



**JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY KAKINADA**  
Kakinada-533003, Andhra Pradesh, India

**M.Tech in Biotechnology**

**Vision**

To cultivate World class Biotechnicians with a perspective to innovate create and distribute knowledge for the advantage of the general public and environment.

**Mission**

- Initiate multi-disciplinary programs through academia – industry interface with special emphasis on applications of biotechnology so as to make the student employable.
- Importance on recent trends in biotechnology and its applications through organizing symposiums, seminars and conferences.
- To improve quality of teaching through faculty development programs.

**PROGRAM EDUCATIONAL OBJECTIVES**

- PEO1 Use of Biotechnology in developing economically important Bio products.
- PEO2 To do Research in the areas of Microbiology, Bioprocessing and Immunology.
- PEO3 Use of Bioinformatics and Computational biology in Drug designing.
- PEO4 Pursue research and develop capabilities to handle multi-disciplinary Research
- PEO5 Work in teams and demonstrate leadership skills with professional ethics.

**PROGRAM OUTCOMES:**

At the end of the program the student will be able to:

- PO1** Engage in critical thinking and pursue research/ investigations and development to solve practical problems.
- PO2** Communicate effectively on complex engineering activities with the engineering community and with society at large, write and present substantial technical reports.
- PO3** Demonstrate higher level of professional skills to tackle multidisciplinary and complex research related to “Biotechnology”.
- PO4** Do research on ongoing health issues, Agricultural Problems and Bio-product Production.
- PO5** Application of advanced research Platforms in Biology and Life Sciences.
- PO6** Develop Entrepreneurs, Researchers, Managers in the Field of Biotechnology.

**COURSE OUTCOMES**

Course Code	<b>Advanced Bioprocessing Engineering</b>
<b>M0301</b>	

After completion of course, students would be able to:

- C01 An introduction for the history of application of the course
- C02 Deals with different media formulations
- C03 Concept of different online and offline monitoring systems
- C04 Introduces about study of different fluid characteristics of different fluids
- C05 Explains about stability aspects and Different bioreactors



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Course Code	<b>Immunotechnology</b>
<b>M0302</b>	

After completion of course, students would be able to:

- C01 Deals with fundamental concepts of Immunology
- C02 Deals with Antigens, Receptors and about Major Histocompatibility Complexes
- C03 Different applications of immunological techniques and Cytokines.
- C04 current Vaccine technology
- C05 autoimmunity, treatment , immunotherapy and immunodeficiencies

Course Code	<b>PROTEIN ENGINEERING (Elective-I)</b>
<b>M0303</b>	

After completion of course, students would be able to:

- C01 PROTEIN STRUCTURAL FAMILIES, Ramachandran Plot and conformational accessibilities
- C02 Protein folding pathways in prokaryotes and eukaryotes, Inclusion bodies and chaperones
- C03 Strategies for protein engineering, Role of low-fidelity enzymes in protein engineering,
- C04 PREDICTION AND DESIGN OF PROTEIN STRUCTURES
- C05 Different databases for protein structure and their uses.

Course Code	<b>ADVANCES IN FERMENTATION TECHNOLOGY &amp; DOWNSTREAM PROCESSING (Elective-I)</b>
<b>M0304</b>	

After completion of course, students would be able to:

- C01 INTRODUCTION TO FERMENTATION TECHNOLOGY
- C02 Strain improvement and Media formulation.
- C03 Environmental regulations and technology, laws and regulations
- C04 DESIGN AND CONTROL OF FERMENTER
- C05 Different downstream processing techniques

Course Code	<b>TISSUE ENGINEERING (Elective-I)</b>
<b>M0305</b>	

After completion of course, students would be able to:

- C01 Introduction to tissue engineering and its challenges, Tissue organization and Angiogenesis.
- C02 CELL DIVISION AND SIGNAL PROCESSING.
- C03 Cell-extracellular matrix interactions, Direct Cell-Cell contact.
- C04 Measurement of cell characteristics.
- C05 Biomaterials and bioreactors in tissue engineering.

Course Code	<b>MEDICAL BIOTECHNOLOGY (Elective-II)</b>
<b>M0306</b>	

After completion of course, students would be able to:

- C01 CLASSIFICATION OF GENETIC DISEASES like Chromosomal disorders and Gene controlled diseases.
- C02 Pathogenesis of diseases, Diagnosis and Antimicrobial resistance.
- C03 Epidemiology and disease monitoring, Clinical trials and computer aided statistics.
- C04 OVERVIEW OF GENE THERAPY,
- C05 Dealt with different applications like vaccines, bio pharming and Drug targeting.

