

M.Sc. – BIOTECHNOLOGY
Academic Programme
(According to NEP 2022)

Specialization/Discipline:

Biotechnology

Duration:
2 years (4 Semesters)

With effect from academic year 2020-22

M. Sc - BIOTECHNOLOGY PROGRAM OUTCOMES

PO1: This programme explores the knowledge for the changes occurring in living cells. Demonstrate the interdisciplinary skills in the fields of biochemistry, cell and molecular biology, bioprocess engineering, plant biotechnology, genetic engineering, microbiology and bioinformatics.

PO2: The program focuses on techniques used in industry for production of microbial/plant/Animal products thus it enables develop an understanding of an applied aspect of microbes/plants/animals in industry.

PO3: Developed in-depth analytical and critical thinking to identify, formulate and solve the issues related to Biotechnology Industry, Pharma industry, Medical or hospital related organizations, Regulatory Agencies, & Academia.

PO4: To train the students in all the fundamentals of the subject of Biotechnology, progressively giving way to all essentials of the subject with good practical training and exposure to most modern concepts. Develop an ability to solve, analyze and interpret data generated from experiments done in project work or practical courses.

PO5: Demonstrate skills to use modern analytical tools/ software/ equipments and analyze and solve problems in various courses of biotechnology.

PO6: The curriculum carries multiple options in terms of electives for incorporating innovative ideas generated in this field.

PO7: To provide ample opportunity for the students to gain sufficient practical knowledge in the subject with properly designed experiments. Adopt code of ethics in professional and social context and demonstrate exemplary professional, ethical and legal behaviors in decision making. Explore new areas of research in all the branches of biotechnology in addition to interdisciplinary fields

PO8: To help the students to mold themselves as competent enough in an international pursuit of knowledge by providing written and oral communication skills to communicate effectively in healthcare, industry, academia and research.

PO9: Apply responsibilities to promote societal health and safety, upholding the trust given to the profession by the society.

PO10: The interdisciplinary nature of the subject is to be incorporated to have option for employment and higher studies also develop skills, attitude and values required for self-directed, lifelong learning and professional development.

Govt. of India, which provides a strategic roadmap for India's emergence as a global biotechnology innovation and manufacturing hub, which also highlighted importance of human resource development and need for nurturing tailor-made human capital for advanced strategic research and entrepreneurship.

PROGRAMME SPECIFIC OUTCOMES (PSO's) OF MSC DEGREE IN BIOTECHNOLOGY

Students who passed with MSc. Biotechnology will,

PSO1: Have significant knowledge on various aspects of Biotechnology with special reference to microbes and their products.

PSO2: Expertise in laboratory techniques of basic microbiology, especially with regard to isolation, characterization of industrially important microbes.

PSO3: Understand the fundamental concepts in core (plant, animal, industrial biotechnology, molecular biology, genetic engineering and genetics) and allied (microbiology, immunology and physiology).

PSO4: Get exposure to various research fields and thrust area of the core and interdisciplinary subjects.

PSO5: Acquire technical skills especially in regard to industrially important metabolites and their production. **PSO6:** Have ability to plan and execute experiments as well as to analyze & interpret data for any research.

COURSE OUTCOME OF MSC DEGREE IN BIOTECHNOLOGY

I SEMESTER

Title of paper: CELL AND DEVELOPMENTAL BIOLOGY

Course code: **MBT-1001**

CO1: The student can understand how the cell is equipped with machineries to conduct activities as the basic structural and functional unit of life.

CO2: The structural features of cell organelles/machineries.

CO3: The functional mechanisms of cellular phenomena.

CO4: The fundamental principles of heredity and deviations from mendelian behavior.

Title of paper: GENERAL BIOCHEMISTRY

Course code: **MBT-1002**

The student is exposed to:

CO1: The biochemical composition of the cell.

CO2: The structure and types of nutrient components.

CO3: The major metabolic pathways and their significance.

CO4: The coordination of metabolic pathways.

Title of paper: BIOPHYSICAL CHEMISTRY AND TECHNIQUES

Course code: **MBT-1003**

The student gets awareness in:

CO1: The techniques used in the visualization of cellular components and macromolecules.

CO2: Analytical techniques used in detection and quantification of biological compounds and the separation techniques used in biology.

