# KONGUNADU ARTS AND SCIENCE COLLEGE (AUTONOMOUS)

**COIMBATORE – 641 029**

**DEPARTMENT OF BIOTECHNOLOGY (Unaided)**

**COURSE OUTCOMES (CO)**

**OF**

**M.Sc. BIOTECHNOLOGY**

**For the students admitted In the Academic Year 2025 - 2026**

# DEPARTMENT OF BIOTECHNOLOGY

## 2025 - 2026

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 25PBT101 | **Core Paper** 1- Biochemistry | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>4 | Employability |

**Course objectives**

1. To appraise the role of biomolecules in cells
2. To study about the structure and biological functions of macromolecules such as proteins,polysaccharides, lipids
3. To describe the basic reaction types and mechanisms of biomolecules
4. To Identify the structural differences and its properties

**Course outcomes**

| | | |
|---|---|---|
| K1 | CO1 | Employ the principles of thermodynamics to various systems |
| ↕ | CO2 | Explain the structure and properties of carbohydrates and Proteins |
| | CO3 | Classify lipids with examples, Combine the structure and functions of lipids |
| K5 | CO4 | Analyze and study the chemical and biochemical properties of biomolecules |
| | CO5 | Correlate the metabolism of different biomolecules |

| Programme code: 08 | | M.Sc. Biotechnology | | |
|---|---|---|---|---|
| **Course code**: 25PBT102 | | **Core Paper** 2 – Biology of Cell | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>4 | Employability |

## Course Objectives

1. To stimulate exploration of concepts and current approaches in modern cell biology
2. To sensitize students to the dynamic behavior of Cytoskeleton
3. To illustrate the interconnection and feedback between the matrix surroundings of cells
4. To provide an in depth knowledge on cell division cycle and cancer

## Course Outcomes

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Quantify and purify different cell types |
| | CO2 | Prudently use the basics of cellular communication for developing novel tools |
| | CO3 | Devise new molecular tools for prognosis of cancer |
| | CO4 | Correlate the cell cycle to onset of cancer and progression |
| | CO5 | Comprehend signaling networks to decipher cellular conditions |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT103 | **Core Paper 3** – Applied Microbiology | | | |
| Batch 2025-2027 | Hours / Week 5 | Total Hours 75 | Credits 4 | Employability |

## Course Objectives

1. To make the students to understand the basic concepts of the biology of microorganisms and itsmechanism of action in host cells
2. To learn the microbiological techniques used for the classification of microorganisms
3. To understand the microbe-host interaction and their metabolic activities
4. To introduce the role of microorganisms in pathogenesis

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Recollect the early development and physiology of microbes |
| | CO2 | Understand the microbial taxonomy and classification methods |
| | CO3 | Apply the knowledge of microbiological methods to study about themicrobes by phenotypic and genotypic methods |
| | CO4 | Apply the knowledge to decipher food spoilage due to cause of microbial contamination and food preservation methods |
| | CO5 | Devise methods of microbial containment in industrial and hospital environments |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT104 | **Core Paper 4**- Bioinformatics | | | |
| Batch<br>2025-2027 | Hours /<br>Week 4 | Total<br>Hours 60 | Credis<br>4 | Employability |

**Course Objectives**

1. To inculcate students with the rapidly evolving field of bioinformatics
2. To learn about the bioinformatics databases, databanks and data format data retrieval from the onlinesources
3. To understand the essential features of the interdisciplinary field of science for better understandingbiological data.
4. To provide a strong foundation for performing further research in bioinformatics

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1<br>↑<br>↓<br>K5 | CO1 | Apply various computational methods and tools used for protein secondary structure prediction and genome analysis |
| | CO2 | Describe about sequence alignment and similarity search tools |
| | CO3 | Implement computational solutions to basic problems in biologicalscience |
| | CO4 | Analyze the docking studies of biomolecules and implement in pharmacological drug-lead compound analysis |
| | CO5 | Relate the sequence, structure and functions of biological molecules |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT1CL | **Core Practical 1-** Lab in Microbiology and Cellular Biology | | | |
| Batch 2025-2027 | Hours / Week 6 | Total Hours 90 | Credits 3 | Employability |

