.			

Semester : IV

Name of the Course : Genetics

Course code : SMZO41

Lecture hours: 60 hrs

OBJECTIVE: To understand the inheritance of parental characters and hereditary diseases.

Major Core VI

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Mendelian laws of heredity, Interaction of genes, Multiple alleles and multiple genes.	1.To develop an understanding of Mendelian laws of genetics. 2.To analyze the various techniques in prenatal diagnosis and justify the need of genetic counselling.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal
II	12 hrs	Linkage, Sex linked Inheritance in man, Extra chromosomal inheritance and Animal Breeding.			
III	12 hrs	Mutation – types of mutation, Chromosomal abnormalities.			
IV	12 hrs	Human genetics – twins.			

		Inborn errors of metabolism, Improvement of human race, Genetic counselling	3. To interpret the various genetic diseases and the factors responsible for them.	Test
V	12 hrs	Bacterial genetics, structure and life history of T4phage.		

Semester : IV

Major Practical-IV

Name of the Course : Genetics

Course code : SMZOP4

Practical hours: 2 hrs/week

OBJECTIVE: To gain practical knowledge about Mendelian principles.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
2 hours/week	Breeding Experiment: Chi Square test to be illustrated with beads a) Monohybrid cross and b) Dihybrid cross. Observation of simple Mendelian traits in man – to be recorded. Observation and study of polygenic inheritance of quantitative traits to be interpreted in graphs:-a)height of student b) weight of students / length of	1. To develop practical knowledge of the laws of genetics. 2. To understand the polygenic inheritance and simple Mendelian traits. 3 To gain knowledge about the models and charts of genetic significance.	Observation Demonstration cum Lecture method	Practical test

	shells / length of pods. Blood group to be analyzed in a population with a minimum of 30students. Observation of models and charts of genetic significance			
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Semester : IV

Skill Based Subject

Name of the Course : VermiTechnology

Course code : SSZO4B

Lecture hours: 60 hrs

OBJECTIVE: To get thorough knowledge of making vermicompost and vermiculture.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	12 hrs	Earthworm taxonomy, Organ systems of earthworm, Earthworm as farmer's friend.	1.To develop an understanding of different aquarium fishes and its rearing methods. 2.To gain knowledge about the culture practices of earthworms. 3. To encourage the self employment practice and save the	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	12 hrs	Types of earthworm, Culture techniques of earthworms.			
III	12 hrs	Vermicompost production. Different methods of Vermicomposting.			
IV	12 hrs	Role of Earthworms in soil fertility, Role of Earthworms in Solid Waste, Sewage and faecal waste management			

		and Vermifilters. Earthworms as bioreactors.	human being by the way of minimizing the use of chemical fertilizers.		
V	12 hrs	Interaction of earthworms with other organisms . Financial supporting – Government and NGOs for vermiculture work.			

Semester : IV

Non-major Elective

Name of the Course : Public Health and Hygiene

Course code : SNZO4A

Lecture hours: 2 hrs/week

OBJECTIVE: To understand the physical, mental and social health and also know the safer disposal of various wastes

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	6 hrs	Dimensions of Health, Population explosion in India – Birth control measures.	1.To develop an understanding of dimensions of health. 2. To make aware about the first aid and excreta disposal. 3.To gain the knowledge about the preventive measures of diseases.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	6 hrs	Environment and health. Standards of Housing – Ventilation.			
III	6 hrs	Excreta disposal – Importance. First aid with reference to accident.			
IV	6 hrs	Communicable diseases by virus,bacteria,protozoa and helminthes.			
V	6 hrs	Health situation in India. National Programmes of Health.			

Semester : V

Major Core-VI

Name of the Course : Animal Physiology

Course code : SMZO51

Lecture hours: 75 hrs

OBJECTIVE: Carving an integrated approach to physiology related to the functional significance of the various organs and organ systems of animals.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Classification and Structure of Carbohydrates, Proteins and Lipids Prostaglandins - Structure – Classification – Functions .	1.To develop an understanding of biological molecules and its metabolism. 2.To gain knowledge about enzymes and different organ systems in the body.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	15 hrs	Enzymes – classification and properties. Metabolism of Carbohydrates ,Proteins and Lipids.			
III	15hrs	Respiration, Circulation and Excretion.			
IV	15 hrs	Muscle and Nerve Physiology . Synapse – Synaptic transmission of impulses – Neurotransmitters – Neuromuscular junction.			
V	15 hrs	Endocrine system and endocrine organs.			

