DEPARTMENT OF BIOTECHNOLOGY
FACULTY OF SCIENCE & HUMANITIES

Program Learning Outcomes (PLOs)

PLO 1: Students will be capable of doing collaborative and multidisciplinary

studies. PLO 2: Aptitude to carry out research in specialized areas of

biotechnology.

PLO 3: Students will be able to work both independently or in groups on complex projects that require collaboration across disciplines.

PLO 4: Students will be capable of designing an experiment with step-by-step instructions to address a research problem.

PLO 5: Capable to present the results/findings in the scientific

meetings/conferences/symposia. Program Specific Outcomes (PSOs)

The student will able to,

PSO 1: Understand the fundamental aspects in biological phenomenon of what, how and why to seek?

PSO 2: Demonstrate and apply the principles of bioprocess engineering in the design, analysis, optimization and simulation of bioprocess operations.

PSO 3: Gain fundamental knowledge in animal and plant biotechnology and their applications.

PSO 4: Demonstrate and apply knowledge of cell biology, biochemistry, microbiology and molecular biology to solve the problems related to health, environment with the aid of biotechnology tools.

PSO 5: Student will be able to describe fundamental molecular principles of genetics, relationship between phenotype and genotype, basics of genetic mapping, regulation of gene expression.

PSO 6: Familiarize with basic laboratory instruments and understand the principle.

PSO 7: Able to understand various aspects of molecular procedures and basics of genomics, proteomics and metabolomics which can be benificial in early diagnosis and prognosis of human diseases.

PSO 8: 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.

MICROBIOLOGY

Course Code: 21MBM101 Continuous Evaluation: 40 Marks Credits: 3 End

Semester Examination: 60 Marks L T P : 3 0 0 Course Type: THEORY

Prerequisite: None

COURSE LEARNING OUTCOMES: Students should be able to:

1. Identify major categories of microorganisms and analyse their classification, diversity, and omnipresence;
2. Identify and demonstrate structural, physiological, genetic similarities and differences of major categories of microorganisms;
3. Understand, how they cause different diseases and demonstrate how to control microbial growth; 4. Establish and evaluate interactions between microbes, hosts and environment.

CELL BIOLOGY

Course Code: 21MBM102 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: THEORY

Prerequisite: NONE

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion of course, students would be able to:

1. Classify the cell.
2. Understand how a cell and cell organelles perform their functions.
3. Understand the mechanism of cellular talk and signal transduction.
4. Understand the underlying mechanism of cell division.

BIOCHEMISTRY

Course Code: 21MSB103 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type:Theory

Prerequisite:

COURSE LEARNING OUTCOMES:

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. The student will be able to understand the structure, composition and function of protein, carbohydrate, lipids and nucleic;
2. The student will be able to understand the glycolysis, Kreb cycle, electron transport and photosynthesis;
3. The student will be able to understand the anabolism and catabolism of macromolecules;
4. The student will be able to understand the principles of thermodynamics and its application

in living organisms.

BIOPHYSICS & INSTRUMENTATION TECHNOLOGY

Course Code: 21MBM104 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type:Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES:

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the various types of bonds stabilizing a protein and its separation based on molecular weight and isoelectric point;
2. Understand the principle and instrumentation of separation techniques of biomolecules; 3. Understand the various spectrophotometry techniques; 4. Understand the light microscopy and electron microscopy.

MOLECULAR BIOLOGY AND GENETICS

Course Code: 21MBM105 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES: (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Understand the chemical structure of genetic material and molecular mechanism of inheritance; 2. Understand packaging of the vast genetic material in a cellular compartment;
3. Understand the mutagens and their role in mutation;
4. Understand the transcription and translation;
5. Understand the regulation of transcription and translation.

