SRI V.S.SIVALINGAM CHETTIAR GOVERNMENT DEGREE COLLEGE (A)

SULLURPETA-TIRUPATHI DISTRICT

DEPARTMENT OF ZOOLOGY - POs and COs

PROGRAMME OUTCOMES OF M.Sc ZOOLOGY

PO1: Advanced Knowledge in Zoology

Graduates will acquire in-depth knowledge of animal biology, including areas such as genetics, physiology, ecology, evolution, and biotechnology.

PO2: Research and Analytical Skills

Students will develop the ability to design experiments, analyze biological data, and interpret results using modern scientific tools and techniques.

PO3: Application of Biological Concepts

Learners will apply zoological principles in fields like wildlife conservation, environmental management, public health, and biotechnology.

PO4: Laboratory and Field Competence

Graduates will gain practical skills in laboratory techniques, specimen handling, field surveys, biodiversity assessment, and data collection.

PO5: Ethical and Environmental Awareness

Students will understand ethical issues in biological research and develop responsibility towards biodiversity conservation and sustainable use of natural resources.

PROGRAMME SPECIFIC OUTCOMES OF M.Sc ZOOLOGY

PSO1: Advanced Knowledge in Zoology

Graduates will acquire in-depth understanding of animal biology, including taxonomy, physiology, genetics, ecology, and evolutionary biology.

PSO2: Research and Analytical Skills

Students will develop the ability to design experiments, analyze biological data, and interpret research findings using modern scientific tools and techniques.

PSO3: Application of Modern Techniques

Learners will gain proficiency in advanced laboratory techniques such as molecular biology, biotechnology, histology, and bioinformatics.

PSO4: Environmental and Wildlife Conservation Awareness

Graduates will understand biodiversity conservation, wildlife management, and ecological balance, enabling them to address environmental issues effectively.

PSO5:Professional and Ethical Competence

Students will demonstrate scientific ethics, communication skills, and professional competence for careers in research, academia, healthcare, and environmental sectors.

SEMESTER-I

CORE COURSE-1 COMPARATIVE ANATOMY OF INVERTEBRATE AND CHORDATE

On successful completion of this course, students will be able to

CO1. Demonstrate knowledge of Species Concept, Zoological Nomenclature, feeding and digestion in different Phyla.

CO2. Understand the Respiration, circulation, nervous system in different Invertebrates, crustacean and Echinoderm larval forms.

CO3. Understand the Evolutionary time scale, vertebrate integument, Heart, and Excretion

CO4. Gain the knowledge of comparative anatomy of Respiration, Central Nervous system, organs of vision and hearing of vertebrates.

SEMESTER – I

CORE COURSE-2: CELL BIOLOGY AND IMMUNOLOGY

Cell Biology - Course Outcomes:

CO1: This course develops concepts in molecular understanding of structural and functional properties of cells and various processes associated which have potential applications in molecular and biochemical research.

CO2: Students will understand the structures, positions and functions of plasma membrane and all cellular organelles in details. They will acquire knowledge about chromosomes and cell divisions, both mitosis and meiosis. They will also know about cell signaling and cancers.

CO3: They will know how to measure and stain different cell types.

CO4: Students would gain expertise in the ultra structural information of animal cell besides the detailed views of the cell interior revealing the various events and actions of cell at the molecular level.15

CO5: The study will help the students to understand the new discoveries about the structure and internal functioning of the cell due to technological improvements.

CO6: The study will help the students to increase powerful means of visualization in the field of cell biology.

Immunology-Outcomes:

After completion of the course, a student will be able to achieve these outcomes:

CO1.Learn the fundamental principles of immune response including molecular, biochemical and cellular basis of immune homeostasis.

CO2.The course will aid in understanding various aspects of immunological response and how its triggered and regulated.

CO3. The student will learn and understand the rationale behind various assays used in immune diagnosis of diseases and will be able to transfer knowledge of immunology in clinical perspective.

