

**ST. JOSEPH'S COLLEGE, DEVAGIRI, CALICUT
(AUTONOMOUS)**



POST GRADUATE DEGREE PROGRAMME

**ST. JOSEPH'S CHOICE BASED CREDIT SEMESTER SYSTEM
(SJCBCSSUG)**

**MASTER OF SCIENCE
IN
ZOOLOGY**

Course Outcome
(2019Admn Onwards)

COURSE OUTCOMES

CORE COURSES

SEMESTER I

FZOL1C01: BIOCHEMISTRY

COs	COURSE OUTCOMES
CO1	The student will describe the importance of various chemical interactions in the biological system
CO2	The Student develops the ability to analyse the structure, classification, and biochemical properties of carbohydrates from other organic molecules
CO3	The student develops the ability to describe classification, structural organization, and purification techniques of proteins.
CO4	The student acquire knowledge regarding the classification and functions of lipids and fatty acids
CO5	The student develops appreciation on the mechanisms of enzyme action, inhibition, and acquire knowledge regarding classification of enzymes that facilitate the functioning of enzymes
CO6	The student develops appreciation on Watson and Crick model of DNA
CO7	The student will explore various anabolic and catabolic pathways of biomolecules such as glucose, nucleic acids, amino acids and lipids.
CO8	The student develops a conceptual knowledge regarding the principles of energetics in biological systems

SEMESTER I

FZOL1C02: BIOPHYSICS AND BIOSTATISTICS

COs	COURSE OUTCOMES
CO1	The student develops conceptual knowledge regarding the basic principles of physics involved in biological processes
CO2	The student appreciate the biological aspects and implications of sound energy
CO3	The student will be able to differentiate various ionizing radiations and to understand a comparative account of their biological effects
CO4	The student may familiarize with various biophysical and electrophysiological methods
CO5	The student gain conceptual knowledge on the principles of microscopy and apply
CO6	The student explore the possibilities of the applications of separation techniques.

CO7	The student will describe gravity 'G' force and its multi-faceted applications
CO8	The student will explore and appreciate nano technology as a highly promising arena in biological investigations
CO9	The student skills in various methods of data collection, tabulation and presentation of data for biological research
CO10	The student develops ability to apply measures of central tendency and dispersion in biological research, and various types of probability distribution
CO11	The student analyze and apply parametric and non parametric tests and its applications in biological research
CO12	The student learn how to apply different types of ecological indexes in biological research

SEMESTER I

FZOL1C03: SYSTEMATICS AND EVOLUTION

COs	COURSE OUTCOMES
CO1	The student develops skills in the identification and taxonomic classification of organisms based on their characters
CO2	The student will be able to describe different levels of taxonomy
CO3	Aware about Place, importance, applications and goals of taxonomy
CO4	Learn about purpose of classification, use of classification, theories of biological classification and types classification
CO5	Explain taxonomic procedures like Taxonomic collections, Curation, Recording of field data, storage of collection, labelling and cataloguing of collection Identification- methods of identification, Use of keys, Taxonomic descriptions, Taxonomic and ecological publication and their difference.
CO6	The student will acquire knowledge regarding Species concept and the taxonomic diversity within species, different kinds of species, sub species and other infra specific categories, hybrids
CO7	Recognize the importance of Zoological nomenclature, International Code of Zoological Nomenclature
CO8	Interpret Principle of priority, Homonymy and Synonymy and Different kinds of types in descriptive taxonomy
CO9	Use new trends in Systematics especially Chemo and Serotaxonomy, Cytotaxonomy, Numerical taxonomy, Cladistics, Molecular systematics and DNA bar coding vs traditional taxonomy
CO10	Recognize the ethics related to taxonomic collections and publication
CO11	Realize the taxonomic impediments
CO12	Describe the mechanism of natural selection and the evolutionary mechanisms
CO13	Explain tempo of evolution
CO14	Describe molecular evolutionary theories like Neutral theory of molecular evolution, Molecular clocks- genetic equidistance- human mitochondrial molecular clock and Phylogenetic relationships

