

DEPARTMENT OF BIOTECHNOLOGY

Rajah Serfoji Government College (Autonomous), Thanjavur-613005, Tamilnadu, India.

Programme Specific Outcomes (PSO) and Course Outcomes (CO)

Programme Specific Outcomes (PSOs):

PSO1: After successful completion of the programme students will be able to demonstrate and apply their knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to the field of biotechnology.

PSO2: Students will be able to demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.

PSO3: They will be able to gain fundamental knowledge in r-DNA technology, Bioinformatics, animal and plant biotechnology and their applications.

PSO4: Student will be able to (a) Describe fundamental molecular principles of genetics; (b) Understand relationship between phenotype and genotype in human genetic traits; (c) Describe the basics of genetic mapping; (d) Understand how gene expression is regulated.

PSO5: Students will be able to (a) To elaborate concepts of Microbiology with easy to run experiments; (b) To familiarize with basic laboratory instruments and understand the principle of measurements using those instruments with experiments in biochemistry.

PSO6: Students will be able to understand various facets of molecular procedures and basics of genomics, proteomics and metabolomics that could be employed in early diagnosis and prognosis of human diseases.

SPO7: Perform, and analyse results of experiments using basic laboratory techniques in molecular biology and recombinant DNA technology, like agarose and polyacrylamide gel electrophoresis, restriction enzyme digestion, bacterial transformations and PCR, immunology and plant tissue culture.

PSO8: Students will be able to gain hands on experience in gene cloning, protein expression and purification. This experience would enable them to begin a career in industry that engages in genetic engineering as well as in research laboratories conducting fundamental research. Understand the need and apply knowledge of Biotechnology to solve problems in the areas of Medicine, Agriculture, Fermentation technology, Food processing and Environment, and develop entrepreneurial ideas.

Course code/Paper/ Semester	Title	Course Outcomes
S1BT1 Core Paper: 1 I Semester	General Microbiology	Students became familiar with the historical account and development of microbiology as a scientific discipline and have gained knowledge on different systems of classification. They will also acquire an overview of acellular and cellular microorganisms. They will have gathered detailed information on bacterial morphology using various techniques
S1BTP1 Core Paper: 2 I Semester	Major Practical-I	Students able to isolate micro organisms from different sources. They know the procedure for morphological and cultural characterization of bacteria and fungi. They also gained knowledge on different types of staining methods.
S2BT2 Core Paper : 3 II Semester	Cell Biology and Genetics	Students gained knowledge about the features of cell wall, plasma membrane, cell transport mechanisms and cytoskeleton. Students know the structures and functions of the nucleus and different cell organelles. They learned the mechanisms of cell division/cell cycle and its regulation. Students know about Mendelism and inheritance. They acquainted basic and applied aspects of mutations and mutagenesis and their importance
S2BTP2 Core Paper : 4 II Semester	Major Practical-II	Students know the procedure to measure the size of the cell. They able to identify various stages of mitosis and meiosis and have the knowledge on different types of cell structures
S3BT3 Core Paper : 5 III Semester	Molecular Biology	Students acquired knowledge on nucleic acid structures, the definition of a gene and organization the genome. They gained in-depth knowledge of DNA replication mechanism in prokaryotes and eukaryotes. They have knowledge on the fundamental principles of transcription in prokaryotes and eukaryotes including RNA polymerase and transcription factors involved. Students know the translational mechanism in both prokaryotes and eukaryotes. They learned various mechanisms involved in regulation of gene expression in prokaryotes as well as eukaryotes.
S3BTP3 Core Paper :6 III Semester	Major Practical-III	Students can follow general safety routines for laboratory work in molecular biology and can plan experimental work based on a protocol. They can use instrumentation and gene technology methods for separation and analysis of proteins and nucleic acids also can prepare DNA and RNA from various samples then interpret and report data both qualitatively and quantitatively
S3SB1D Skill based -I III Semester	Aquaculture	Students know the historical and current status of aquaculture in India. They also well versed in current culture system and associated basic engineering aspects. Students know about the types of aquaculture and formation of culture ponds. They identify the important macro and micro nutrients relevant to fish nutrition and feed formulation. They able to know feeding techniques, brood stock collection and transporation practices in aquaculture
S4BT4 Core Paper: 7 IV Semester	Industrial Biotechnology	Students gained the knowledge in the techniques of isolation, screening, preservation and maintenance of industrially important microbial strains. Students can able to explain the steps involved in the production of bioproducts and media used in fermentation process to improve modern biotechnology. They gained proficient knowledge on design and operation of fermentor. They learned the downstream processing. They attained in-depth knowledge on the principles of techniques used for production, extraction purification of industrial products.