CO4. The course will aid in understanding the principles of Graft rejection, Auto immunity and Antibody based therapy.

SEMESTER – I

CORE COURSE-2 IMMUNOTECHNOLOGY

CO1: Comprehensive understanding of Immunology principles and their applications in Biotechnology.

CO2: Proficiency in performing various immunological techniques for research and diagnostics.

CO3: Ability to analyze and interpret immune responses in different contexts.

CO4: Knowledge of how Immunotechnology is applied in healthcare, agriculture, and environmental sectors.

CO5: Understanding of the importance of Immunology in disease prevention and treatment strategies.

CO6: Awareness of the ethical, legal, and regulatory frameworks governing Immunotechnology.

CO7: Skill development in immune engineering and genetic manipulation for therapeutic purposes.

CO8: Profound insight into the role of Immunotechnology in personalized medicine and future healthcare trends.

SEMESTER – I

CORE COURSE-3 COMPARATIVE ANIMAL PHYSIOLOGY

After going through this course of **Comparative Animal Physiology**, the students have a good understanding of:

CO1: How Invertebrates and Vertebrate animals work and how these animals biology is influenced by the different environments of their niches.

CO2: The students will be able to explore an original query in Animal Physiology. The students will appreciate evolutionary changes and environmental adaptations in different taxa of Invertebrates and Vertebrates.

CO3: An appropriate understanding of functioning of each system of different groups of animals with their comparison will be acquainted.

CO4: Understanding of the basic concepts of Physiological regulation, from cellular to organ to organismal.

CO5: Understanding of how different groups of animals have different Physiological adaptations appropriate to carry out the required function.

CO6: Appreciation of the gorgeous diversity of Physiological possibilities that animals have developed through natural selection.

SEMESTER – I

CORE COURSE-3 ENDOCRINOLOGY

After completion of the course, a student will be able to achieve these outcomes:

CO1: Understand the structure, function and regulation of endocrine & neuro-endocrine glands,

CO2: Develop a deep knowledge of the role of endocrine secretion in regulation of reproductive Cycle

CO3: Understand the pathways associated with Biosynthesis and secretion of Endocrine hormones and their role in the control of metabolism.

CO4: Acquiring the knowledge of signal transduction mechanisms.

CO5: Through understanding of several endocrines including Peptide hormones, Steroid hormones, Pituitary hormones, Sex hormones, Thyroid hormones etc in the control of metabolic pathways

CO6: Understanding the influence of hormones on Growth, Development and Reproduction and their regulatory pattern.

SEMESTER – I

SKILL ORIENTED COURSE-1BIOANALYTICAL TOOLS AND TECHNIQUES-I

CO1: Students would be trained the different acid and base conditions and their effect on the biomolecules in biology and research.

CO2: To learn about the separation of biomolecules through apply the different centrifugal force.

CO3: Students would be expertise different molecular and cellular separation techniques and their application in biological research.

CO4: Students would be trained in various tools and techniques used to gain insight into biological processes.

CO5: Students would be expertise techniques used for imaging, isolation, purification and characterization of various biological substances.

CO6: Students would gain basic knowledge of the underlying principles and practical strategy of the analytical and preparative techniques that are fundamental to study and **understanding of life processes.**
CO7: Identify and describe the different equipment and tools used in a biology laboratory.
CO8: Correctly operate different laboratory instruments.
CO9: Identify and Analyse the spectra of biomolecules
CO10: Isolate and purified the biomolecules through chromatography

SEMESTER – I
SKILL ORIENTED COURSE-1 HISTOLOGY AND HISTOCHEMISTRY

CO1: Explain the structural organization of different mammalian tissues at the histological level. Understand the types and causes of morphological alterations in cells due to diseases.

CO2: Comprehend the relationship between etiology, pathogenesis, and histopathological changes in specific diseases.

CO3: Illustrate the process of permanent slide preparation, immunofluorescence technique, and mechanism for the Identification of total Proteins and Glycoproteins.