**Course Objectives**

1. To get hands on experience and to learn the principles behind molecular and microbiological techniques
2. To give hands on experience in estimation of nucleic acids and isolation of cell organelles
3. To train the students on microbiological media preparation, isolation of microbes andstaining techniques
4. To introduce the basic methods of cellular characterization

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K3 ↕ K5 | CO1 | Extend the hands on experience on standard solution preparation for experimentation |
| | CO2 | Demonstrate the various pure culture as well as the staining techniquesof microbiology and methods in Molecular Genetics |
| | CO2 | Develop and apply molecular and microbiological techniques forresearch as well as for in the various fields of applied science |
| | CO4 | Examine and analyze the results behind the molecular and microbiological techniques for the development of new techniques infuture |
| | CO5 | Employ various methods of cellular biology to the high end research |

| **Programme code: 08** | **M.Sc. Biotechnology** | | | |
|---|---|---|---|---|
| **Course code**:24PBT205 | **Core Paper** 5- Molecular Biology and Human Genetics | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>5 | Employability |

## Course Objectives

1. To understand the concept of replication and mutation
2. To introduce the concepts of transcription and its regulation in eukaryotes
3. To understand the overall mechanism of protein synthesis machinery in prokaryote and eukaryote
4. To study the human inherited disorders and the factors determining the population genetics

## Course Outcome (CO)

| | | |
|---|---|---|
| K1 | CO1 | Describe the gene expression and its regulation mechanism |
| ↑ | CO2 | Apply the mutational effects and its analysis in different fields |
| ↕ | CO3 | Investigate the chromosome and gene linked inherited diseases |
| ↓ | CO4 | Compare and contrast the variation in population genetics through different genetic analysis |
| K5 | CO5 | Interpret molecular events in eukaryotes |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT206 | **Core Paper** 6 - Genetic Engineering | | | |
| Batch<br>2025-2027 | Hours / Week<br>4 | Total Hours<br>60 | Credits<br>4 | Employability |

**Course Objectives:**

1. To acquaint on the versatile tools and techniques employed in genetic engineering and recombinant DNA technology
2. To provide theoretical base to properties and applications of DNA modifying enzymes and cloning strategies
3. To understand vector types, host genotype specificities for selection and screening of recombinants and/or recombinant transformants
4. To comprehend the various strategies for studying recombinant DNA molecules and its application in myriad fields

**Course Outcomes (CO):**

| | | |
|---|---|---|
| K1<br>↑<br>↓<br>K5 | CO1 | Apply the technical knowhow on manipulating genes and genomes |
| | CO2 | Showcase the knowledge to construct clones and apply them for cloning in different hosts |
| | CO3 | Be competent in handling PCR and related techniques for various applications |
| | CO4 | Be proficient in conducting genetic engineering experiments |
| | CO5 | Be competent enough to handle recombinant strains at an industrial scale |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT207 | **Core Paper** 7- Immunology and Immunotechnology | | | |
| Batch<br>2025-2027 | Hours /<br>Week 4 | Total Hours<br>60 | Credits<br>4 | Employability |

**Course Objectives**

1. To provide the students with a foundation in immunological processes
2. To understand the immune response made in humans to foreign antigens including microbial pathogens
3. To give the description of cells involved in the immune response as well to understand how the immune systemrecognizes self from non-self
4. To introduce the basic concepts of immuno diagnosis and therapy

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1<br>↕<br>K5 | CO1 | Define the role of the immune system |
| | CO2 | Demonstrate the basic knowledge of the organization and function of theimmune system |
| | CO3 | Develop immunological concepts and methods to diagnose immune disorders |
| | CO4 | Distinguish the mechanisms that lead to beneficial immune responses andimmune disorders |
| | CO5 | Apply the basics of immunotechnology in diagnosis and treatment |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT2CM | **Core Practical 2**- Lab in Molecular Biology and Genetics | | | |
| Batch<br>2025-2027 | Hours / Week<br>6 | Total Hours<br>90 | Credits<br>3 | Employability |