		Reproductive Physiology and the role of hormones in reproductive process.			
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Semester : V

Major Core-VII

Name of the Course : Animal Biotechnology

Course code : SMZO52

Lecture hours: 75 hrs

OBJECTIVE: To introduce various concepts, principles of biotechnology, concepts of isolation, cloning and insertion of various genes into a prokaryotes and to describe the utilization of biotechnology in various biological fields.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Scope and importance of biotechnology Steps in Gene cloning. Hybridization and Blotting techniques.	1.To develop an understanding of gene cloning.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	15 hrs	Genomic library, Plasmids – types, Transposons as vectors. Gene Amplification through PCR.	2.To gain knowledge about animal cell culture and transgenic animal technology.		
III	15 hrs	Animal cell and Tissue culture, Organ and Stem cell culture, Hybridoma technology / Monoclonal antibody production.	3. To learn about the advancement in biological techniques and their utilization in biological fields		
IV	15 hrs	Transgenic animal technology, Gene therapy, Bioethics and Bio-safety. Biosafety guidelines in India.			
V	15 hrs	Biotechnological methods of sewage water treatment, Bioremediation, Biofuel, Aqua culture technology, Human genome project;			

		Microarrays, Biochip, Bio-weapons			
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Semester : V

Elective-I

Name of the Course : Sericulture

Course code : SEZO5A

Lecture hours: 75 hrs

OBJECTIVE: To explore the scope for students adopting sericulture as a vocation after their graduation as it is rural based and welfare oriented agro based industry.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Importance of sericulture, and sericulture industry. Moriculture.	1.To develop an understanding of silk worm and its life cycle. 2.To gain knowledge about rearing of silk. 3. To learn about the rearing and maintenance of silk worm and uses of silk	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	15 hrs	Diseases of mulberry-fungal, viral and deficiency diseases.			
III	15 hrs	Classification of mulberry silkworm, habit and habitats . Life cycle of mulberry silkworms. Organ systems in silkworm.			
IV	15 hrs	Rearing of silkworm. Chawki rearing, Shelf rearing, Mounting, Cocoon marketing.			
V	15 hrs	Diseases of silkworms-Protozoan,Viral,Fungal. Silk reeling, Process of reeling			

Semester : V

Elective-II

Name of the Course : Apiculture

Course code : SEZO5B

Lecture hours: 75

OBJECTIVE: To examine the scope for self employment opportunities after their graduation account of the rural based and welfare oriented nature of this vocation.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Classification of bees, Bee colony-Distinctive features, Identification and Functions of queen, drones and workers. Behaviour of bees-dances	1.To develop an understanding of honey bees and its life cycle.	Historical method Integrating ICT Lecture-discussion e- learning	Group Discussion, Involvement in Debates, Seminar Presentations, Assignments and Internal Test
II	15 hrs	Principles of apiculture, Arranging an apiary. Bee keeping-Primitive methods. Different types of Modern hives.	2.To gain knowledge about apiculture.		
III	15 hrs	Honey bee products, Honey- Collection and Extraction, Preservation and storage. Bee wax and bee venom.	3. To learn about selection, rearing and maintenance of apiary .		
IV	15 hrs	Enemies of bees, Diseases of bees-adult and brood diseases.			
V	15 hrs	Swarming, Robbing and Fighting, Supersedure. Foraging, inter-relationships of plants and bees			

Semester : IV

Major Practical-V

Name of the Course : Animal Physiology

Course code : SMZOP5

Practical hours: 3 hrs/week

OBJECTIVE: To gain practical knowledge about various physiological systems and their activities.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
3 hrs/week	<p>Rate of Oxygen consumption in a fish.</p> <p>Effect of temperature on the opercular movement of fish – Calculation of Q10.</p> <p>Action of salivary amylase in relation to enzyme concentration.</p> <p>Qualitative test for carbohydrate (glucose), protein and lipid.</p> <p>Demonstration of blood pressure using sphygmomanometer.</p> <p>Estimation of Haemoglobin – demonstration only.</p> <p>Counting of different kinds of blood cells using haemocytometer – demonstration only.</p> <p>Qualitative test for ammonia, Urea and Uric acid.</p> <p>Observation of models and charts of physiological significance</p>	<p>1. To develop practical knowledge of concepts of Animal Physiology.</p> <p>2. To understand the functioning of organ systems in animal species.</p> <p>3 To gain knowledge about the models and charts of physiological significance.</p>	<p>Observation</p> <p>Demonstration cum</p> <p>Lecture method</p> <p>Titration method</p>	<p>Practical test</p>