MICROBIOLOGY LAB

Course Code: 21MBM151 Continuous Evaluation: 60 Marks Credits: 2 End Semester Examination: 40 Marks L T P : 0 2 2 Course Type: Practical

Prerequisite: NIL

LAB LEARNING OUTCOME:

Understand advancement of techniques for healthcare

- Learn Aseptic techniques
- Industrial production of desired chemicals;
- AMR and MIC
- Microbes uses in various industries

BIOCHEMISTRY LAB

Course Code: 21MBM153 Continuous Evaluation: 60 Marks Credits: 2 End Semester Examination: 40 Marks L T P : 0 2 2 Course Type: Practical

Prerequisite: NIL

LAB LEARNING OUTCOME:

1. Understand the principles of various fields of chemistry and biology (organic chemistry, analytical chemistry, biochemistry, genetics, metabolism, and molecular biology); 2. Students will be able to make different solutions & reagents of different molarity, molality & normality according to experiment need;
3. Students can be able to analyze organic compounds quantitatively & qualitatively; 4. Develop as independent thinkers who are responsible for their own learning.

MOLECULAR BIOLOGY LAB

Course Code:21MBM155 Continuous Evaluation: 60 Marks Credits: 2 End Semester Examination: 40 Marks L T P : 0 2 2 Course Type: Practical

Prerequisite: Biology at graduation

LAB LEARNING OUTCOMES (LLOs):

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Isolate DNA and protein from prokaryotic and eukaryotic cell;
2. Handle the instruments like centrifuge, trans-illuminator, incubator, gel electrophoresis, PCR;
3. Understand the chemistry behind each experiment;
4. Work independently regarding the experiments conducted.

ANIMAL BIOTECHNOLOGY

Course Code: 21MPE101 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES (CLOs):

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion of course, students would be able to:

1. Explain the principles of animal tissue culture technique;
2. Identify & compare the traditional and novel methods of animal breeding;
3. Examine genetic tools used in animal improvement;
4. Discuss the various animal disease models;
5. Recognize the applications of transgenic animals.

PLANT BIOTECHNOLOGY

Course Code: 21MPE102 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P :3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion of course, students would be able to:

1. State the historical background & principles of plant tissue culture;
2. Describe the fundamentals of plant tissue culture technique;
3. Examine the production and uses of plant secondary metabolites;
4. Compare and contrast various techniques for creating transgenics;
5. Recognize the applications of transgenic plants.

ENVIRONMENTAL BIOTECHNOLOGY

Course Code: 21MPB103 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion of course, students would be able to:

1. Examine the global environmental challenges.
2. Compare and contrast various alternative non-fuel energy sources.
3. Describe the various waste water treatment process and solid waste treatment process. 4. Discuss the various approaches to bioremediation.
5. Recognize the importance of Environment Impact Assessment.

GENOMICS & PROTEOMICS

Course Code: 21MBM201 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: Knowledge of basic biology

LEARNING OUTCOME:
Students should be able to acquire

1. Knowledge and understanding of fundamentals of genomics and proteomics, transcriptomics and metabolomics.
2. Information of the structure and functions of the genomes together with the computational approaches to analyse the genomes & proteome;
3. Understanding of the gene expression and functional genomics;
4. Understanding the applications in various applied areas of biology.

RECOMBINANT DNA TECHNOLOGY

Course Code: 21MSB202 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type:Theory

Prerequisite: Elementary knowledge of molecular biology

COURSE LEARNING OUTCOMES:
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. The student will be able to understand the plasmid, phagemid, bacteriophages as cloning vectors and their application in gene mapping;

2. The student will be able to understand the application of various enzymes in cloning; 3. The student will be able to understand the difference between cloning and expression vector; 4. The student will be able to understand the methods used for selection of clones; 5. The student will be able to understand the industrial application of genetic engineering and recombinant DNA technology.

BIOINFORMATICS & COMPUTATIONAL BIOLOGY

Course Code: 21MBM203 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: Knowledge of biology and basic programming (10+2)

COURSE LEARNING OUTCOMES (CLO)
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Develop an understanding of basic theory of these computational tools.
2. Gain working knowledge of these computational tools and methods
3. Appreciate their relevance for investigating specific contemporary biological questions; 4. Understanding the applications in various applied areas of biology.

BIOETHICS, IPR & BIOSAFETY

Course Code: 21MBM303 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Students will gain awareness about Intellectual Property Rights (IPRs) to take measure for the protecting their ideas
2. Students will be able to devise business strategies by taking account of IPRs 3. Students will acquire adequate knowledge in the use of genetically modified organisms and its effect on human health
4. Students will gain more insights into the regulatory affairs.