## Course Objectives

1. To enrich the students to have practical experience on molecular biology and Microbial genetics
2. To provide hands on experience in isolation of DNA, RNA and protein
3. To introduce basic microbial genetic experiments
4. To provide hands on experience in DNA and protein elution

## Course Outcomes (CO)

| | | |
|---|---|---|
| K3 ↕ K5 | CO1 | Apply the technical skills involved in extraction, manipulation of biomoleculesand quantification |
| | CO2 | Understand the mechanisms of genetic exchange, mutations and their implications. |
| | CO3 | Apply the practical skill for isolation of bacteria/plasmid DNA and its visualization in gel after separation by electrophoresis. |
| | CO4 | Be competent in planning and execution of molecular genetic experiments |
| | CO5 | Be capable of handling bacterial hosts and strains |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT2CN | **Core Practical 3-** Lab in Genetic Engineering andImmunotechnology | | | |
| Batch<br>2025-2027 | Hours /<br>Week 6 | Total Hours<br>90 | Credits<br>3 | Employability |

**Course Objectives**

1. To acquire skills on techniques of construction of recombinant DNA - Cloning vectors and isolation ofgene of interest
2. To have hands on experience in DNA manipulative enzymes
3. To give hands on experience in immunological techniques
4. To provide a basic understanding of labeling and detection techniques

**Course Objectives (CO)**

| | | |
|---|---|---|
| K3<br>↕<br>K5 | CO1 | Construct recombinant DNA molecule |
| | CO2 | Understand the mechanisms of construction of genomic DNA library and cDNA Library |
| | CO3 | Develop and apply the recent technology involved in diagnostic techniques ofimmunology |
| | CO4 | Employ techniques like PCR for high end applications |
| | CO5 | Plan and execute basic immunology experiments |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT308 | **Core Paper 8**- Plant and Animal Transgenics | | | |
| Batch 2025-2027 | Hours / Week 4 | Total Hours 60 | Credits 4 | Employability |

**Course Objectives**

1. To familiarize the students plant genetic engineering and gene transfer techniques
2. To discuss the concepts on gene knockout and hybridoma technology.
3. To explain methods ofvarious viruses mediated gene transfer methods and somatic cell nucleartransfer.
4. Discuss ethical concerns over the use of animal and plant transgenics.

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 | CO1 | Understand various types of vector system and gene delivery in plants. |
| ↕ | CO2 | Categorize biotic and abiotic profile |
| ↕ | CO3 | Investigate the importance of vector mediated gene transfer |
| ↕ | CO4 | Understand the various concepts of animal transgenics |
| K5 | CO5 | Discuss the applications of plant and animal transgenics in human welfare |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 24PBT309 | **Core Paper 9-** Industrial Applications of Biotechnology | | | |
| Batch<br>2025-2027 | Hours / Week<br>4 | Total Hours<br>60 | Credits<br>4 | Employability |

## Course Objectives

1. To acquaint students with technical and biological aspects of microbial utilization for production ofmetabolites
2. To study techniques for genetic improvements of microorganisms to improve yield of bioproducts.
3. To sensitize the students to basic bioreactor designs and uses
4. To expose to various biotechnological approaches for product production and recovery

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1<br>↕<br>K5 | CO1 | Comprehend the role of industrial biotechnology in improving microbial cell as factories |
| | CO2 | Design protocols for strain improvement and separation of molecules after fermentation process. |
| | CO3 | Plan a research career or to work in the biotechnology industry with strong foundation about bioreactor design and scale up. |
| | CO4 | Integrate research lab and industry, identify problems and seek practical solutions for large scale implementation of Biotechnology. |
| | CO5 | Apply methods of production of bioproducts at an industrial scale |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 25PBT310 | **Core Paper 10** – OMICS in Biotechnology | | | |
| Batch 2025-2027 | Hours/ Week 4 | Total Hours 60 | Credits 4 | Employability |

## Course Objectives

1. To develop a basic understanding of OMICS and their myriad applications
2. Exposure to the technical knowledge requirement for OMICS
3. To comprehend the fundamentals of genome and proteome data mining.
4. To promote study of human genome project to develop cures for human diseases with skills
5. To use complex algorithms, computer databases and software.

