PANJAB UNIVERSITY CHANDIGARH

Scheme and Syllabus of

MASTER OF ENGINEERING

SCHEME OF EXAMINATION OF M.E. BIOTECHNOLOGY

First Year - Second Semester

ME BIO 205(a):

SCHEME OF EXAMINATION OF M.E. BIOTECHNOLOGY

Second Year – Fourth Semester

S. No.	Subject Code	Subject Name	L-T-P	Contact hrs/week	Credits	Marks		Total Marks
						Internal Assessment	University Exam	
1	ME BIO 401	Thesis Work – II	**0- 0- 0**	25	15	100	100	200

Instructions for Examiners to award marks/grades for Thesis

S.No.	Grade	Requirement
1	**A+**	**Publication in SCI/SCIE indexed journal**
2	**A**	**Scopus / ESCI indexed journal**
3	**B+**	**Paper presented International / National conference**

Total Marks: 1700
Total Credits: 75

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.

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

Flow cytometry and cell sorting, Techniques for Protein-Protein and receptor-ligand interaction (FRET, SPR, and ITC) Two hybrid system

Advances and applications of Chromatographic and mass spectrometric techniques, 2D-DIGE, Qualitative and quantitative Proteomics (ICAT, ITRAQ, SILAC approaches), protein-based microarrays, Organelle/tissue/plasma proteomics (18)

TIRF and confocal microscopy, and their applications for fixed and live-cell imaging, Dynamic analysis using

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.

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SECTION A

Bioprospecting of microbial diversity- scope and techniques (4)

Process technology for the microbial production of:
Organic acids- itaconic acid, propionic acid
Enzymes: Inulinase, peroxidses, chitinase
Microalgal pigments- β carotene from algae (14)

Large scale production of insulin from recombinant microorganism (3)

GMP for production of antibiotics and vaccines (2)

SECTION B

Bioleaching of ores (3)
Microbial fuels (Methane, Hydrogen) (5)

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.

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SECTION-A

INTRODUCTION TO BIOSEPARATION: Characterization of biomolecules and fermentation broth. (4)

SOLID-

Paper Title: ME BIO 105 (a) Stem Cell Biology

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

SYLLABUS

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, marketing concept. Foods of increasing sophistication: Newer foods, GM foods, organic foods. (5)

Food safety and regulations: FDA, Codex Alimentarius, PFA, FPO, BIS, ISO, Agmark, Overview of Food Safety and Standards Act, 2006, HACCP, Food Safety Management System, Process Control, Food plant sanitation, personal hygiene, hygienic water for processing; Food Industry waste: types, disposal and management. (8)

Recommended books:

1. Principles and practices for the safe processing of food, ed. By D.A. Shapton and N.E. Shapton, Butter worth, Heinmann Ltd., Oxford, 1997.
2. Principles of food processing by Dr. Heldman and R.W. Hartel Champman and Hall, New York, 1997.
3.

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) Estimation of chemical oxygen demand (COD) of given sample

Paper Title: Biotechnology Lab II

Paper Code: ME BIO 107 **L T P 0 0 3** **Credits: 2**

Internal Assessment: 50

SYLLABUS

List of Experiments:

1) Separation and identification of compounds using Coloumn Chromatography.
2) Proteomic analysis of bacterial cell lysate using 2D Gel electrophoresis.
3) Synthesis of Gold nanoparticles and their characterization using SEM/TEM.
4) Virtual designing of siRNA using bioinformatics tools.
5) Determination of growth curves for microbial cultures and liquid-liquid extraction of metabolites from fermentation broth.
6) Cell disruption methods and their effect on the extracted lipid composition.
7) Chromatographic separation of metabolites/drugs/bio molecules.
8) Estimation of Monods Kinetic Parameters.
9) Evaluate the temperature and pH effect on culture growth.

