PANJAB UNIVERSITY CHANDIGARH

Scheme and Syllabus of

MASTER OF ENGINEERING

M.E. (Biotechnology)

1st to 4th semester

2020-2022

University Institute of Engineering and Technology,

Panjab University, Chandigarh

SCHEME OF EXAMINATION OF M.E. BIOTECHNOLOGY

Second Year Third Semester

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		Total Marks
						Theory		
						Internal Assessment	University Exam	
1.	ME BIO 301							

SYLLABUS OF M.E. (BIOTECHNOLOGY) 1 ST SEMESTER

Paper Title: Biotechniques

Paper Code: ME BIO 102	L T P 4 0 0	Credits: 4
Internal Assessment: 50	University Examination: 50	

Course Duration: 45 Lectures of one hour each.

Paper Title: Microbial Biotechnology
Paper Code: ME BIO 103 L T P 4 0 0 Credits: 4
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION A

Bioprospecting of microbial diversity: scope and techniques (2)

Process technology for the microbial production of organic acids

Paper Title: Bioseparation and Bioprocess Technology
Paper Code: ME BIO 104 L T P 4 0 0 Credits: 4
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The semester question paper of each subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION-A

INTRODUCTION TO BIOSEPARATION : Characterization of biomolecules and fermentation broth. Guidelines to recombinant protein purification. (4)

SOLID-LIQUID SEPARATION AND CELL DISRUPTION : Solid liquid separation- microfiltration and centrifugation theory and design for scaleup operation. Cell disruption- Homogeniser , dynomill principle, factors affecting disruption, batch and continuous operation. Cell disruption by chemical methods. (9)

CONCENTRATION AND PURIFICATION : Liquid- liquid extraction theory and practice with emphasis on Aqueous two phase extraction. Solid liquid extraction. Precipitation techniques using salt and solvent. Separation by ultrafiltration, Dialysis, Electrophoresis. (10)

SECTION-B

BLACK BOX MODEL : Yield coefficients, black box stoichiometries, elemental balances, heat balance, degrees of reduction balances, systematic analysis of black box stoichiometries (5)

DESIGN OF FERMENTATION PROCESSES: Kinetics of substrate utilization, biomass growth and product formation, inhibition on cell growth and product formation. Design and operation of continuous cultures, chemostat in series, batch and fed batch cultures, total cell recultivation. (12)

CASE STUDIES IN FERMENTATION DERIVED PRODUCTS : Case studies on Production of

Paper Title: Stem Cell Biology (Elective-I)
Paper Code: ME BIO 105a L T P 3

Paper Title: Cell & Cell Technology (Elective-I)
Paper Code: ME BIO 1051 L T P 3 0 0 Credits: 3
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two Sections having three questions each. The candidate is required to attempt at least two questions from each section.

SECTION-A

History and Introduction of Animal Cell Culture - Past, present and future of animal cell culture, terminology of cell and tissue culture, normal and transformed cells, cell lines, types of culture (cell culture, organ

Paper Title: Food Processing and Biotechnology (Elective-I)
Paper Code: ME BIO 105c L T P 3 0 0 Credits: 3
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two Sections having three questions each and candidate is required to attempt at least two questions from each section.

SECTION-A

Historical developments in food processing, World and Indian food processing scenario, food processing industries types, technology of processing (4)

Effect of processing on nutritive value of foods, Quality control and assurance, Sensory evaluation of foods (4)

Constituent of food contribution to texture, flavour and organoleptic properties of food; food additives intentional and non-intentional and their functions; enzymes in food processing (7)

Manufacture of Bread and baked goods, dairy products milk processing, cheese, butter, ice-cream, vegetable and fruit products; edible oils and fats; meat, poultry and fish products confectionery, beverages. (8)

SECTION-B

Post Processing Technology: coating and enrobing; functions of a package, types of containers, package design considerations, packing materials properties and testing procedures, packing of fresh and processed foods. (6)

Aseptic packaging, retort pouch processing technology, RFID/smart tag in labeling of foods, recent trends in packaging. (3)

Present scope of food technology, setting up of food processing units, selection of processing technology

Paper Title: Biotechnology Lab I
Paper Code: ME BIO 106 L T P 0 0 3 Credits: 2
Internal Assessment: 50

SYLLABUS

List of Experiments:

1) Production of microbial inoculants.
2) Assay of biocontrol activity of microorganisms.
3) Preparation of Plasma from blood and estimation of glucose.
4) Estimation of total cholesterol/ lipid profile in blood.
5) Estimation of plant secondary metabolite.
6) Hemolytic activity assay of bacteria
7) Isolation of nitrogen fixing bacteria from environment
8) Analysis of transfection efficiency
9) Determination of the phenol coefficient of a given disinfectant
10)

SYLLABUS OF M.E. (BIOTECHNOLOGY) 2nd SEMESTER

Paper Title: Research Methodology
Paper Code: ME BIO 201 L T P 4 0 0 Credits: 4
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two Sections having three questions each and candidate is required to attempt at least two questions from each section.