CO4: Explain morphological alterations in cells due to diseases, such as cloud, hyaline,

hydrophic, and fatty degeneration.

CO5: Review the application of immunohistochemistry and immunofluorescence techniques to localize proteins in endocrine cells (Pituitary cell types or islet of Langerhans).

CO6: Specify and compile applications of Cryotechniques, Cryoultramicrotomy, microscope, Importance of Enzyme histochemistry,

CO7: Application of Histochemical methods for the detection of various types of Carcinoma Immunofluorescent techniques.

SEMESTER – I
SKILL ORIENTED COURSE-2 POULTRY SCIENCE AND MANAGEMENT

CO1: Students will understand about poultry farming and poultry development.

CO2: Students would gain Knowledge about modern breeds of chicks.

CO3: Students will understand about structural anatomy of birds and different poultry birds in India.

CO4: Students learn about different poultry birds in India.

CO5: Gains knowledge about egg embryo development and endocrine regulation of development.

CO6: To understand feeding types and poultry nutritional status of feed.

CO7: To understand overall poultry farming and feed formulation.

SEMESTER – I

SKILL ORIENTED COURSE-2 ECONOMIC ZOOLOGY

CO1: After completing Economic Zoology, the student will be able to:

CO2: Explore various concepts and the importance of Economic Zoology.

CO3: Create self-employment opportunities for rural students through Animal husbandry,

Aquaculture, and Sericulture.

CO4: Understand the significance of economically important animals including cultivable Fishes, Prawns, and their culture practices.

CO5: Identify animal pathogenic diseases in Fisheries, Sericulture, Apiculture, Aquaculture, and their management strategies.

CO6: Introduce technologies pertaining to Pearl culture, Poultry keeping, dairy farm management.

SEMESTER – II

CORE COURSE-4 GENETICS AND EVOLUTION

On successful completion of this course, students will be able to

CO1. Demonstrate knowledge of Concept of Gene, Genome organization, Gene mapping and types of Crossing Over.

CO2. Understand the mutations, Pedigree Analysis, Eugenics and Euphenics.

CO3. Demonstrate the Evolutionary time scale, Concepts of Darwinism, Isolation and Models of Speciation.

CO4. Gain the knowledge of Population Genetics and Molecular Evolution

SEMESTER – II
CORE COURSE-5 BIOMOLECULES: STRUCTURE AND FUNCTION

On successful completion of this comes students will be able to

CO1. Understand the importance of Carbohydrates and Lipids.

CO2.Demonstrate Knowledge of Aminoacids

CO3. Gain the Knowledge of Protein structure.

CO4. Understand the concepts in the structure of DNA&RNA.

SEMESTER – II
CORE COURSE-5 NEUROBIOLOGY AND ETHOLOGY

Neurobiology:

CO1: Learnt about structure, function and organization of Neurons in the Central nervous system.

CO2: Understanding Electrophysiological techniques and Molecular mechanisms associated with action potentials.

CO3: Students leant and gain knowledge on structure and function of different types of Synapses.

CO4: Gained information on different types of Neurotransmitters i.e. Amino acids and Peptides.

Ethology (Animal Behavior):

CO1: Acquired knowledge on types of perception in different Animals and their importance

CO2: Understand the overview of Animal Behavior and prominence of social organization in insects and primates.

CO3: Gained lot of information on different types of Learning phenomenon and their mechanisms

SEMESTER – II
CORE COURSE-6 DEVELOPMENTAL BIOLOGY

On successful completion of this course, students will be able to

CO1. Comprehension of gametogenesis,oogenesis and fertilization process.

CO2. Understand the patterns of cleavage ,cellular differentiation and formation of placenta.

CO3. Illustrate the organization and function of organogenesis.

CO4. Gain the knowledge of Chromosomal sex determination,Concept of test tube baby and theories of Ageing

CO5. To understands Pregnancy: conception and blastocyst formation, implantation and delayed implantation, placenta: formation, types and functions, hormones in pregnancy.

CO6. Explain and contrast the processes of spermatogenesis, oogenesis.