CO15	Recognize Evolutionary trends in Biochemical evolution and primates evolution
CO16	An enhanced knowledge about the Mechanism of natural selection
CO17	The student develops conceptual understanding on Hardy-Weinberg law, founder principle, bottleneck effect and genetic drift, process of Isolating mechanisms-Prezygotic and Postzygotic isolating mechanisms; speciation-allopatric, peripartric-parapatric-heteropatricsympatric speciation; ecotypes etc.
CO18	The student develops appreciation about the major processes involved in the Co-evolution; Microevolution, Macroevolution et
CO19	The process involved in the Gradualism and punctuated equilibrium along with anagenesis and cladogenesis will be acquired
CO20	An enhanced level of conceptual learning regarding Neutral theory of molecular evolution; molecular divergence; molecular drive, Molecular clocks- genetic equidistance- human mitochondrial molecular clock , Phylogenetic relationships- DNA barcoding vs traditional taxonomy etc
CO21	An elevated understanding of the Biochemical evolution- Collapse of Orthogenesis along with Stages in primate evolution ; African origin for modern humans, Y-chromosomal Adammitochondrial Eve, the process of Communication, speech, language and self awareness in Primates etc

SEMESTER II

FZOL2L01: BIOCHEMISTRY, BIOPHYSICS & BIostatISTICS

COs	COURSE OUTCOMES
CO1	The student develops skills to perform and compare the importance of pH in biological processes.
CO2	The student familiarize with qualitative tests to identify and distinguish various carbohydrates.
CO3	The student learn to conduct qualitative analysis to identify proteins and nonprotein nitrogenous substances.
CO4	The student acquire skills to perform quantitative tests for carbohydrates, lipids, proteins and non- protein nitrogenous substances.
CO5	The student familiarize with the instruments/ techniques in biophysics; PH meter, Paper chromatography, TLC, Gel electrophoresis
CO6	The student learn the applications of colorimetry in quantitative analysis
CO7	The student gather knowledge regarding collection, grouping and graphical representation of data with special emphasis on Microsoft Excel.
CO8	The student learn to calculate measures of dispersion and their applications in data analysis.
CO9	Familiarising with data interpretation in statistics; ANOVA, Correlation and Regression analysis

SEMESTER II
**FZOL2L02: SYSTEMATICS, EVOLUTION,
 ECOLOGY AND ETHOLOGY**

COs	COURSE OUTCOMES
CO1	The student may gather basic knowledge regarding Collection and Identification of animals up to species level
CO2	Scientific handling of specimens collected, preservation and museum curation
CO3	The student may gather basic knowledge regarding convergent and divergent evolution
CO4	carryout experiments of laboratory standards to estimate water quality parameters including BOD COD hardness and PH, Salinity, Phosphates nitrates
CO5	Students able to determine the water holding capacity and moisture of soil sample
CO6	Determine the transparency of water by using Secchi- disk
CO7	Able to calculate the diversity of different habitat
CO8	Able to recognise the behavioural response of Jungle babbler and bonnet macaques

SEMESTER II
FZOL2C04: CELL AND MOLECULAR BIOLOGY

COs	COURSE OUTCOMES
CO1	The student will acquire knowledge regarding the mechanism of DNA replication- both chromosomal and extra chromosomal, enzymes involved, models of replication, inhibitors and the significance of DNA replication.
CO2	The student learn to know the safeguard systems of DNA, restriction enzymes and their significance, mechanisms involved in damage and repair of eukaryotic DNA and its importance.
CO3	Learn to explain the general features of genetic code, special features of the genetic code in mitochondria, and variations in genetic code.
CO4	The student gain in-depth knowledge regarding the structural organization of mRNA in prokaryotes and eukaryotes, the mechanism of transcription, translation, post transcriptional and translational modifications, structure, biogenesis and role of ribosomes in protein synthesis; and RNA editing.
CO5	The student will gain knowledge regarding the regulation of gene expression in Phages, Bacteria, and in Eukaryotes; recent research findings like antisense RNA strategies and role of si RNA, piRNAs and mi RNA in the regulation of eukaryotic gene expression and their applications.
CO6	The components, organization and special features of eukaryotic genome, interrupted genes and their evolution; concept of gene families, and molecular evolutionary clock.