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Interpret genome proteome data obtained through high throughput techniques |
| | CO2 | Analyse and identify sequence similarity with skills that can empower biologists to make use of their own data for understanding of biological processes |
| | CO3 | Suggest and provide solutions to theoretical and experimental problems in Genomics , Proteomics and Metabolomics |
| | CO4 | Apply the acquired knowledge for pharmacogenomics and comprehend the techniques for drug design |
| | CO5 | Use genome proteome and Metabolome information on agri and health sector |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 24PBT3CO | **Core Practical 4**- Lab in Plant and Animal Biotechnology | | | |
| Batch<br>2025-2027 | Hours / Week<br>6 | Total Hours<br>90 | Credits<br>4 | Employability |

**Course Objectives**

1. To make the students to be skilled in plant tissue culture techniques
2. To enhance the secondary metabolites through *in vitro* techniques
3. To equip the students with animal cell culture techniques
4. To provide a basic understanding of application of plant and animal culturing

**Course Objectives (CO)**

| | | |
|---|---|---|
| K3 ↕ K5 | CO1 | Conserve the endangered species using *in vitro* culture techniques |
| | CO2 | Perform tissue culture techniques can be useful for bioprospecting important natural compounds |
| | CO3 | Employ *in vitro* animal cell culture techniques to evaluate the bioactive properties of samples |
| | CO4 | Plan and execute commercial *in vitro* plant propagation |
| | CO5 | Be competent in handling cell lines for various applications |

| Programme code: 08 | Programme title: M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 25PBT3CP | **Core Practical 5** -Lab in Applied Biotechnology | | | |
| Batch 2025-2027 | Hours / Week 6 | Total Hours 90 | Credits 3 | Employability |

**Course Objectives**

1. To impart hand-on experience and laboratory skills to students in area of bioprocess
2. To train students to set up different fermentation processes with special emphasis on the downstreamprocessing of bio-molecules purification and characterization
3. To expose to basic Omics experiments and data analysis
4. To introduce basic concepts of herbal drug preparation

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K3 | CO1 | Acquire General bacteriology and microbial techniques for isolation of pure cultures of microbes from different food, agricultural and environmental Sources |
| ↕ | CO2 | Downstream processing of the bio-molecules and characterization such as stability at different pH and Temperature |
| | CO3 | Be compatible in basic methods of herbal drug preparation and testing |
| K5 | CO4 | Analyse protein and metabolite databases and infer |
| | CO5 | Apply drug preparation methods for new product development |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:**25PBT3IT | Internship Training | | | |
| **Batch**<br>2025-2027 | Hours / Week<br>- | Total Hours<br>- | Grade | Employability |

**Course objective**

- To provide an opportunity to work in industry/institute under the mentorship of an industrial personnel
- To develop key skill sets that are industry relevant for future placements
- To have a flavor of corporate life in an industry sector
- To built strength, sprit of team work and self confidence
- To prepare the students to comprehend industrial problem

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 25PBT411 | **Core Paper 11**- Pharmaceutical Biotechnology | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>5 | Employability |

**Course Objectives**

1. To expose the students to biopharmaceutical market
2. To give them the knowledge on drug development process.
3. To cover the latest developments in Pharmaceutical Biotechnology
4. To create an insight on drug interaction and clinical trials
5. To expose the students to Traditional Knowledge System

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Apply the basic knowledge involved in drug preparation and the classical treatment processes |
| | CO2 | Correlate the effects of drugs, bio-assay and interpretation |
| | CO3 | take part in clinical research |
| | CO4 | Have commendable research aptitude for drug designing |
| | CO5 | Indigenous knowledge system for treating diseases |

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| **Programme code:** 08 | M. Sc. Biotechnology | | | |
| **Course code:**25PBT4Z1 | Project and Viva voce | | | |
| **Batch**<br>2025-2027 | Hours / Week<br>21 | Total Hours<br>315 | Credits<br>8 | Employability |