S4BTP4 Core Paper:8 IV Semester	Major Practical-IV	Students have gain hands-on experience and to learn the principles behind bioprocess technology and to know the process involved in isolation, separation, manipulation of bioprocessing. Developing and assessing the conditions for efficient and sustainable design of bioprocesses and fermenter and apply the technology in pharmaceutical and any other industries
S4SB2B Skill based -II IV Semester	Biofertilizer	Students acquired knowledge regarding biofertilizers and its consequences in the environment. They developed skill regarding isolation, identification and mass production of bacterial biofertilizers, on blue green algal biofertilizer production and its application. They are familiar with the commonly used bacterial, fungal and cyanobacterial biofertilizers for different crops. Students gained knowledge on biofertilizers and chemical fertilizers in increasing crop productivity. Students get awareness to mitigate the usage of synthetic fertilizers
S5BT5 Core Paper: 9 V Semester	r-DNA Technology	Students know to construct genomic and cDNA libraries. This course teaches r-DNA technology techniques and their application in the field of genetic engineering and they learn about plasmids, vectors and gain knowledge on the construction of cDNA libraries. Student of this course have knowledge on gene manipulation, gene expression, etc which prepares them for further studies in the area of genetic engineering. Students become familiar with various gene transfer mechanism. The course teaches students to handle separation techniques like blotting
S5BTP5 Core Paper: 10 V Semester	Major Practical V	After completion of the practical's students can plan and organize laboratory activities and develop further experimental strategies. Students became skilled at centrifuges; colorimeter; UV transilluminator, pH meter; Fermenters; shakers; electrophoresis, gel documentation systems. They also acquired practical methodology knowledge and goal-oriented working skills in recombinant DNA technology independently and in a team. Students understand and apply main methodologies and instruments that characterize serological test for the diagnosis of human diseases.
S5BTEL1A Major Elective Course :1 V Semester	Enzymology and Enzyme Technology	Students develop and awareness in understanding the fundamentals of enzyme properties, nomenclatures, characteristics and mechanisms and they learn to apply biochemical calculation for enzyme kinetics. Students able to analyse and compare methods for production, purification, characterization and immobilization of enzymes. Students able to discuss various applications of enzymes that can benefit human life. They can discover the current and future trends of applying enzyme technology for the commercialization purpose of biotechnological products.
S5BTEL1B Major Elective Course :1 V Semester	Bioinstrumentation	This enables the students to apply their acquired knowledge in isolation and separation of biomolecules for analysis. Students have gained an in-depth knowledge of principles and applications of chromatography, spectrophotometry. They comprehend details of working principle and outline of all biological techniques Students know the procedures to operate all instruments for clinical diagnosis. Students able to explain the importance of immunological methods
S5BTEL1C Major Elective Course :1 V Semester	Developmental Biology	On completion of this subject, the student should be able to use the developmental biology concepts in various fields. Students have also well versed in the foundational knowledge that defines the fields of developmental biology. They are able to understand the concepts clearly and effectively about developmental biology at the graduate level. Students can able to explain the techniques of developmental biology to professional scientists, students and to a lay audience. The students can also able to explain the development process and its genetic control
S5BTEL2A Major Elective Course :2 V Semester	Immunology and Immunotechnology	The students after successfully completing this subject would be aware of immune system structure and functions. Students well explain the concepts of innate and adaptive immune response and techniques for clinical diagnosis. Students can understand the roles of immunology in protection against disease and autoimmune disorders to choices in their daily lives. The students would be aware of the concepts and mechanism behind tumor development, allergy and hypersensitivity reactions. The students would be aware of the principles behind the production of therapeutic/diagnostic molecule