IMMUNOLOGY & IMMUNOTHERAPY

Course Code: 21MBM205 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. 1.Demonstrate the basic knowledge of immunological processes at a cellular and molecular level
2. Outline key events and cellular players in antigen presentation, and how the nature of the antigen will shape resulting effector responses
3. Understand the principles governing vaccination and the mechanisms of protection against infectious diseases
4. Understand and explain the basis of immunological tolerance, autoimmUnity and transplantation
5. Understand and explain the basis of allergy and allergic diseases.
6. Understand and explain the immune system in cancer; tumor immunology and principles of immunotherapy

RECOMBINANT DNA TECHNOLOGY LAB

Course Code: 21MSB252 Continuous Evaluation: 60 Marks Credits: 2 End Semester

Examination: 40 Marks L T P : 0 2 2 Course Type: Practical

Prerequisite: NIL

LAB LEARNING OUTCOMES (LLO)

● At the end of the course, the students will have sufficient scientific understanding of the subject.

● The students will have good knowledge of application of Recombinant DNA and genetic engineering techniques in Life Sciences Research.

IMMUNOLOGY LAB

Course Code: 21MBM255 Continuous Evaluation: 60 Marks Credits: 2 End Semester Examination: 40 Marks L T P : 0 2 2 Course Type: Practical

Prerequisite: NIL

LAB LEARNING OUTCOMES (LLO)

After performing immunological experiments student must learn

1. Detection antigen in the given patient sample
2. Detection of antibodies in the given specimen
3. Detection antigen antibody complexes
4. Diagnosis of antigens & antibodies in serum
5. Detection of hormones, drugs & vitamins at very low concentration

COMPUTATIONAL BIOLOGY LAB

Course Code: 21MBM253 Continuous Evaluation: 60 Marks Credits: 2 End Semester Examination: 40 Marks L T P : 0 2 2 Course Type: Core

Prerequisite: Knowledge of biology and basic programming (10+2)

LAB LEARNING OUTCOMES (LLO)

The syllabus has been prepared in accordance with National Education Policy (NEP).
After completion of practical course, students would be able to:

1. To use and develop bioinformatics programs for comparing & analyzing biological sequence data to identify probable function.
2. Gain working knowledge of these computational tools and methods
3. To understand the methodologies used for database searching, and determining the accuracies of database search.

4. Analysis and development of models for better interpretation of biological data to extract knowledge.

DRUG DESIGNING & PHARMACOGENOMICS

Course Code: 21MPE201 Continuous Evaluation: 40 Marks Credits: 2 End Semester Examination: 60 Marks L T P : 2 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES:
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Explain the basic concepts of drug discovery and development
2. Describe drug receptor interaction.
3. Discuss molecular modelling and virtual screening
4. Explain the role of genomics in drug discovery
5. Discuss drug delivery methods and regulations

ENZYMOLOGY

Course Code: 21MPE202 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1.Describe and use the equations of enzyme kinetics.
2.Explain the principles of enzyme inhibition.
3.Explain the mechanisms of enzyme catalysis.
4.Know the enzyme technology and application of enzymes.

VIROLOGY

Course Code: 21MPE203 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Describe and review the elements of the viral life cycle.
2. Explain viral replication strategies; and compare and contrast replication mechanisms used by viruses relevant for human disease.
3. Describe viral strategies to evade host immune and cellular factors.
4. Understand virus pathogenesis, and methods used for laboratory diagnosis of viral infections

DOWNSTREAM PROCESSING & FERMENTATION TECHNOLOGY

Course Code: 21MBM301 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES:
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Learn Bioprocess engineering.
2. Understand how biology and engineering are interconnected.
3. Understand industrial production of chemicals.
4. Types of fermentation process; and applications.

BIOSTATISTICS

Course Code: 21MBM302 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: Nil

COURSE LEARNING OUTCOMES (CLO)
The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Gain broad understanding of basic biostatistics.
2. Appreciate their relevance for investigating specific contemporary biological questions. 3. Develop their own work flows using biostatistics concept to solve biological problems. 4. Apply Recognize importance and value of mathematical and statistical thinking, training, and approach to problem solving, on a diverse variety of disciplines.

