

Session 2021-22

Programme and Course Outcome

M.Sc. Biotechnology



**Multani Mal Modi College,
Patiala**

Program Outcomes (POs)

PO-1: Industry applications of better understanding of the key principles of biochemical functioning at an advanced level. Better awareness of the major issues at the forefront of the discipline, will possess an in-depth understanding of the area of biochemistry chosen for research emphasis.

PO-2: An ability to conduct experiments, as well as to analyze data, understood the basic concepts, fundamental principles, and the scientific theories related to various scientific phenomena and their relevancies in the day-to-day life

PO-3: An ability to acquire the skills in handling scientific instruments, planning and performing in laboratory experiments to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability in biotechnology

PO-4: Students will demonstrate engagement in the biotechnology discipline through involvement in research or internship activities and outreach or mentoring activities specific to biotechnology.

PO-5: Students will acquire and demonstrate competency in laboratory safety and in routine and specialized biotechnological laboratory skills applicable to biotechnology research or clinical methods, including accurately reporting observations and analysis.

Course Outcomes (COs)

M.Sc. Biotechnology - I

Semester-1st

Paper	Course
I	Principles of Biochemistry
II	Molecular Genetics
III	Introductory Microbiology
IV	Immunology

Semester-2nd

Paper	Course
V	Genetic Engineering
VI	Molecular Biophysics
VII	Fundamentals of Bioprocess Development
VIII	Fundamentals of Fermentation Technology

PAPER I: PRINCIPLES OF BIOCHEMISTRY

- CO-1: This subject will demonstrate knowledge and understanding of the chemical structures and metabolic functions in living beings.
- CO-2: This subject will demonstrate knowledge and understanding of the fundamental biochemical principles, such as structure and function of biomolecules, metabolic pathways and regulation of biochemical processes.
- CO-3: This subject will demonstrate knowledge and understanding of the principles and basic mechanisms of metabolic control.
- CO-4: Students will learn the use of basic laboratory skills and apparatus to obtain reproducible data from biochemical experiments.

PAPER II: MOLECULAR GENETICS

- CO-5: This subject will demonstrate knowledge and understanding of the molecular machinery of living cells.
- CO-6: This subject will demonstrate knowledge and understanding of the principles and basic mechanisms of metabolic control and molecular signaling.

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- CO-7: This subject will demonstrate knowledge and understanding of the principles that govern the structures of DNA and their participation in replication, transcription and translation.
- CO-8: Students will learn how to implement experimental protocols, and adapt them to plan and carry out simple investigations.
- CO-9: Students will learn the use of basic laboratory skills and apparatus to obtain reproducible data from biochemical experiments.
- CO-10: Students will be able to analyse, interpret, and participate in reporting to their peers on the results of their laboratory experiments;

PAPER III: INTRODUCTORY MICROBIOLOGY

- CO-1: To know the structure, metabolism, genetics and ecology of prokaryotic microorganism, eukaryotic microorganism and viruses.
- CO-2: Understand the basic microbial structure and function and study the comparative characteristics of prokaryotes and eukaryotes and also Understand the structural similarities and differences among various physiological groups of bacteria/archaea.
- CO-3: Students will understand the prevention and control of infectious diseases.
- CO-4: Students will understand the principles of physical and chemical methods in the control of microorganism.
- CO-5: This subject gives the understanding of various laboratory techniques such as isolation, staining, identification for various microorganism.

PAPER IV: IMMUNOLOGY

- CO-1: The students will be able to identify the cellular and molecular basis of immune responsiveness.
- CO-2: The students will be able to describe immunological response and how it is triggered and regulated.

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- CO-3: The students will be able to describe the roles of the immune system and overall organization of genes.
- CO-4: The students will be able to transfer knowledge of immunology into clinical decision making through case studies presented in class. Learn about immunization and their preparation and its importance.
- CO-5: The students will be able to demonstrate a capacity for problem-solving about immune responsiveness.
- CO-6: Demonstrate scientific quantitative skills, such as the ability to evaluate experimental design, read graphs, and understand and use information from scientific papers.