S5BTEL2B Major Elective Course 2 V Semester	Molecular Diagnostics	On completion of the course, the student should be able to:explain the layout of different molecular analysis methods. Able to analyze the urine and blood samples. They can explain how these methods are applied in current research and diagnostics. Evaluate the advantages and disadvantages of the methods. To select appropriate molecular methods for a given application
S5BTEL2C Major Elective Course: 2 V Semester	Nanobiotechnology	On successful completion of this paper, Our students can explain the fundamental principles of nanotechnology and their application to biomedical engineering.They can understand the synthesis of nanomaterials and their application. They know the impact of nanomaterials on environment. Students can apply their learned knowledge to develop nanomaterials and have the technical knowledge on the analysis of biomolecular structure by AFM.
S5SB3C Skill based -III V Semester	Mushroom cultivation and value addition	On successful completion of this paper, students can Identify edible types of mushroom Gain the knowledge of cultivation of different types of edible mushrooms and spawn production. Manage the diseases and pests of mushrooms. Learn a means of self-employment and income generation.
S6BT6 Core Paper :11 VI Semester	Plant and Animal Biotechnology	Students should be able to gain fundamental knowledge in animal and plant biotechnology and their applications. Students will learn the principals and technical advances behind the in vitro culture of plant cells and rDNA techniques. Students will learn the applications of plant transformation for improving the productivity and performance of plants under biotic and abiotic stresses. Students will understand the use of antisense technologies for improvement of crop Plants. Students will understand the structure of animal genes and genomes and also how genes are expressed and what regulatory mechanisms contribute to control of gene expression. Students will understand basic principles and techniques in genetic manipulation, gene transfer technologies for animals and animal cell lines. Students will understand the techniques and problems both technical and ethical in animal cloning. This course prepares the students in appreciating its benefits and applications in biotechnological, pharmaceutical, medical and agricultural field
S6BT7 Core Paper :12 VI Semester	Environmental Biotechnology	Students can apply the concepts of Biotechnology in Environmental Management. They can also investigate some examples of different types of environmental pollution and their impacts. Students can able to recognize the various global and regional environmental concerns due to natural causes and/or human activities, and the impact of these on various forms of microorganisms in bioremediation. Students can demonstrate an awareness of emerging concerns such as climate change, waste management, sewage treatment, removal of oil spills fuels, and new technologies for addressing these. Students appreciate the scientific, ethical and social issues associated with certain applications of biotechnology for alleviating the environmental concerns.
S6BTP6 Core Paper :13 VI Semester	Major Practical VI	Students can demonstrate and employ practical skills with both classical and modern laboratory techniques in plant, animal, environmental biotechnology and bioinformatics, including troubleshooting and problem solving. They have enough knowledge in preparing and maintaining cultures of plants with good viability, minimal contamination and appropriate documentation. Students know to recognize and troubleshoot problems common to routine cell culture. They learned how to use bioinformatics tools in an appropriate way.
S6BTEL3A Major Elective Course :3 VI Semester	Introduction to Bioinformatics	Students will be acquired with the chemical composition of nucleic acids and proteins. They gained an in-depth knowledge of primary, secondary and composite databases, organization of diverse types of biological databases. Students acquire knowledge to explore domains of genomic technologies Students will be able to gain about sequence analysis, metabolism and regulation of protein. Will have learnt the concept of omics concept-genomics and proteomics.

S6BTEL3B Major Elective Course :3 VI Semester	Intellectual property rights and bioethics	Students have knowledge the concepts of IPR and its protection. They also understand IPR through Patents, Copyright and related rights. Students know about the Agreements, Treaties and Acts related to IP protection. Students can know the framework for ethical decision making on science and religious rules and guidelines. The students should know to use the ethical aspects in genetic engineering.
S6BTEL3C Major Elective Course :3 VI Semester	Genomics and Proteomics	Students should be able to acquire knowledge and understanding of fundamentals of genomics and proteomics, transcriptomics and metabolomics and their applications in various applied areas of biology. Identify and describe the different components in prokaryotic and eukaryotic genomes and proteomes. Identify molecular mechanisms responsible for diseases. Use the different methodologies, techniques and tools commonly used in genome sequencing, assembly and annotation.
S5BTEL01 Non Major Elective Paper:1 V semester	Pharmaceutical Biotechnology	Students can understand the importance of Immobilized enzymes in pharmaceutical industries. Genetic engineering applications in relation to production of pharmaceuticals. Students will be able an outline the production and use of monoclonal antibodies and their importance in industries They have gained in-depth knowledge about the mutation, DNA repair mechanisms and drug designing strategies. They can appreciate the use of microorganisms in fermentation technology and the principles of techniques used for extraction purification of industrial products.
S6BTEL02 Non Major Elective Paper:2 VI semester	Health Education	Students gained depth knowledge about the spectrum of diseases. They have the clear idea about the composition of balanced diet. Students learned how to keep the environment pollution free. They are well versed in the causes of mental ill health. They are aware about the vaccines and immunization schedule


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K. J. Somaiya Institute of
V. J. Somaiya Institute of
(V. J. Somaiya Institute of
(Autonomous)
ANJAVUR - 613 005