

CMJ UNIVERSITY, SHILLONG
REGULATION FOR MSC BIOTECHNOLOGY

Duration – Two Years

**Eligibility - B.Sc. with Micro Biology / Bio-Chemistry / Bio-Technology / Genetics/
 Industrial Micro Biology / Botany/ Zoology/ Chemistry or B.Sc. M.L.T. or its
 equivalent**

Scheme of Distribution of Marks

Sr. No.	First Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Cell Organization	30	70	100	40
2	Inheritance Biology	30	70	100	40
3	Enzymology	30	70	100	40
4	Bio Chemistry	30	70	100	40
5	Practical-I				
Sr. No.	Second Year	Internal Assessment Marks	Term End Examination	Total Marks	Passing Marks
1	Recombinant DNA Technology	30	70	100	40
2	Industrial & Environmental Biology	30	70	100	40
3	Applied Biotechnology	30	70	100	40
4	Computer Applications	30	70	100	40
5	Practical-II				

M.Sc BIOTECHNOLOGY First Year

CELL ORGANISATION

MSE 101

UNIT-I

Cell Organisation: Structure And Function of cell membranes: Model Membrane, Lipid Bi-layer And Membrane Protein Diffusion, Osmosis, Ion Channels, Active Transport, Ion Pumps, Mechanism Of Sorting And Regulation Of Intracellular Transport, Electrical Properties Of Membranes.

UNIT-II

Intracellular Organelles –Structural, Organization And Functions: Cell Wall, Nucleus, Mitochondria, Golgi Bodies, Lysosomes, Endoplasmic Reticulum, Peroxisomes, Plastids, Vacuoles, Chloroplast

UNIT-III

Cytoskeleton -Structure & Function -Its Role in Motility-Organization Of Genes And Chromosomes: Split Genes, Organisation Of Genes, Operon, Interrupted Genes, Gene Families

UNIT-IV

Chromatin And Chromosomes -Structure, Centromere, Materials Of The Chromosomes-Ultra Structure Of Chromosomes, Unique And Repetitive DNA, Heterochromatin, Euchromatin Transposons

UNIT-V

Cell Division And Cell Cycle: Mitosis And Meiosis, Their Regulation, Steps In Cell Cycle, And Control Of Cell Cycle-Microbial Physiology: Growth, Yield And Characteristics, Strategies Of Cell Division, Stress Response.

INHERITANCE BIOLOGY

MSE 102

UNIT-I

Introduction to Inheritance biology: Mendelian principles, Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests, Codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, penetrance and expressivity, phenocopy, linkage

UNIT-IV

Crossing over, sex linkage, sex limited and sex influenced characters, Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

UNIT-III

Extra chromosomal inheritance: Inheritance of mitochondrial and chloroplast genes, maternal inheritance, Microbial genetics: Methods of genetic transfers-transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.

UNIT-IV

Human genetics: Pedigree analysis, lod score for linkage testing, karyotypes, genetic disorders, Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.

UNIT-V

Mutation: lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis, Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, Ploidy and their genetic implications, Recombination: Homologous and non-homologous recombination

ENZYMOLGY

MSE 103

UNIT-I

Enzymes, Specificity of Enzyme action, Determination of the Catalytic Activity of Enzymes – Factors influences Enzyme activity, Assay Techniques, Enzyme Kinetics, The Michaelis-Menten Equation, Analysis of Kinetic Data,

UNIT-II

Derivations of Michaelis - Menten Equation Variants, Michaelis- Menten Equation for eversible reactions-equation, Enzyme Inhibition, Reversible Inhibition, Irreversible Inhibition, Competitive and Non-competitive

UNIT-III

Bisubstrate Reactions, Types of Bi-Bi Reactions, Immobilized Enzyme, Immobilization Techniques, Effects of Immobilization on Enzyme, Advantage of Immobilization, Kinetics of Immobilized Enzymes, Uses of Immobilized Enzymes,