Course Code	<b>MODELLING, SIMULATION AND OPTIMIZATION OF BIOPROCESS</b>
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**M.Tech in Biotechnology**

<b>M0307</b>	<b>(Elective-II)</b>
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After completion of course, students would be able to:

- C01 Modeling principles and design and optimization of bioreactors.
- C02 Formulation of balance equations, stoichiometry, elemental balancing and the yield coefficient.
- C03 Information for bioreactor modelling, biological kinetics, and kinetics of anaerobic degradation.
- C04 Bioreactor modeling, liquid-liquid extraction and determination of  $k_{la}$ .
- C05 Processes using berkeley Madonna, lineweaver-burk plot and fluidized bed recycle reactor.

Course Code	<b>BIOLOGICAL TREATMENT OF WASTE WATER</b>
<b>M0308</b>	<b>(Elective-II)</b>

After completion of course, students would be able to:

- C01 Characteristics of Activated Sludge, Analysis of Data and selection.
- C02 Biofilm process considerations, aerobic fixed film & anaerobic treatment processes.
- C03 Technologies used in advanced treatment.
- C04 Nitrification & Denitrification Processes.
- C05 Environmental regulations and technology and Recycling of Industrial wastes.

Course Code	<b>RESEARCH METHODOLOGY AND IPR</b>
<b>M0308</b>	

After completion of course, students would be able to:

- C01 Research Problem and scope.
- C02 Format used in Research.
- C03 Nature of IPR.
- C04 Scope of patent rights and patent filing.
- C05 New developments in IPR..

Course Code	<b>ADVANCED BIOPROCESS ENGINEERING &amp; DOWNSTREAM PROCESSING</b>
<b>M0309</b>	<b>LABORATORY</b>

After completion of course, students would be able to:

- C01 Estimation of Proteins by Different Biochemistry Methods.
- C02 Sonication and Chromatographic techniques.
- C03 Media formulation, Optimization and Sterilization.
- C04 Determination of polarity / partition coefficient of bio molecule by aqueous two phase method.
- C05 Lyophilisation and SDS PAGE

Course Code	<b>IMMUNOTECHNOLOGY LABORATORY</b>
<b>M0310</b>	

After completion of course, students would be able to:

- C01 Blood grouping
- C02 Antibody titre by ELISA method.
- C03 HPLC
- C04 Double diffusion, Immuno-electrophoresis and Radial Immuno diffusion.
- C05 Blood smear identification of leucocytes by Giemsa stain



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Course Code	<b>MOLECULAR BIOLOGY &amp; GENETIC ENGINEERING</b>
<b>N0301</b>	

After completion of course, students would be able to:

- C01 Basic concepts and cloning vectors in genetic engineering
- C02 Ligation techniques, Gene transfer techniques, Eukaryotic Screening.
- C03 Manipulation of gene expression and hybridization techniques.
- C04 Types of PCR, Mutation detection.
- C05 DNA sequencing, DNA finger printing and gene therapy.

Course Code	<b>SYSTEMS BIOLOGY</b>
<b>N0302</b>	

After completion of course, students would be able to:

- C01 Fundamentals Overview of Gene Control.
- C02 Equilibrium Binding and Co-operativity, Michaelis Menten Kinetics.
- C03 Building an Organism Starting From a Single, Drosophila Development.
- C04 Establishment of Developmental Precision.
- C05 Gene regulation at a single cell level.

Course Code	<b>ADVANCES IN BIOINFORMATICS (Elective-III)</b>
<b>N0303</b>	

After completion of course, students would be able to:

- C01 Introduction to Genomic data and Data Organization, Biological databases.
- C02 Protein structure predictions, folding and Protein ligand interactions.
- C03 Introduction to proteomics and protein engineering, 2-D PAGE and Mass spectrometry.
- C04 Functional Genomics & analysis of gene expression, Pharmacogenetics and molecular Diagnosis.
- C05 Concepts of phylogeny.