**Course objectives**

- To inculcate strong sense of research attitude
- To plan hypothesis design and execute experiments
- To analyse and interpret the results
- To present the research in a standard dissertation format

| Programme code: 08 | M.Sc., Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT1E1 | Major Elective I - Environmental Biotechnology | | | |
| Batch 2025-2027 | Hours / Week 5 | Total Hours 75 | Credits 5 | Skill development |

**Course Objectives**

1. To introduce the students to various regional and global concerns regarding the environment,including the natural challenges, various types of environmental pollutants and their effects.
2. To Study the changing environment, and the developments of diverse technologies to detect,address these concerns.
3. To prioritize specific examples and cases, and explain how chemical, biological sciences can beapplied to identify and address issues of environmental concerns.

**Course outcomes**

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Recognise the various global and regional environmental concerns due to natural causes |
| | CO2 | Investigate some examples of different types of environmental pollution and their impacts |
| | CO3 | Demonstrate an awareness of emerging concerns such as climate change,waste management or reductions in fossil fuels, and new technologies for addressing these. |
| | CO4 | Explain Environmental Impact Assessment, Management and Auditing in India |
| | CO5 | Evaluate the potential for biodegradation of organic pollutants, taking microbial and physical/chemical environments, as well as the chemical structure of the compound itself, into consideration |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 24PBT1E1 | Major Elective 1-Nano Biotechnology | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>5 | Skill development |

**Course Objectives**

1. To understand the influence of dimensionality of the object at nanoscale on their properties
2. To outline size and shape-controlled synthesis of nanomaterials and their applications
3. To familiarize themselves with nanotechnology potentialities
4. To introduce the various applications of nanotechnology

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 | CO 1 | Understand the fundamentals of nanotechnology |
| ↕ | CO 2 | Give a general introduction to different classes of nanomaterials |
| | CO 3 | Apply their knowledge on various synthesis methods of nanomaterials |
| | CO 4 | Understand characterization techniques involved in nanotechnology |
| K5 | CO 5 | Apply nanotechnological principles in agri and medical fields |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT1E1 | Major Elective 1- Post Production System of Foods | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>5 | Skill development |

## Course Objectives

1. To focus on producing a high-quality product, maintaining the nutrition value of the food, increasing the shelf life of the product and availability of the seasonal fruits and vegetables throughout the year.
2. To impart knowledge and skills to deal with the technicalities and diverse issues with the food processing technologies.
3. To introduce a flavour of indigenous products
4. To sensitize on various packaging systems

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1<br>↕<br>K5 | CO1 | Comprehend the basic principles and methods of food processing, reservation and quality. |
| | CO2 | Predict processing and to find a method of preservation in relation to food composition. |
| | CO3 | Discuss and employ quality standards ethics of processed foods. |
| | CO4 | Invent and develop novel food by utilizing local resources of vegetation. |
| | CO5 | Be competent in using local resources for entrepreneurship options |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT1E1 | Major Elective 1- Plant therapeutics and phytoproducts | | | |
| Batch 2025-2027 | Hours / Week 5 | Total Hours 75 | Credits 5 | Skill development |

**Course Objectives**

1. To understand the basics and applications of natural products
2. To comprehend the various phytomolecules in plant systems
3. To analyze and improve the standards and formulation of natural products in pharmaceuticalindustry
4. To study the role of natural products as nutraceuticals

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 ↑↓ K5 | CO1 | Discuss the extraction methods of several natural products |
| | CO2 | Illustrate the screening, isolation and characterization of phytocompounds |
| | CO3 | Examine the mode of action of natural products in pharmaceutical and cosmetic industry |
| | CO4 | Deploy the advanced methods for formulating drugs from natural origin |
| | CO5 | Comprehend the regulatory aspects in plant therapeutics |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT2E2 | Major Elective II -Research Methodology | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>5 | Skill development |

## Course Objectives

1. To identify the overall process of designing a research study from its inception to its report.
2. To distinguish a purpose statement, a research question or hypothesis, and a research objective.
3. To describe and express the role and importance of research in basic and applied sciences
4. To Design an action plan of research and acquire skills of writing a research manuscript