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

Paper Title:

Paper Code: ME BIO 201

2. Cohen, L. Educational Research in class rooms and schools! A Manual of Materials and Methods NY: Harper and Row Publishers, 2000
3 CPSC: Developing Skills in Technican Education Research Modules 1 to 11 Singapore, Colombo

Plan Staff College for Technician Education

4. Garrett, HE and Woodworth, RS Statistics in Psychology and Education, Educational Research, Bombay:

Vakils Fetter and Simons Ltd. 2003

5. Gay, LR, Educational Research, Ohio: Charles E. Merril Publishing Company 2000 Wiersma William Research Methods in Education- An Introduction London, Allyn and Bacon, Inc. 2000

Paper Title: Bioprocess & Bioreactor Engineering

Paper Code: ME BIO202 **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

1. **Overview** of bioprocess engineering concepts with special reference to basic cultivation strategies. (5)
2. **Scale-up of bioreactors**: introduction, scale-up methods, correlations and illustrations. (8)
3. **Heat transfer**: heat transfer equipment, heat transfer between fluids, design equations for heat transfer systems, applications of design equations. (10)

SECTION-B

4.

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.

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SECTION-A

Paper Title: ME BIO 205 (b) Pharmaceutical Biotechnology (Elective -

Paper Title: ME BIO 205 (c) Protein Engineering (Elective-II)
Paper Code: ME BIO 205 **L T P 3 0 0** **Credits: 3**
Internal Assessment: 50 **University Examination: 50**
Course Duration: 45 Lectures of one hour each

SYLLABUS

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

Biology of Proteins
Basic constituents, hierarchical arrangements, over-view of protein preparation, modification, maturation; protein protein interactions, Heat shock proteins,their structure and functions in cells, protein mimicry, assisted protein maturation processes in cells, Protein trafficking and dislocation, protein secretion from cell, biomarker discovery, ribosome profiling. (11)

Protein folding and assembly
Protein folding pathways in prokaryotes and eukaryotes; Single and multiple folding pathways; Protein folding of single domain and multi-domain proteins; Inclusion bodies and recovery of active proteins; Osmolyte assisted protein folding; Structure of chaperones and role of chaperones in protein folding, kinetics and thermodynamics of protein folding and unfolding reactions. (12)

SECTION-B

Protein modifications
Strategies for protein engineering, Random and site directed mutagenesis, Role of low-fidelity enzymes in protein engineering, Gen

Paper Title: Biotechnology Lab III

Paper Code: ME BIO 206 **L T P 0 0 2** **Credits: 1**

Internal Assessment: 50

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

Paper Title: ME BIO 301 (a) Nanobiotechnology and Nanodevices (Elective - III)

Paper Code: ME BIO 301 **L T P 3 0 0** **Credits: 3**

Internal Assessment: 50 **University Examination: 50**

Course Duratio

Paper Title: ME BIO 301 (b) Agriculture Biotechnology (Elective - III)

Paper Code: ME BIO 301 **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

Introduction and History of Plant Biotechnology (2)

General Concept and Methodology- Nutrition of cell and orgaTJETE ol ies( )-69(wo)-1Pol hand oist an rE

Paper Title: ME BIO 302 (a) Biological Waste Water Engineering (Elective - IV)

Paper Code: ME BIO 302 **L T P 3 0 0** **Credits: 3**

Internal Assessment: 50 **University Exam**

Paper Title: ME BIO 302 (b) Biostatistics & Computer Applications (Elective - IV)

Paper Code: ME BIO 302 **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

Introduction to biostatistics: Basic definitions and applications, sampling representative sample size, sampling bias and sampling techniques. Data collection and presentation: types of data, methods of collection of primary and secondary data, methods of data collection, graphical representation by histogram, polygon, ogive curves and pie diagram.

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Paper Title: Thesis Work – I

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

Internal Assessment: 100

SYLLABUS OF M.E. (BIOTECHNOLOGY) 4th SEMESTER

Paper Title: Thesis Work – II

Paper Code: ME BIO 401 **L T P 0 0 0** **Credits: 15**

Internal Assessment: 100 **UnivL 1**