CO7. Demonstrate an understanding of the hormonal control of reproduction in males and how this is regulated.

CO8: Distinguish between the main stages of embryonic, foetal and neonatal development.

SEMESTER – II

CORE COURSE- 6 ANIMAL BIOTECHNOLOGY

CO1. Imparts the knowledge to cells lines and stem cells in culture media.

CO2. It gives insight into various cell/ tissues culture techniques and their applications

CO3. Understanding of in vitro culturing of organisms and production of transgenic animals.

CO4. Understanding of cloning of mammals, large scale culture and production from recombinant microorganisms and cloning vectors.

CO5. This insight allows students to take into consideration about ethical issues involved in production of transgenic animals and BT products.

CO6. Use in gene transfer technology, genetic manipulations and in a variety of Industrial

CO7.processes and prominence of IVF, Artificial insemination and embryo transfer techniques.

CO8.Gives knowledge to culture of animal cells and its culture medium.

CO9. Learn basic concepts and principles of recombinant DNA technology, Gene manipulation for transgenic animal production and therapeutics/ vaccine production.

CO10. Provides knowledge on Livestock, improvement aquaculture and pearl culture

CO11. Provides knowledge on Intellectual property rights and genetically modified organisms

SEMESTER – II

SKILL ORIENTED COURSE-3 MOLECULAR BIOLOGY

On successful completion of this course, students will be able to

CO1. Demonstrate knowledge of Molecular nature of Genome.

CO2. Understand the Replication in Prokaryotes and Eukaryotes.

CO3. Demonstrate the organization and function of Trancription and Translation.

CO4. Gain the knowledge of Gene expression and Molecular Biology Techniques.

SEMESTER – II

SKILL ORIENTED COURSE-3 MEDICAL BIOTECHNOLOGY, IPR, BIO-SAFETY AND BIO-ETHICS

CO1. Student comes familiar with the Application of Biotechnological techniques in control of neurogenetic diseases and neoplastic diseases.

CO2. Students will gain awareness about Intellectual Property Rights (IPR) to take measures for protecting their ideas.

CO3. Gains knowledge on the Developmental stages of organism in Animal Biotechnology.

CO4. They will be able to devise business strategies by taking account of IPRs.

CO5. Students will develop awareness about bioethics and biosafety, Authorship and patenting / commercial rights and conflicts.

CO6. Students will develop the knowledge on bacterial, plant and animal viruses.

SEMESTER – II

SKILL ORIENTED COURSE-4 ENVIRONMENTAL BIOLOGY

CO1. The student will get idea about the ecological process in its surrounding and at National and Global level and the use of student knowledge on Ecology, Behaviour can be applied to Education, Research and Extension programmes in his further career.

CO2. Students will understand the various features and aspects of population ecology, community ecology and ecosystem ecology. They might have the knowledge about environmental biology in details. They will acquire knowledge about various tools and techniques of field ecology.

CO3. Students will be able to apply the scientific method and quantitative techniques to describe, monitor and understand environmental systems.

CO4.Students will be able to use interdisciplinary approaches such as ecology, economics, ethics and policy to devise solutions to environmental problems.

CO5. Students will be able to be proficient in ecological field methods such as wildlife survey, biodiversity assessment, mathematical modeling and monitoring of ecological systems.

CO6. Students will be able to use technology, such as geographical information systems and computer programming, to assist in problem solving.

CO7. This paper will help in creating skilled personnel in the field of environment protection and research.

CO8.Demonstrated an understanding of Ecological relationships between organisms and their environment.

SEMESTER – II

SKILL ORIENTED COURSE-4 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) AND GREEN AUDITING

CO1.Explain the concepts about Environmental Impact Assessment, develop skills in identifying and solving problems

CO2. Locate, analyze and evaluate information's from various environmental matrices systematically.

CO3. Be able to access and analyze different case studies/examples of EIA in practice for evaluation/assessment.