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 | CO1 | Evaluate literature, form a variety of sources, pertinent to the research objectives. |
| ↕ | CO2 | Identify and justify the basic components of the research framework, relevantto the tackled research problem |
| | CO3 | Raise awareness of crucial aspect of the nature of Knowledge and the value ofscientific method |
| | CO4 | Appreciate the components of scholarly writing and evaluate its quality |
| K5 | CO5 | Perform a standard and outcome based research in niche areas |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT2E2 | Major Elective II- IPR, Biosafety and Bioethics | | | |
| Batch<br>2025-2027 | Hours / Week<br>5 | Total Hours<br>75 | Credits<br>5 | Skill development |

## Course Objectives

1. To disseminate fundamentals of Intellectual Property Rights to students
2. To impart the importance of IPR laws and to encourage students in the novel creation to meet the biotechnological demands.
3. To educate students about the principles and conflicts in bioethics
4. To perceive the various IPR convention and their utilities in biotechnology innovation.
5. To employ the basics of biosafety measures to maintain the biological integrity between theecology and human health.

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 | CO1 | Apply skills of critical thinking, reading, understanding, explaining and applying IP-related statutes and IP-related cases |
| ↑ | CO2 | Analyse ethical and professional issues which arise in the intellectual property law context |
| | CO3 | Apply intellectual property law principles (including copyright, patents, designs and trademarks) to real problems and analyze the social impact of intellectual property law and policy |
| | CO4 | Facilitate the students to explore career options in IPR |
| K5 | CO5 | Be competent in evaluation of safety and ethical standards in biology |

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| **Programme code:** 08 | **M.Sc. Biotechnology** | | | |
| **Course code**: 24PBT2E2 | Major Elective II-Marine and Algal Biotechnology | | | |
| Batch 2025-2027 | Hours / Week 5 | Total Hours 75 | Credits 5 | Skill development |

## Course Objectives

1. To familiarize the students on marine natural products and its bioactive compounds
2. To provide insights on algal production and its importance.
3. To explain the applications of marine and algae in an environment and medicines.
4. To introduce various methods of applications of aquaculture

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 | CO1 | Explain about the production of bioactive compounds and marine natural product. |
| ↑ | CO2 | Investigate the application of Genetic Engineering in the marine science |
| ↕ | CO3 | Describe importance of aquaculture Biotechnology |
| ↕ | C04 | Explain about algal cultivation and its importance |
| K5 | CO5 | Employ methods of resource mobilization and usage for product production |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PB2TE2 | Major Elective II – Total Quality Control and Management | | | |
| Batch 2025-2027 | Hours / Week 5 | Total Hours 75 | Credits 5 | Skill development |

**Course Objective**

1. To facilitate the understanding of Quality Management principles and process.
2. To understand the different components in management, customer - supplier relationship andservices.
3. To learn the elements of quality systems and quality auditing.

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | To overview the basic knowledge of total quality management principles andconcepts of Current Biotech Industries. |
| | CO2 | To predict the customer orientated quality and leadership and continuous improvement process and supplier selection and management. |
| | CO3 | To discuss six sigma concept methodology and application and the TQM tools. |
| | CO4 | To invent and develop novel design of quality systems of ISO auditing in the field of Biotechnology. |
| | CO5 | Apply TQM principles in biotechnology research and industry |

| Programme code: 08 | M.Sc., Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT3N1 | Non Major Elective (on-line Exam ) - Aptitude and reasoning I | | | |
| Batch<br>2025-2027 | Hours / Week<br>4 | Total Hours<br>60 | Credits<br>4 | Skill development |

**Course Objectives**

1. To introduce the concept of reasoning ability, research aptitude, and general awareness to the students.
2. To develop divergent thinking and motivate the students to participate in various competitive examinations
3. To prepare the students to face the challenges of the competitive exams
4. To train students by advancing, verbal and quantitative skills