Semester : V

Major Practical-VI

Name of the Course : Animal Biotechnology

Course code : SMZOP6

Practical hours: 3 hrs/week

OBJECTIVE: To gain practical knowledge about the various concepts and principles of biotechnology

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
3 hours/week	Isolation of genomic DNA –Isolation of plasmid Protoplast preparation and fusion Estimation of CO ₂ in any three effluent / sewage water samples. Isolation of Protein by PAGE – Demonstration Observation of models and charts of biotechnological significance	1.To develop practical knowledge of the concepts of biotechnology. 2. To understand about the advancement in biological techniques and their utilization in biological fields . 3 To gain knowledge about the models and charts of biotechnological significance.	Observation Demonstration cum Lecture method	Practical test

Semester : V

Major Practical-VII

Name of the Course : Sericulture and Apiculture

Course code : SMZOP7

Practical hours: 2 hrs/week

OBJECTIVE:

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
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2 hours/week	<p>Dissection of silk glands, digestive and nervous system and reproductive system of silkworm.</p> <p>Mountings of Legs, mouth parts and sting of honey bee.</p> <p>Observation of specimens and slides charts related to sericulture and apiculture.</p>	<p>1. To develop practical knowledge of the rearing of silkworm and honey bee.</p> <p>2. To understand the selection, rearing and maintenance of silkworm and honey bee by visiting sericulture farm and apiary respectively.</p> <p>3 To gain knowledge about the specimens and slides related to sericulture and apiculture.</p>	<p>Observation Demonstration cum Lecture method Dissection</p>	<p>Practical test</p>
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Semester : VI

Major Core-IX

Name of the Course : Evolution

Course code : SMZO61

Lecture hours: 75 hrs

OBJECTIVE: To know how the life originated in our planet and related theories.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Origin of life	1.To develop an understanding of origin of life and	Historical	Group
II	15 hrs	Lamarckism, Darwinism, Mutation theory of De vries Modern concept of evolution and Natural			

		selection.	evolution of man.	method	Discussion,
III	15 hrs	Variations and Sources of Variability. Isolation and Isolating mechanisms. Population genetics and evolution .	2.To gain knowledge about theories of evolution.	Integrating ICT Lecture-discussion e- learning	Involvement in Debates, Seminar Presentations, Assignments and Internal Test
IV	15 hrs	Mimicry,Protective Colouration and Adaptations	3. To learn about the evolutionary knowledge through the concepts of coloration and mimicry.		
V	15 hrs	Evolution of Horse,Man. Animal distribution (Geographical) and Patterns of Distribution			

Semester : VI

Major Core-X

Name of the Course : Immunology and Microbiology

Course code : SMZO62

Lecture hours: 75 hrs

OBJECTIVE: To study the immune system and their role of our body to arouse immune response.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Scope of Immunology. Immunity and its types.	1.To develop understanding of antigen and antibody reactions. 2.To gain knowledge	Historical method	Group Discussion,
II	15 hrs	Immunoglobulin-Structure, Function. Salient features of antigen-antibody reaction.			

III	15 hrs	Immune response and its types. Tumour immunology.	about the life cycle of microbes and their control measures. 3.To identify the role of pathogen in the spoilage of food and water and to assess various food preservation methods.	Integrating ICT Lecture-discussion e- learning	Involvement in Debates, Seminar Presentations, Assignments and Internal Test
IV	15 hrs	Scope of microbiology. General structure of microbes (Bacteria, virus). Bacterial growth .			
V	15 hrs	Food, Industrial, Soil microbiology and Medical microbiology.			

Semester : VI

Major Core-XI

Name of the Course : Biostatistics, Computer Applications & Bioinformatics

Course code : SMZO63

Lecture hours: 75 hrs

OBJECTIVE: To study the descriptive and non descriptive methods of mathematics and their application in biology incorporating computer systems.