PAPER V: GENETIC ENGINEERING

- CO-1: The ultimate goal of this subject is to develop student's understanding towards the identification and characterization of proteins expressed in a genome.
- CO-2: Learn on assigning gene function through mutagenesis and genetic engineering and will be able to conduct gene expression profiling.
- CO-3: Students will be able to browse whole genome databases.
- CO-4: This subject will cover recent developments in genetics, epigenetics, small RNAs, proteomics, gene expression, mutagenesis and mapping genes.
- CO-5: It includes study of the entire set of proteins in order to understand its structure and function.
- CO-6: Acquire skills in the techniques of Site directed mutagenesis, Transposon tagging and targeted genome editing technologies.
- CO-7: It aims to teach students advanced technologies, research methods with major emphasis on the applications of DNA sequencing and protein analysis techniques.

PAPER VI: MOLECULAR BIOPHYSICS

- CO-8: The ultimate goal of this subject is to study physics of life processes with training that integrates the principles of physics and computer science.
- CO-9: Biophysicists use the methods of physical science to study the structure and

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functions of macromolecules and solve problems at the intersection of biological and physical science

CO-10 Biophysics major receive excellent training for careers in medicine and related health professions, biotechnology and pharmaceutical industries.

PAPER VII: FUNDAMENTALS OF BIOPROCESS DEVELOPMENT

CO-1: This course explains the processes and techniques used for extraction and purification of a product from culture medium. Also, bioprocess consideration in using animal and plant cell cultures will discuss using different techniques.

CO-2: This will also provide students with an up-to-date knowledge of upstream and downstream processing technology.

CO-3: To instruct students with an in-depth understanding of the key process design concepts relating to the production of biomolecules of industrial importance, produced using isolated microbial and mammalian cells.

CO-4: Students will be equipped with a knowledge and understanding of mainstream bioprocess design heuristics so that they may engage productively within multidisciplinary process development teams.

CO-5: Throughout this module, the emphasis will be on relating how market requirements influence the development and cost-effective optimization of biotechnology processes, stressing the multidisciplinary nature of this sector.

PAPER VIII: FUNDAMENTALS OF FERMENTATION TECHNOLOGY

CO-1: Industrial fermentation is an interdisciplinary science that applies principles associated with biology and engineering.

CO-2: Students will understand the commercial exploitation of microorganisms on a large scale.

CO-3: Students will learn microbiology and biochemistry from biological aspect.

CO-4: This fundamental knowledge is essential for Students to make their career in industry based on bioprocess.

CO-5: This subject provides the knowledge of basic principle of fermentation process, which help students to design, develop and operate industrial level biofuels.

Course Outcomes (COs)

M.Sc. Biotechnology - II

Semester-3rd

Paper	Course
IX	Enzymology
X	Microbial and Food Technology
XI	Environment Biotechnology
XII	IPRs, TQM & Biosafety

Semester-4th

Paper	Course
XIII	Tissue & Cell Culture Technology
XIV	Research Methodology
XV	Computers and Biostatistics
XVI	Introduction to Bioinformatics

PAPER IX: ENZYMOLOGY

- CO-1: This subject will serve as foundation for more advanced enzymology courses.
- CO-2: Students will learn various theoretical and practical aspects of enzymology.
- CO-3: This subject will stimulates students's interest in learning the structure, function and kinetics of enzyme and their role as catalyst and regulator of cell metabolism.
- CO-4: The student will understand the concept of immobilization and its relationship with various cells and enzymes.
- CO-5: A practical approach in the field of biosensors and immobilized systems.

PAPER X: MICROBIAL AND FOOD TECHNOLOGY

- CO-1: This subject discusses the technological principles and industrial applications of microorganisms and enzymes in food production and processing systems to provide useful products and services.
- CO-2: Analyse the importance of microorganisms in foods and understand the biotic and abiotic factors that affect their development in these substrates.