**Course outcomes**

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | The ability to analyse a logical problem and to identify the appropriate resolving technique. |
| | CO2 | The ability to use current skills, and tools necessary for Aptitude glitches. |
| | CO3 | Students are asked to remember concepts in a short way. |
| | CO4 | The ability to recognize the need for continuing professional development. |
| | CO5 | Increase in analytical nature to apply the scientific knowledge to arrive at the solution to the given scientific problem |

| **Programme code: 08** | **M.Sc., Biotechnology** | | | |
|---|---|---|---|---|
| **Course code:** 24PBT3N2 | Non Major Elective (on-line Exam )– Cancer Biology | | | |
| Batch 2025-2027 | Hours / Week 4 | Total Hours 60 | Credits 4 | Skill development |

**Course Objectives**

1. To introduce the overview and causes of cancer
2. To develop chance to learn molecular mechanism and cellular events in cancer progression
3. To understand the diagnostic procedure and treatment of cancer

**Course outcomes**

| | | |
|---|---|---|
| K1 | CO1 | Develop the knowledge of causative agents of cancer |
| ↑ | CO2 | Integrate the cellular events and signaling mechanism for cancer progression |
| ↕ | CO3 | Comprehend the molecular basis for cancer |
| ↕ | CO4 | Discuss the advanced diagnostics tools to detect the early onset of cancer |
| K5 | CO5 | Invent and apply alternative strategies to treat cancer |

| **Programme code: 08** | **M.Sc., Biotechnology** | | | |
|---|---|---|---|---|
| **Course code**: 24PBT3N2 | Non Major Elective (on-line Exam ) – Nutraceuticals | | | |
| Batch<br>2025-2027 | Hours / Week<br>4 | Total Hours<br>60 | Credits<br>4 | Skill development |

**Course Objectives**

1. To explain the nutraceutical concepts and classification and their role in human health
2. To understand the plant and animal origin and explain the health benefits of functional foods
3. To explain the importance of nutraceuticals in disease prevention

**Course outcomes**

| | | |
|---|---|---|
| K1<br>↕<br>K5 | CO1 | Develop the knowledge on relation of nutraceutical Science with other sciences |
| | CO2 | Identify the different sources of nutraceuticals, their extraction methods, and their metabolism |
| | CO3 | Discuss the concepts and extraction of marine and algal nutraceuticals |
| | CO4 | Discover various food products that are used as nutraceuticals in making functional foods |
| | CO5 | Relate the role of various nutraceuticals in combating major health problems such as diabetes, obesity, cardiovascular diseases, cancer, and osteoporosis |

| **Programme Code: 08** | **M.Sc Biotechnology** | | | |
|---|---|---|---|---|
| **Course Code:** 24PGI4N2 | Non-Major Elective Paper : Information Security | | | |
| Batch 2025-2027 | Hours/ Week 4 | Total Hours 60 | Credits 4 | Skill development |

## Course Objectives

1. Students will identify the core concepts of Information security.
2. To examine the concepts of Information Security.
3. To design and implement the security features for IT and Industrial sectors.

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | To Learn the principles and fundamentals of information security. |
| | CO2 | To Demonstrate the knowledge of Information security concepts |
| | CO3 | To Understand about Information Security Architecture. |
| | CO4 | To Analyze the various streams of security in IT and Industrial sector. |
| | CO5 | To know about Cyber Laws and Regulations. |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT3X1 | Extra Departmental Course – Business ventures in Biosciences | | | |
| Batch<br>2025- 2027 | Hours / Week<br>2 | Total Hours<br>30 | Credits<br>2 | Entrepreneurship |

## Course Objectives

1. Provides a more refined procedural road map for non-bioscience students who are interested instarting their own companies in bio sectors
2. To strengthen students‟ skills to commence their biotechnology company from its earliest stagesto self-sustainable model
3. Provide students with a broad coverage of key areas of modern biotechnology and a basicunderstanding of business and finance issues.
4. Coupling of entrepreneurship with scientific innovation.