CO7	Introduction to transposition mechanisms in prokaryotes and eukaryotes, and their significance.
CO8	Molecular mechanisms of genetic recombination models, and significance.
CO9	Special features of microbial genetics, and organelle genome, their replication and mapping.
CO10	The student gain an in depth knowledge regarding the events and regulation of cell cycle, its alteration and causes of cancer. Genes involved in the regulation of cancer and modern therapeutic interventions like immunotherapy and gene therapy

SEMESTER II
FZOL2C05: ECOLOGY AND ETHOLOGY

COs	COURSE OUTCOMES
CO1	The student develops ability to differentiate between the concepts of Habitat, Niche
CO2	The student explain the concepts of, Ecosystem energetic sand Mineral cycling
CO3	The student learn to appreciate nature's way to maximize efficiency in utilization of energy and resources; to reduce competition.
CO4	The student will be able describe the characteristics of population growth and species interaction
CO5	The student will explain the components of Ecological community, the process of Ecological succession, Biomes etc
CO6	The student will appreciate the complexity of relationship between organisms.
CO7	The student will be able to describe the characteristics of various biogeographically realms, and Indian biodiversity
CO8	The student will be able to give explanation to the differential distribution of organisms across the world
CO9	The student will describe the characteristics of various biogeographically realms, and Indian biodiversity
CO10	The student will explain the concept of Carbon credit, Carbon trading etc
CO11	The student will learn to analyse various aspects of Green building technology and interlinking of rivers.
CO12	The student learn to appreciate the richness of Indian biodiversity and various strategies of Wildlife conservation
CO13	The student will be able to describe the components of animal behaviour, factors of motivation and conflict behaviour, properties of instinctive behaviour, types of learning, adaptiveness of behaviour, importance of biological rhythms and parental care, influence of hormones on behaviour
CO14	The student develops appreciation about the importance of nature watch and field study

SEMESTER II

FZOL2C06: DEVELOPMENTAL BIOLOGY & ENDOCRINOLOGY

COs	COURSE OUTCOMES
CO1	The student will gain knowledge on basic concepts in development.
CO2	The student will explain the process of gametogenesis, fertilization and embryonic development.
CO3	The student will appreciate the genetic, cellular and molecular basis of development.
CO4	The student will describe the process of ageing and mechanisms.
CO5	The student realize the impact of environment on development.
CO6	Describe different classes of chemical messengers and their physical characteristics
CO7	Explain how the secretion of hormone is regulated through positive and negative feedback mechanisms
CO8	Summarize the anatomy, regulation, and physiological functions of the hormones of the hypophysis, thyroid, parathyroid, pancreas adrenal, hypothalamus and adrenal glands
CO9	Describe the anatomy of male and female reproductive systems including hormonal functions and pathophysiology

SEMESTER II

FZOL2L03: CELL AND MOLECULAR BIOLOGY, DEVELOPMENTAL BIOLOGY & ENDOCRINOLOGY

COs	COURSE OUTCOMES
CO1	The student develops practical knowledge to isolate genomic DNA from animal tissues.
CO2	The student acquire hands own training in the Quantification of DNA, RNA and Proteins by colourimetric methods
CO3	Understand the preparation of polytene chromosome of drosophila larva and study of meiotic stages using grass hopper testis
CO4	The student gain knowledge about the identification of different developmental stages of frog.
CO5	The student will identify common larval forms..
CO6	The student gain skills in the vital staining technique.
CO7	The student will be able to perform the whole mount preparation of different developmental stages of chick embryo.
CO8	The student will be trained to do the mounting of various larval forms.
CO9	The student learn the stages of insect development.