Recommended books:

1. Borg, W and

Paper Title: Enzyme Engineering

Paper Code: ME BIO 203	L T P 4 0 0	Credits: 4
Internal Assessment: 50	University Examination: 50	

Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two Sections having three questions each and candidate is required to attempt at least two questions from each section.

SECTION-A

INTRODUCTION

Introduction to enzymes, Classification, Sources, Mechanism of enzyme action. Strategies of purification of enzymes, criteria of purity, molecular weight determination and characterization of enzymes Biocatalysis: Definition of Biocatalysis, advantages and disadvantages of Biocatalysis over chemical catalysis.

Stereo selective biocatalysts for the synthesis of chiral pharmaceutical intermediate such as synthesis of ACE inhibitors, definition, mode of action of inhibitors. (10)

KINETICS OF ENZYME ACTION: Methods for investigating the kinetics of Enzyme catalysed reactions Initial velocity Studies, Estimation of Michaelis Menten parameters, Effect of pH and

Recommended books:

1. Trevor Palmer and Philip L Bonner, Enzymes: Biochemistry, Biotechnology, Clinical Chemistry, East- West Press, 2004
2. Shuler, M.L. and F. Kargi, Bioprocess Engineering: Basic Concepts, 2nd Edition, Pearson, 2002.
3. Bailey.J.E and Ollis.D.F, Biochemical Engineering Fundamentals, 2nd Edition, McGraw-Hill, 1986.
4. Faber, Kurt Biotransformations in Organic Chemistry: A Textbook, 5th Edition. Springer, 2008

Paper Title: Genetic Engineering
Paper Code: ME BIO 204 L T P 4 0 0 Credits: 4
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be

Regulation and Patenting in Molecular Biology- importance of regulation, regulating food and food ingredients, GMOs release and controversy, Human gene therapy. (2)

Recommended books:

1. Gene Cloning and DNA Analysis, An Introduction. T.A.Brown, Wiley Blackwell publication, 2010.
2. Recombinant DNA by Watson., Scientific American books, New York, 1992.
3. Bernard R. Glick and J. J. Pasternak, 2003, Molecular biotecnlogy, ASM Press, Washington, 3rd edition

Paper Title: Pharmaceutical Biotechnology (Elective-II)
Paper Code: BIO 205 L T P 3 0 0 Credits: 3
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two Sections having three questions each and candidate is required to attempt at least two questions from each section.

SECTION-A

History of pharmacy, pharmaceutical industry & development of drugs, economics and regulatory aspects, quality management, GMP, drug kinetics and biopharmaceutics, mechanism of drug absorption, distribution, metabolism and excretion, factors affecting ADME process, advance drug delivery systems, controlled release, transdermals, liposomes and drug targeting. (23)

SECTION-B

Factors contributing to immunogenicity (product related factors, host related factors), consequences of immunogenicity to biopharmaceuticals, drug design, principles and applications of SAR and PAR (QSAR), study of artificial enzymes, computer aided drug design (CADD) and molecular modeling. (22)

Recommended books:

1. Gary ,w. 2007. Pharmaceutical biotechnology: Concepts and applications, Wiley publishers.
2. Hugo and Russell's . 2011. Pharmaceutical microbiology, 8th Edition; Wiley publishers
3. Kokare, C.R. 2008. Pharmaceutical microbiology; principles and Applications, 6

SYLLABUS OF M.E. (BIOTECHNOLOGY) 3rd SEMESTER

Paper Title: Nano Biotechnology and Nanodevices (Elective - III)
Paper Code: ME BIO 301a L T P 3 0 0 Credits: 3

Paper Title: Agriculture Biotechnology (Elective - III)
Paper Code: ME BIO 301b L T P 3 0 0 Credits: 3
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The Semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be

Paper Title: Bioprocess Control and Instrumentation (Elective II)
Paper Code: ME BIO 301c L T P 3 0 0 Credits: 3
Internal Assessment: 50

Paper Title: Biological Waste Water Engineering (Elective - IV)
Paper Code: ME BIO 302a L T P 3 0 0 Credits 3
Internal Assessment: 50 University Examination: 50
Course Duration: 45 Lectures of one hour each.

Note for the Paper setter: The semester question paper of a subject will be of 50 Marks having 7 questions of equal marks. Students are required to attempt 5 questions in all. First question, covering the whole syllabus and having questions of conceptual nature, will be compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each section.

SECTION-A

Measuremen

Paper Title: Biostatistics & Computer Applications (Elective - IV)
Paper Code: ME BIO 302b L T P 3 0 0 Credits: 3
Internal Assessment: 50

Paper Title: Thesis Work I

Paper Code: ME BIO 303 L T P 0 0 0 Credits: 10