Course Code	<b>ADVANCEMENTS IN BIOREACTOR DESIGN (Elective-III)</b>
<b>N0304</b>	

After completion of course, students would be able to:

- C01 Introduction about Bioreactors, Methods of Aeration, product and substrate inhibition on chemostat.
- C02 Different types of bioreactors and their design features.
- C03 Gas liquid Mass transfers in cellular systems.
- C04 Mass transfers, Fluid dynamics and Sterilization.
- C05 Aeration and agitation in animal cell reactors.

Course Code	<b>AGRICULTURE BIOTECHNOLOGY (Elective-III)</b>
<b>N0305</b>	

After completion of course, students would be able to:

- C01 Introduction about role of bio fertilizers and bio-pesticides.
- C02 Molecular aspects of systemic and abiotic stress responses.
- C03 Concepts about Insect resistance and Viral resistance.
- C04 Concepts about Fungal resistance and genetic improvement.
- C05 Social, ethical and legal aspects of Biotechnology.



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Course Code	<b>MEMBRANE BIOLOGY AND SIGNAL TRANSDUCTION (Elective-IV)</b>
<b>N0306</b>	

After completion of course, students would be able to:

- C01 Introduction about Membrane structure
- C02 Concepts of Transport Proteins in Membranes.
- C03 Cell cycle regulation.
- C04 Signal Transduction in cells.
- C05 Information of different signaling pathways.

Course Code	<b>BIOFUELS AND BIOENERGY (Elective-IV)</b>
<b>N0307</b>	

After completion of course, students would be able to:

- C01 Introduction about Bioethanol.
- C02 Cellulases and its role in ethanol production.
- C03 Bioethanol production from Ligno cellulose feed stocks.
- C04 Biochemical engineering and Bioprocesses management for fuel production.
- C05 Genetic manipulation of plants for Bioethanol production.

Course Code	<b>ADVANCED BIOSTATISTICS (Elective-IV)</b>
<b>N0308</b>	

After completion of course, students would be able to:

- C01 Introduction about Biostatistics.
- C02 Programming aspects of R.
- C03 Concept of Probability.
- C04 Different Distributions
- C05 Analysis.

Course Code	<b>MOLECULAR BIOLOGY &amp; GENETIC ENGINEERING LABORATORY</b>
<b>N0309</b>	

After completion of course, students would be able to:

- C01 Isolation of Plasmid DNA from Plants and Bacteria.
- C02 Primer Designing
- C03 Cloning of amplified gene to pUC 18 or pUC 19 plasmid
- C04 Transformation of recombinant clone to bacteria.
- C05 Recombinant screening of clone (blue white screening or colony PCR) and Screening.

Course Code	<b>BIOINFORMATICS LABLABORATORY</b>
<b>N0310</b>	

After completion of course, students would be able to:

- C01 Protein homology modeling by Swiss Model
- C02 Genome annotation and Construction of phylogenetic tree using MEGA.
- C03 Protein Structure classification and Validation.
- C04 Molecular Docking and Dynamics.
- C05 Database similarity search by WU – BLAST , PSI – BLAST



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Course Code	<b>BIOPROCESS CONTROL AND INSTRUMENTATION</b>
<b>P0302</b>	

**COURSE OUTCOMES**

After completion of course, students would be able to:

- C01 Representative process control problems.
- C02 Rationale for process modeling, Thermodynamics and reaction kinetics.
- C03 Dynamic behavior of chemical Processes.
- C04 Introduction to feedback control.
- C05 Types of controller, Design of feedback controller.

Course Code	<b>MOLECULAR MODELLING &amp; DRUG DESIGN</b>
<b>P0303</b>	

**COURSE OUTCOMES**

After completion of course, students would be able to:

- C01 Concepts in Quantum mechanics and Molecular Modeling.
- C02 Molecular Mechanics and Energy Minimization.
- C03 Molecular Dynamics and Molecular Docking.
- C04 Homology Modeling and Pharmacophore Modeling.
- C05 Stages of drug discovery, identification, validation and diversity of drug targets.

Course Code	<b>BIONANOTECHNOLOGY</b>
<b>P0304</b>	

**COURSE OUTCOMES**

After completion of course, students would be able to:

- C01 Introduction to Nano Biotechnology.
- C02 Chemical approaches to nano structured materials.
- C03 Introduction to Nano Fabrication.
- C04 Introduction about Nano engineering Aspects.
- C05 Concepts about Instrumentation and characterization in Nano Biotechnology