CO10	The student compare morphological and histological details of different types of placenta in mammals.
CO11	The student appreciate the effects of hormones in amphibian metamorphosis

SEMESTER III
FZOL3C07: PHYSIOLOGY

COs	COURSE OUTCOMES
CO1	The student create an awareness among the society to promote balanced lifestyle and improve people's diet
CO2	The student will be able to explain the role of nutrition in health
CO3	Discuss the physiology of various organ systems in the body
CO4	The student will be able to differentiate the structure and functions of various organs in the human body
CO5	The student will describe different functional areas of cerebral cortex
CO6	The student will describe the cardiac cycle
CO7	The student will be able to discuss the physiology and mechanisms of respiration
CO8	The student will Identify and define neuro-anatomical structures
CO9	The student will summarize the various neurological disorders
CO10	Discuss different types of excretory organs in different animal groups
CO11	Explain the role of excretory system in the regulation of water balance, ,acid base balance and electrolyte balance
CO12	Identify the symptoms of life style diseases and suggest ways to control them
CO13	Explain the environment's influence on the physiological function and performance of living organisms

SEMESTER III
FZOL3C08: IMMUNOLOGY & CYTOGENETICS

COs	COURSE OUTCOMES
CO1	An in depth knowledge in the process of immune cell synthesis and maturation, antigen receptor structure and the mechanisms of antigen recognition by B-cell and T-cells.
CO2	The student will explore the Structure and diversity of immunoglobulins, antigens and its classification, production and clinical uses of monoclonal antibodies and antigen antibody interactions.
CO3	Mechanisms of humoral and cellular immunity, immune cell receptor and intracellular signal cascades related to immune system activation and response.

CO4	The student explore the fundamentals of Immune effector mechanisms, chemical signaling through cytokines, its therapeutic uses and cytokine related diseases.
CO5	The student gain conceptual knowledge regarding key principles, procedure and applications of different Immunetechniques used in the biomedical field and to develop new methods and techniques on the basis of the earned knowledge.
CO6	The complement system and its components, hypersensitivity and allergic responses, diseases related to hypersensitivity, autoimmune disorders and complement deregulation.
CO7	The student will appreciate the scientific principles behind vaccination, types of vaccines and their role in fighting diseases.
CO8	The student will be able to describe the mechanisms of autoimmunity and immune deficiency diseases

SEMESTER III

FZOL3C09: MICROBIOLOGY & BIOTECHNOLOGY

COs	COURSE OUTCOMES
CO1	The student learn the features of various types of cloning vectors
CO2	The student explore different steps involved in molecular cloning
CO3	The student will describe the techniques involved in the production of molecular probes, Genomic and CDNA library
CO4	The student evaluate and compare various types of PCR techniques
CO5	The student will analyze techniques involved in isolation, sequencing and synthesis of genes
CO6	The student explore and appreciate the applications of biotechnology in animal health care, agriculture and environmental protection
CO7	The student get familiar with the biotechnological techniques involved in animal cell tissue culture, gene silencing and cloning
CO8	The student ethical and social implications of biotechnology
CO9	The student understand taxonomy, structure, nutrition, growth of various microbes
CO10	The student analyze various types of microbial diseases and its control measures
CO11	The student appreciates beneficial effects of microbes

SEMESTER IV
**FZOL4E10: ENVIRONMENTAL BIOLOGY I: MAN,
 ENVIRONMENT & NATURAL RESOURCES**

COs	COURSE OUTCOMES
CO1	The student will describe the concepts related to Weather and Climate
CO2	The student will explain the general features of Human population
CO3	The student will identify the different types and Functions of Ecosystems
CO4	Explain the human impact on ecosystems and sustainable development
CO5	Enumerate the various types and relevance of renewable and non-renewable natural resources
CO6	The student learn the concepts of Water management and conservation