CO3: The application of statistical principles in biological studies.

CO4: The research methodology and documentation.

Title of paper: FUNDAMENTALS IN BIOSTATISTICS AND BIOMATHEMATICS

Course code: **MBT-1004**

CO1: Mathematically model, solve, and analyze problems in biomathematics.

CO2: Implement computational approaches to solve and analyze problems in biomathematics.

CO3: Write lucidly about biomathematics.

CO4: Speak fluently and coherently about biomathematics.

CO5: Describe various application area of biostatistics, Summarize, organize and display quantitative data

CO6: Distinguish different types of data and sampling techniques, Compute and interpret the result of correlation and regression analysis

CO7: Calculate and interpret measures of central tendency and variability in statistical data, Compare different population sample using ANOVA

CO8: Explain the characteristics and use of statistical software and packages of biostatistics

CO9: Identify appropriate tests to perform hypothesis testing and experimental design for biological experiment and interpret the output adequately.

II SEMESTER

Title of paper: MOLECULAR BIOLOGY AND GENETICS

Course code: **MBT-2001**

The student gets a comprehensive knowledge of:

CO1: The structural and functional organization of genome.

CO2: The molecular phenomena of DNA copying and transmission of informations.

CO3: The regulation of gene function and associated phenomena.

CO4: The fundamental principles of heredity and deviations from mendelian behavior.

CO5: The effect of mutations and mutational analysis. Principles of behavioural and population genetics.

Title of paper: GENERAL MICROBIOLOGY

Course code: **MBT-2002**

The students get an exposure in:

CO1: Microbial grouping and its taxonomical significance.

CO2: Cultivation and identification of microorganisms.

CO3: The Organization of Bacterial Cell CO4: Maintenance and preservation of bacterial cultures.

CO5: General characteristics of Archaeobacteria and their phylogenetic overview

CO6: Overview of Bacterial Diversity: Morphology, Metabolism, Ecological Significance and Economic importance

Title of paper: PHYSIOLOGY AND METABOLISM

Course code: **MBT-2003**

CO1: The characteristics of enzymes as biological catalysts, enzyme kinetics, enzyme classification.

CO2: The role of nucleic acids in synthesis of macromolecules, particularly proteins and enzymes.

CO3: The structure and physico chemical properties of carbohydrates from monosaccharide to polysaccharides.

CO4: The difference between the water soluble and fat soluble vitamins and their key role in the metabolism as coenzymes.

CO5: The rate of reactions and order of reactions, and inhibitions and their kinetics.

CO6: This course teaches the basic anatomy and physiology of human body.

CO7: The students are taught the functioning aspects of the human body at molecular level.

CO8: At the end of this course the students will be able to appreciate the anatomical and physiological aspects of the human body

Title of paper: COMPUTATIONAL BIOLOGY AND BIOINFORMATICS

Course code: **MBT-2004**

Upon completion of the course the student will be able to:

CO1: Get to know effective use of Office package

CO2: Create a patient record database in MS Access and handle queries on the same.

CO3: Store and Retrieve drug related information using online tools

CO4: Design a questionnaire using word processing package

CO5: Comprehend the utility of tools & databases available in genomic & proteomics

III SEMESTER

Title of paper: CELLULAR AND MOLECULAR IMMUNOLOGY

Course code: **MBT-3001**

The students have knowledge of:

CO1: The cells and organs associated with immune system.

CO2: The details of immune system functioning.

CO3: Analytical techniques based on immunological reactions.

CO4: The after effects of defects in immune system.

CO5: This course provides you with knowledge and understanding of immunology and the way it is applied in diagnostic and therapeutic techniques and research.

CO6: It's a paper which accomplishes the learning of techniques involved in understanding the immunological aspects of physiology and biological samples.

Title of paper: PRINCIPLES OF GENETIC ENGINEERING

Course code: **MBT-3002**

This course will provide students with the recent knowledge of genetic engineering. At the end of the course, a successful student will be able to

CO1: Understand and explain the concept of genetic engineering including the techniques, applications and limitations.

CO2: Demonstrate the ability to design recombinant molecules and apply information extracted from a variety of sources including journal articles, technical bulletins, product manuals, and drug information sheet to solve problems.

CO3: Apply learned knowledge to their future research.