ADVANCED STRUCTURAL BIOLOGY

Course Code: 21MPE303 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: Knowledge of basic biology

COURSE LEARNING OUTCOMES:

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Learn the fundamentals of protein structure, and physical interactions. 2. Learn about various methods and experimental approaches that reflect the state-of-the-art in protein research and are commonly used;
3. Understand various applications of protein structure;
4. The course will provide students with a learning experience that will make protein structure exciting, interesting, and accessible to them, as well as applicable to their future careers.

NANOBIOTECHNOLOGY

Course Code: 21MSB304 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite:

COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Students will be able to learn about the background of Nanoscience; 2. Understand nanomaterial can be used for a diversity of analytical medicinal rationales. 3. Nucleic acid-based Nanomaterial; Liposphere in drug target and delivery. 4. Application of nanotechnology in Biomedical and Life Sciences.

DOWNSTREAM PROCESSING LAB

Course Code: 21MBM351 Continuous Evaluation: 60 Marks Credits: 2 End Semester Examination: 40 Marks L T P : 0 2 2 Course Type: Practical

Prerequisite: NIL

LAB LEARNING OUTCOMES (LLO) :

1. Learn Bioprocess engineering;
2. Understand how biology and engineering are interconnected;
3. Industrial production of chemicals;
4. Types of fermentation process

APPLIED BIOTECHNOLOGY LAB

Course Code: 21MSB354 Continuous Evaluation:40 Marks Credits: 2 End Semester Practical Examination: 60 Marks L T P : 0 2 2 Course Type: PRACTICAL

Prerequisite: NIL

LAB LEARNING OUTCOMES (LLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

- Perform the various experiments
- Correlate the theoretical concepts with practical application.
- various practicals related to applied biotechnology
- To learn various molecular biology, recombinant DNA technology

RESEARCH METHODOLOGY

Course Code: 21MBM357 Continuous Evaluation: 40 Marks
Credits: 1 End Semester Examination: 60 Marks L T P : 1 0 0 Course Type:Theory

Prerequisite:

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Demonstrate the ability to choose methods appropriate to research aims and objectives. 2. Understand the limitations of particular research methods. Develop skills in qualitative and quantitative data analysis and presentation.
3. Develop advanced critical thinking skills.

PHARMACEUTICAL BIOTECHNOLOGY

Course Code: 21MPB301 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES (CLO)

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1.Explain the concepts of recombinant DNA technology & interpret applications in pharmaceutics. 2. Describe uses of microbial enzymes as therapeutics. 3. Discuss the various types of vaccines.
4. Explain the development of biologics and personalized medicine.
5. Discuss the utility of tissue culture and IPR in pharmaceutical industry.

INDUSTRIAL BIOTECHNOLOGY

Course Code: 21MPB302 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite:

COURSE LEARNING OUTCOMES

1. The student will be able to understand the industrially useful microorganism and its application for development of useful products.
2.The student will be able to design biotechnology processes in a sustainable way 3.The student will be able to design fermentation processes for the production of fuels, chemicals & foodstuffs
4.The student will be able to utilize properties of microorganisms to convert organic waste streams into biomaterials, chemicals & biofuels.

AI & ML IN BIOLOGICAL SCIENCES

Course Code: 21MPE303 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type:Theory

Prerequisite:

COURSE LEARNING OUTCOMES:

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. To understand the basic concepts of Artificial intelligence structures and strategies 2. To understand the concepts of knowledge representation in AI.
3. To give an insight knowledge ML and DL techniques.
4. Able to apply AI-based models in disease classification.

NUTRITIONAL IMMUNOLOGY

Course Code: 21MPE304 Continuous Evaluation: 40 Marks Credits: 3 End Semester Examination: 60 Marks L T P : 3 0 0 Course Type: Theory

Prerequisite: NIL

COURSE LEARNING OUTCOMES

The syllabus has been prepared in accordance with National Education Policy (NEP). After completion of course, students would be able to:

1. Outline and integrate factors that determine microbial growth, survival, and death in foods & can explain methods for detection and enumeration.
2. Know the different methods of food preservation, basics of sanitation, and food safety. 3. Know role of gut microbiota in immune system development
4. Know the importance of microorganisms for development of food products and microbes that benefit host health.
5. Students will be aware of probiotics, prebiotics, their role in immunomodulation & prevention of diseases.