SEMESTER IV
**FZOL4E11: ENVIRONMENTAL BIOLOGY II:
 ENVIRONMENTAL POLLUTION**

COs	COURSE OUTCOMES
CO1	Acquire in depth knowledge about the common pollutants in our environment and their interactions with ecosystem components
CO2	Perform qualitative and quantitative analysis of various primary and secondary pollutants in the environment
CO3	Gain insight on the multi-dimensional impact produced by various pollutants on health, environment and materials of the ecosystem
CO4	Apply appropriate abatement techniques for various air, water and terrestrial pollutants present in the ecosystem
CO5	Comprehend the rules and regulations implemented by various governmental institutions

SEMESTER IV

FZOL4E12: ELECTIVE COURSE: ENVIRONMENTAL BIOLOGY-III - ENVIRONMENTAL CONSERVATION

COs	COURSE OUTCOMES
CO1	The student gain knowledge on the important approaches and practices in biodiversity conservation and management
CO2	The student evaluate ecological, evolutionary, economical importance of various biodiversity components
CO3	Develop skills in planning management of bioresources
CO4	The student develops appreciation of the major conservation strategies & programmes implemented by national and international agencies and their role in biodiversity conservation
CO5	The student will be able to identify and categorise organisms based on the degree of threat and under the need for their conservation
CO6	Acquire insight towards and environmental friendly and sustainable life

SEMESTER IV

FZOL4L04: PHYSIOLOGY, IMMUNOLOGY, MICROBIOLOGY, BIOTECHNOLOGY AND MICROTECHNIQUES

COs	COURSE OUTCOMES
CO1	The student gain practical knowledge regarding the methods of analysis of enzyme activity and its dependent factors
CO2	The student will compare the effects of biotic and abiotic factors on aquatic life
CO3	The student gain a thorough practical knowledge related to the analysis of various blood parameters
CO4	The student gain hands on training on various immune-techniques
CO5	Students may gain a thorough knowledge regarding the immune components and production of antiserum in animals
CO6	The student gather hands own experience in isolation, staining and counting of bacteria
CO7	The student gain better knowledge regarding various sterilization techniques and bacterial culture
CO8	The student gain skills for Isolation of pure colonies of bacteria
CO9	The student is able to analysis the presence of bacteria in water samples
CO10	The student secure hands own training to isolate plasmid DNA and RNA from bacteria and other tissues
CO11	The student know how to separate DNA /RNA by electrophoresis

CO12	The student acquire practical knowledge to work with PCR machine in order to amplify DNA and experience on cell immobilization
CO13	The student attain skills in Tissue fixation and staining
CO14	Student will demonstrate the differential staining
CO15	Gain the knowledge on stained and unstained whole mounts

SEMESTER IV

FZOL4L05: ENVIRONMENTAL BIOLOGY I: WATER POLLUTION

COs	COURSE OUTCOMES
CO1	Students will attain skills in the determination of various parametres such as dissolved solids, dissolved oxygen, biochemical oxygen demand, chemical oxygen demand, ammonia nitrogen, nitrite nitrogen and sulphate in waste water samples

SEMESTER IV

FZOL4L06: ELECTIVE COURSE: ENVIRONMENTAL BIOLOGY – II: AIR POLLUTION, RADIATION BIOLOGY AND HEAVY METALS

COs	COURSE OUTCOMES
CO1	The student acquire practical knowledge regarding air samplers
CO2	The student gain knowledge regarding the analysis of pollutants in air and effluents

SEMESTER IV

FZOL4L06: ELECTIVE COURSE: ENVIRONMENTAL BIOLOGY-III: SOIL & SEDIMENT ANALYSIS

COs	COURSE OUTCOMES
CO1	The student develop skill for Soil and Sediment Analysis
CO2	The student gain indepth knowledge regarding environmental pathogens and their bioassays

SEMESTER IV
FZOL4P13: PROJECT

COs	COURSE OUTCOMES
CO1	Student get the skill to define the research problem
CO2	The student attain skills in collecting the relevant information
CO3	Student develop the capacity to reach out conclusion
CO4	Develop the skill for scientifically present the results