Unit	Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
I	15 hrs	Sampling methods, Presentation , Classification and Tabulation of Data.	1.To develop an understanding of data collection, tabulation and presentation of data and measures of central tendency. 2.To gain	Historical method Integrating ICT Lecture-discussion	Group Discussion, Involvement in Debates, Seminar Presentations,
II	15 hrs	Measures of dispersion, Chi – square test ,Co-relation, Interpretation of the Correlation coefficient.			
III	15 hrs	Components of computer,MS Office, MS Word basics, Uses of Internet.			

IV	15 hrs	Components of Bioinformatics in life science. Biological sequence analysis.	knowledge about computer applications.	e- learning Chalk and Talk method	Assignments and Internal Test
V	15 hrs	Major Data bases in Bioinformatics. Databases similarity search Tools, Database Retrieval Tools and Protein structure visualizing tools .	3. To understand the mathematical principles of biological systems and bioinformatics		

Semester : VI

Major Practical-VIII

Name of the Course : Evolution

Course code : SMZOP8

Practical hours: 3 hrs/week

OBJECTIVE: To gain practical knowledge about the evolutionary theories .

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
3 hours/week	<p>Variations : variation and finger prints</p> <p>Gene Frequency : Hardy Weinberg law-probability</p> <p>Experiment</p> <p>Observation of models and charts of evolutionary significance</p>	<p>1. To develop practical knowledge of the laws of evolution.</p> <p>2. To obtain the knowledge about direct observation of fossils and evolutionary important specimen by which evolutionary relationship of animal groups.</p>	<p>Observation</p> <p>Demonstration cum</p> <p>Lecture method</p>	Practical test

		3 To gain knowledge about the models and charts of evolutionary significance.		
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Semester : VI

Major Practical-IX

Name of the Course : Immunology and Microbiology

Course code : SMZOP9

Practical hours: 3 hrs/week

OBJECTIVE: To gain practical knowledge of culture of microbes and to understand about antigen and antibody reactions.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
	<p>ABO blood grouping and Rh blood grouping.</p> <p>Simple staining ,gram staining and serial dilution techniques of bacteria.</p> <p>Microscopic</p>	<p>1.To Demonstrate practical skills to interpret and infer results and apply the techniques related to staining of bacteria.</p> <p>2.To apply the basic tools and concepts of</p>	<p>Observation Demonstration cum Lecture method</p>	<p>Practical test</p>

3 hours/week	<p>examination of living bacteria by hanging drop method.</p> <p>Microscopic counting of microbes using haemocytometer and measurement of microbes using micrometers .</p> <p>Preparation of culture media for microbes.</p> <p>Observation of models and charts of immunological and microbiological significance</p>	<p>immunology and micro-biology.</p> <p>3.To classify and assess the structure, growth requirements and maintenance of microbes in aseptic conditions.</p>		
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Semester : VI

Major Practical-X

Name of the Course : Biostatistics, Computer applications & Bioinformatics

Course code : SMZOP10

Practical hours: 2 hrs/week

OBJECTIVE: To acquire the practical skills of explaining and summarizing the topics related to Biostatistics, Computer applications & Bioinformatics

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
2 hours/week	<p>Mean, Median, Mode, Standard deviation, Standard error and co-efficient of variance using Neemleaf.</p> <p>Calculation of correlation</p> <p>Observation of models and charts</p>	<p>1. To develop practical knowledge of the biostatistics problems and apply these problems in daily life.</p> <p>2. To understand the basic concepts of computer applications and be familiarized with</p>	<p>Observation Demonstration cum Lecture method Chalk and Talk method</p>	Practical test

	related to bio-statics,computer applications and bio-informatics.	MS office and bioinformatics. 3 To gain knowledge about the models and charts related to bio-statics,computer applications and bio-informatics.		
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Semester : VI

Group Project

Name of the Course : Project

Course code : SMZO6P

Contact hours: 7 hrs/week

OBJECTIVE: To assess critically the methods related to research such as literature study, case study and research methods pertinent to technology innovation research.

Duration	Major concepts	Learning Outcome	Strategies & Approaches	Assessment
7 hours/week	Relevant topics related to Zoology	<p>1. To develop research inquisitiveness in students by critical thinking.</p> <p>2. To acquire knowledge and skills in research fields and critically analyze the concepts of Zoology.</p> <p>3.To impart research skills and ability to perform lab experiments to obtain accurate results to solve problems.</p>	<p>Identifying problem</p> <p>Literature study</p> <p>Observation</p> <p>Solution to problem</p> <p>Report writing</p>	Viva-voce