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- CO-3: Recognise the importance of fermentation processes and appreciate the role of microorganisms in industrial processes.
- CO-4: Demonstrate knowledge of major scientific concepts, social, economic and ethical implications in food sciences.
- CO-5: Major fermented food product technologies will also be discussed with specific references to alcoholic beverages, dairy products, organic acid, traditional fermented products.
- CO-6: This subject will cover basic properties, characteristics of microorganisms and enzymes, their metabolic pathways and how these are harnessed, manipulated and applied to increase productivity in food sector.
- CO-7: The practical component of this subject will include food fermentation and processing concepts to help student's understanding in food technology and related processes.

PAPER XI: ENVIRONMENTAL BIOTECHNOLOGY

- CO-1: Students will know the basic physiology of a microorganism and how their structure dictates their function in the environment.
- CO-2: Students will understand the basics for microbial metabolism of environmental contaminants.
- CO-3: To understand the conventional fuels, modern fuels and their environmental impact.
- CO-4: Students will understand the principles of bioremediation, phytoremediation, bioleaching and waste water treatment.
- CO-5: To know various techniques to modify and augment microorganisms in the laboratory and environment.

PAPER XII: IPR, TQM & BIOSAFETY

- CO-1: Students will understand balanced integration of scientific and social knowledge in sustainable development.

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- CO-2: This subject will introduce basic concepts of ethics and safety that are essential for different disciplines of science and procedures involved and protection of intellectual property and related rights.
- CO-3: This subject will provide a basic layout on regulations for entrepreneurship.
- CO-4: To understand the risks, ethics and safety of biotechnology based research and products related to various environmental factors.

PAPER XIII: TISSUE AND CELL CULTURE TECHNOLOGY

- CO-1: The course introduces to plant and animal cells and tissue culture, specificity of working with animal cells under in vitro conditions and their applications in biotechnology.
- CO-2: This subject will demonstrate knowledge and understanding of the cultures of Plant and animal cells and establish cell lines with good viability, minimal Contamination.
- CO-3: This subject will demonstrate knowledge and understanding to manipulate the cell cultures.
- CO-4: Students will learn the use of basic laboratory skills and practical knowledge required for dealing with cell cultures.

PAPER XIV: RESEARCH METHODOLOGY

- CO-1: The primary objectives of this course are to identify and discuss the role and importance of research in sciences.
- CO-2: The course identifies and discusses the complex issues inherent in selecting the research problem, research design and implementing a research project.
- CO-3: This subject will provide scientific understanding for detail interpretation of research work.

PAPER XV: COMPUTER AND BIOSTATISTICS

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- CO-1: To give students an introduction to the basics of biostatistics and helps in easy interpretation of data.
- CO-2: Provide knowledge of basic principles and concepts of computer science existing software to extract information.
- CO-3: To recognize the definition of statistics, its subject and its relation with other sciences.
- CO-4: To collect data relating to variables which will be examined and calculate descriptive statistics from these data.

PAPER XVI: INTRODUCTION TO BIOINFORMATICS

- CO-5: To give students an introduction to the basic practical techniques of bioinformatics.
- CO-6: Describe the history, scope and importance of Bioinformatics and role of internet in Bioinformatics.
- CO-7: Describe about Multiple Sequence Alignment, BLAST, FASTA, SWISSPROT its significance, algorithms and tools used for MSA
- CO-8: Emphasis will be given to the application of bioinformatics and biological databases to problem solving in real research problems.
- CO-9: The students will become familiar with the use of a wide variety of internet applications, biological database and will be able to apply these methods to research problems.
- CO-10: The aim of practical subject is to provide practical training in bioinformatics methods including accessing the major public sequence databases, use of the different computational tools to find sequences, analysis of protein and nucleic acid sequences by various software packages.