Title of paper: PLANT BIOTECHNOLOGY AND TISSUE CULTURE

Course code: **MBT-3003**

Students get familiarized with the:

CO1: Fundamental requirements and design of lab to carry out plant Tissue culture experiments.

CO2: The different approaches and techniques involved in creating recombinant plant.

CO3: The applications and demerits of genetic modification in plants.

CO4: This course introduces the students to explore entrepreneurial avenues in this field.

Title of paper: ENZYMOLOGY AND ENZYME TECHNOLOGY

Course code: **MBT-3004**

CO1: It helps the students to learn the significant features of the biochemical catalysts.

CO2: It helps the students to learn the methodology involved in assessing the enzyme activity and mechanism of enzyme action.

CO3: It illustrates the enzyme catalysis, kinetics and regulatory aspects.

IV SEMESTER

Title of paper: ANIMAL CELL CULTURE, MEDICAL AND MICROBIAL BIOTECHNOLOGY

Course code: **MBT-4001**

Students get familiarized with the:

- CO1: Comprehend basic concepts of establishing animal cell cultures
- CO2: Understand the principles and applications of these technologies
- CO3: Modern tools in diagnosis
- CO4: Demonstrate antigen-antibody relationships and their detection methods.
- CO5: The biotechnological approaches to therapy
- CO6: Understand the principles of the new biotechnology-based assays
- CO7: The therapeutic uses of plant products

Title of paper: GENOMICS, PROTEOMICS, INTELLECTUAL PROPERTY RIGHTS AND PRODUCT REGULATION

Course code: **MBT-4002**

This course aims to provide the knowledge and practical skills of functional genomics and proteomics

CO1: The course also teaches the techniques used in functional genomics such as microarrays, NGST, mRNA expression and miRNA expression.

CO2: By the end of the course, students will have the necessary learning to radically advance our understanding of life and transform medicine.

CO3: Teachings like good laboratory procedure and practices, standard operating procedures for biotechnology research, legal and institutional framework for biosafety, international agreements and protocols for biosafety.

CO4: learn about the Intellectual property rights and their usages to protect work created by human mind that has commercial value.

CO5: Makes students aware about different national and international IPR issues including patents, trademarks, copyrights etc. and various international agreements and treaties.

Title of paper: INDUSTRIAL BIOTECHNOLOGY

Course code: **MBT-4003 A**

Upon completion of the course, the student will be:

CO1: Biological and kinetic concepts underlying bioprocesses engineering

CO2: Explain procedures for the design and control of bioreactors

CO3: Product isolation using various analytical methods

CO4: Understand the basic upstream processing principles

CO5: Apply the bioprocess engineering in different industries for the benefit of mankind

Title of paper: ENVIRONMENT BIOTECHNOLOGY

Course code: **MBT-4003 B**

Upon completion of this course, the students will be able to:

CO1: Apply the concepts of Biotechnology in Environmental Management.

CO2: Describe the concept of pollution management.

CO3: Bioremediation and biodegradation principles, processes and applications with advanced applications in wastewater, oil recovery, biohydrometallurgy, biofuel, carbon storage and capture, etc.

CO4: How modern biotechnology is developed to achieve better environmental protection and sustainability through the use of microbes and microbial communities in pollution abatement to mitigation of climate change, bioenergy, biomaterial to enzyme discovery.

Title of paper: DRUG DISCOVERY AND DEVELOPMENT

Course code: **MBT-4003 C**

Upon completion of this course, the students will be able to:

CO1: Understand the differences between the structure of male and female gametes.

CO2: Learn the process of early and late embryonic development including the process of cleavage, blastulation and gastrulation in animals.

CO3: Understand the role and importance of Hox, bicoid, sonic hedgehog, etc genes in development.

Title of paper: NANOBIO TECHNOLOGY

Course code: **MBT-4003 D**

Upon completion of this course, the students will be able to:

CO1: Comprehend the nanoscale phenomenon associated with cellular nanostructures

CO2: To reveal the nature of DNA bricks, aptamers and origami

CO3: Design and utilize the protein and enzyme-based nanostructures

CO4: Classify glycol nanostructures based on their binding ligands

CO5: Have knowledge about membrane transport and membrane-based nanostructures and their uses