CO4. Explain the importance of environmental audits and other management tools in business for social benefit by improving environmental performance.

CO5. Calculate the carbon footprint of any organization and identify suitable mitigation strategies for carbon reduction solutions.

M.Sc., ZOOLOGY SEMESTER – III

CORE COURSE-7 APPLIED TOXICOLOGY

On successful completion of this course students will be able to

CO1. Gain knowledge on dose relationship, factors affecting the toxicity and absorption and biotransformation of Xenobiotics.

CO2. Understanding the bonding between toxicant and biological molecules and oxidative stress.

CO3. Demonstrate the Knowledge of Basic organ toxicity.

CO4. Understand the concepts of Ecotoxicology, occupational toxicology and Legislation rules.

SEMESTER – III

CORE COURSE-8 ENZYMOLOGY AND METABOLISM

On successful completion of this course students will be able to

CO1. Understand the classification and Kinetic properties of enzymes.

CO2. Gain the Knowledge about the Regulation of Enzyme activity.

CO3. Demonstrate the Knowledge of different concepts of Intermediary metabolism.

CO4. Understand the concepts of Biosynthesis and degradation of nucleotides of Purina

Metabolism, Prophysins.

SEMESTER – III

CORE COURSE-8 BIOSTATISTICS AND BIOINFORMATICS

Biostatistics Course Outcomes:

CO1. Came to know the data collection, tabulation and presentation.

CO2. Described the mean, median, mode and SD.

CO3. Understood the Analysis of Variance.

CO4. Described student‘t’ test and probability.

CO5. Understood the Correlation and Regression.

CO6. The student will learn the basics of handling of data, measures of Central tendency like Mean, Median and Mode, Measures of dispersion like Mean deviation and Standard deviation and Coefficient of Variation.

CO7. The course will aid in learning Test of significance like Null hypothesis and Alternative hypothesis, t-test, F-test, Chi-square test, Correlation and Regression analysis.

Bioinformatics Course Outcomes:

CO1. It provides information to the students about database and Computer science into the area ofBiology for the purpose of studying and processing genomic information as well as other forms of biological information.

CO2.Familiar with various Applications of Bioinformatics by exploring the fundamentals of computer applications in Biology.

CO3. Describe different methods of data handling using computers.

CO4. Feed and tabulate raw data using computer.

CO5. Explain and perform data representation using digital methods.

CO6. Access and download relevant information from different online databases of biological information.

CO7. Perform basic operations of gene sequence retrieval and compare them using different software.

CO8. Perform basic operations of protein structure retrieval and comparison using different software.

CO9. The student will learn about the Computer basics like Operating systems, Programming, Data Access, Internet and Nucleic acid Sequence and Protein Data Banks. The course will help to understand the Database similarity searches like BLAST, FASTA etc.

CO10. Multiple sequencing alignments, Primer designing, Homology modeling, Phylogenetic analysis & Drug designing and Determination of Secondary and Tertiary structure of proteins.

SEMESTER – III

CORE COURSE-9 WILDLIFE CONSERVATION BIOLOGY AND FIELD TECHNIQUES

After the completion of the course, a student will be able to achieve these outcomes:

CO1. Sampling and experimental skills: Demonstrating the ability to use scientific sampling and experimental techniques in conservation science

CO2. Data analysis: Applying statistical techniques to biological, environmental, and ecological data, and interpreting the results

CO3. Sampling design: Developing sampling designs to address real-world wildlife conservation issues

CO4. Technical writing: Demonstrating the ability to write in a technical style for wildlife conservation and management

CO5. Data presentation: Using graphical methods to present data in wildlife conservation

CO6. Wildlife identification: Learning to identify species, their characteristics, and their habitat requirements.

CO7.Conservation policy: Understanding conservation policies and legislation, and how they are enforced.

CO8.Wildlife management: Developing skills for scientific wildlife management planning

CO9. Human-wildlife conflict: Developing skills for resolving conflicts between humans and wildlife.

CO10. Ecological assessment: Learning how to conduct a rapid ecological assessment of a site.