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1<br>↑<br>↓<br>K5 | CO1 | Evaluate ideas and innovations that could be viable for a business |
| | CO2 | Decipher and comprehend the ever changing scenario of Biotechnology industry |
| | CO3 | Possess skills including idea evaluation, elevator pitching, intellectual property strategies, feasibility analysis, market assessments, regulatory approval, funding cycles, business planning, team formation, and financial planning |
| | CO4 | Possess personal motivations in choosing potential next steps for commercialization |
| | CO5 | Establish and sustain a bio business enterprise |

| Programme code: 08 | M.Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code**: 24PBT0J1 | JOC 1 – Food Safety and HACCP | | | |
| Batch 2025-2027 | Hours/ Week 2 | Total Hours 30 | Credits 2 | Employability |

## Course Objectives

1. To make students understand the basics of food
2. To give a detailed idea about the food safety
3. To analyze the techniques and validate the samples
4. To provide ideas on the technologies of HACCP and application

## Course Outcomes (CO)

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Remember the scientific terms by repeated learning |
| | CO2 | Understand the concepts with help of videos displayed during class Hours |
| | CO3 | Choose the correct method and solve the problem by applying the specific techniques |
| | CO4 | Distinguish even small variations by simple analysis |
| | CO5 | Know about the food standard laws and principles of hazards assessment |

| Programme code: 08 | M. Sc. Biotechnology | | | |
|---|---|---|---|---|
| **Course code:** 24PBT0J2 | JOC 2 – Natural Farming, Biofertilizers and Biopesticides | | | |
| Batch<br>2025-2027 | Hours/<br>Week<br>2 | Total<br>Hours<br>30 | Credits<br>2 | Employability |

**Course Objectives**

1. To understand the concepts of unique model that relies on farmlands rejuvenation
2. To learn the various cost production to nearly zero and return to a green revolution farming
3. To interpret and understand the mechanism and activity of microbes in soil
4. To develop pesticides to control pests by nontoxic mechanism

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Explaining natural farming to draw chemical free agriculture and to promote traditional Indian Practises |
| | CO2 | Understand the usage of cyanobacteria and Azolla in wetland for crop improvement. |
| | CO3 | Understand the role of microbes in crop improvement. |
| | CO4 | Analyse the mechanism of solubilisation by phosphobacteria. |
| | CO5 | Know about the benefits of using biopesticides to prevent environmental pollution. |

| Programme code: 08 | M. Sc. Biotechnology | |
|---|---|---|
| **Course code:** 24PBT0D1 | ALC. 1 – Forensic Biotechnology | |
| Batch<br>2025-2027 | Credits<br>2 | Skill development |

**Course Objectives**

1. To emphasize the importance of scientific methods in crime detection.
2. To emphasize the importance of scientific methods in crime detection.
3. To be able to use and apply modern tools, techniques and skills in forensic investigations.
4. To highlight the importance of forensic science for perseverance of the society.

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1<br>↕<br>K5 | CO1 | The student will be able to describe the fundamental principles and functions offorensic science and its significance to human society. |
| | CO2 | The student will acquire the skills involving the tools and techniques required fordetection of critical assessment |
| | CO3 | Rationalise the significance of biological and serological evidence |
| | CO4 | Explain how forensic entomology assists in death investigations |
| | CO5 | The student will be able to demonstrate an integrative approach to environmentalissues with a focus on sustainability |

| Programme code: 08 | M. Sc. Biotechnology | |
|---|---|---|
| **Course code:** 24PBT0D2 | ALC. 2 – Stem Cell and Neuroscience | |
| Batch<br>2025-2027 | Credits<br>2 | Skill development |

**Course Objectives**

1. To familiarize the students with stem cell technology and basics of neuroscience
2. To discuss various chemical and biological neural signals and its types.
3. To explain the importance of artificial intelligence in neural network
4. To familiarize the use of stem cells in the treatment of genetic and human diseases

**Course Outcomes (CO)**

| | | |
|---|---|---|
| K1 ↕ K5 | CO1 | Relate various stem cells and their characteristic features |
| | CO2 | Explain neuronal signaling pathways and neurotransmitters in action potential |
| | CO3 | Investigate the role of Artificial intelligence in neural network. |
| | CO4 | Investigate the applications of stem cell and neuroscience in the treatment of various diseases |
| | CO5 | Use stem cells in design of therapeutic regimes |