CO11. Resource use survey: Learning how to survey the use of resources

SEMESTER – III

CORE COURSE- 9 APICULTURE

CO1. Gain a comprehensive understanding of the historical significance and cultural importance of apiculture, beekeeping practices, and the role of bees in pollination.

CO2. Identify and analyze the characteristics, behavior, and challenges faced by different bee species used in apiculture, with a focus on Apis Mellifera and indigenous bee species.

CO3. Demonstrate knowledge of the life cycle of bees, social structures within colonies, mechanisms of communication, foraging behavior, and the role of specialized bee structures.

CO4. Acquire a detailed understanding of the external anatomy of bees, metabolic processes

involved in energy production and temperature regulation, and the significance of specialized bee structures.
CO5. Evaluate and compare different types of beehives, understanding their design, advantages, and suitability for different beekeeping purposes.
CO6. Develop proficiency in using essential beekeeping equipment and safety gear, ensuring proper hive inspection, manipulation, and personal protection.
CO7. Apply principles of apiary management, including site selection, hive orientation, inspection schedules, and swarm prevention techniques throughout the year.
CO8.Explore the diversity of bee products, their composition, properties, health benefits, and various applications in culinary, medicinal, skincare, and other fields, and understand their value in the market.

SEMESTER – III

SKILL ORIENTED COURSE-5 BIOANALYTICAL TOOLS AND TECHNIQUES - II

While studying the Bioanalytical Techniques II, the student shall be able to:
CO1. Students will understand the different tools used in biology and research.
CO2. Students would gain expertise the operational handling and maintenance of laboratory instruments and glassware.
CO3. Students would gain expertise different types of Electrophoresis techniques used in biology.
CO4. Students will understand different microscopic techniques and their application in biological research.
CO5. Students would gain expertise principles and types of isotypes their application in biological research.
CO6.Students would gain expertise about the operational handling and maintenance of laboratory for Cell culture

SEMESTER – III

SKILL ORIENTED COURSE-5 FORENSIC SCIENCE

After the completion of the course, a student will be able to achieve these outcomes:
CO1. Students will be able to understand about the history and background of Forensic Science.
CO2. Learners will be able to understand the crime science managements and knowledge about the handling of crime exhibits.
CO3. Student will be skilled forensic biologists so as to gain the knowledge of forensic analysis of biological evidences to help investigating agencies.
CO4. Student will be skilled forensic biologists so as to gain the knowledge of forensic analysis of biological evidences to help investigating agencies.
CO5. Students will able to understand microscopic and macroscopic examination of biological samples like hair, fibers, diatoms recovered from crime scene.
CO6. It will explicate the insect development and geographical distribution for assistance in estimating the time since death and locating the probable crime scene.

SEMESTER – III

SKILL ORIENTED COURSE-6 PRINCIPLES AND PRACTICES OF AQUACULTURE

On successful completion of this course students will be able to

CO1. Understand the different types of culture systems and culture practices.

CO2. Gain the Knowledge about the Preparation and management of pond.

CO3. Demonstrate the Knowledge of different concepts of Nutrition and health management of fishes and prawns.

CO4. Understand the concepts of processing and preservation of fish and shrimp and sustainability of environmental management.

SEMESTER – III

SKILL ORIENTED COURSE-6 GENETIC ENGINEERING

CO1. Thorough understanding of Genetic Engineering principles and technologies.

CO2. Proficiency in gene manipulation techniques and gene editing tools.

CO3. Ability to apply Genetic Engineering in various fields for practical applications.

CO4. Knowledge of the ethical implications and societal impacts of Genetic Engineering.

CO5. Understanding of how Genetic Engineering is utilized in healthcare, agriculture, and environmental sectors.

CO6. Skill development in genetic modification for beneficial purposes and problem-solving.

CO7. Awareness of the regulatory and safety considerations in Genetic Engineering practices.

CO8. Insight into the future advancements and emerging trends in Genetic Engineering.