UNIT-IV

Microbial Production of Enzymes, Strain improvement, Fermentation, Isolation, Extraction and Purification of Enzymes, Extraction of membrane bound enzymes, Extraction of soluble enzymes

UNIT-V

Biological Roles of Enzymes-Application of the enzymes in industry-Syrup manufacturing, Micro organisms used for cheese production, food processing, fruit juices, beer, distilled alcoholic drinks and their functions

BIO CHEMISTRY

MSE 104

UNIT – I

Carbohydrates: - Monosaccharides and Disaccharides – Definition, classification, structure, properties and biological significance, Polysaccharides – Types and biological importance.

UNIT – II

Amino acids – classification, essential and Non-essential amino acid, structure and properties. Proteins – Definition, classification and function. Structure levels of organization. Denaturation and Renaturation.

UNIT – III

Enzymes: Definitions, classification with example, Active site, Lock and key model, Induced fit hypothesis. Enzyme units. Kinetics factors affecting enzyme activity, M.M. equation, LB. Plot, Enzyme inhibition.

UNIT – IV

Lipids: Classification of lipids, physical and chemical properties, saturated, unsaturated fatty acids and steroids. Structure of cell membrane and Transport.

Vitamins: Classification, occurrence, deficiency symptoms, biochemicals functions of fat soluble and water soluble vitamins.

UNIT – V

Buffers – Definition, important buffers in blood (Bicarbonate, phosphate and hemoglobin buffer systems), Bioenergetics: Laws of thermodynamics, Hormones: - Definition, classification of hormones, Biological functions and disorders of pancreatic hormone (Insulin), thyroid hormone (thyroxin)

MSE 105 PRATICAL-I

M.Sc BIOTECHNOLOGY Second Year

RECOMBINANT DNA TECHNOLOGY

MSE 201

UNIT-I

Introduction to Recombinant DNA Technology, DNA experiment, DNA Cloning, Tools, Enzymes used, Restriction Enzymes: The Molecular Scissors, Action of Restriction Enzymes/target sites, Length Polymorphism (RELP), Type I & II Restriction Endonuclease, , Type III Restriction Endonuclease, DNA Ligase, Alkaline Phosphatase

UNIT-II

Linker, Polylinker, Adaptor and Homopolymer Tailing as Modification Systems of Cut Ends – Poly Linker, Adaptor, Vectors, Plasmids, Desirable properties of Plasmid Cloning vehicles, PUC 18, Bacteriophages

UNIT-III

M13 Phage, Phagemid, Cosmid, BAC (Bacterial Artificial Chromosome), Size of DNA Inserts can be Cloned in various Vectors, Preparation of Chimeric DNA, Cloning of the Chimeric DNA, Genomic Libraries, cDNA Library,

UNIT-IV

Expression Vectors, DNA Probes, Polymerase Chain Reaction – Denaturation of DNA, Annealing with Primers, DNA amplification, RT-PCR (Reverse transcription PCR), Electrophoresis, Blotting Techniques, Southern Blotting (DNA),

UNIT-V

Northern Blotting, Western Blotting, Genetic Fingerprinting, DNA finger printing method, Applications of DNA finger printings, Transgenics and their Potential Applications, Micro Array Technology, Heterologous Protein Expression Systems in Bacteria and Yeast

INDUSTRIAL & ENVIRONMENTAL BIOLOGY

MSE 202

UNIT-I

Organic Acids, Citric acid, Production Process, Gluconic acid, Lactic acid, Biosynthesis of Lactic acid, Fermentation broth, Acetic acid, L-Ascorbic acid, Itaconic acid, Micro organisms used for the process, Applications

UNIT-II

Microbial Production of Amino acid, Commercial applications of Amino acids, L-Glutamic acid, Production of L-glutamic acid, Process of Production and Recovery, L-Phenylalanine, L-Lysine, L-Threonine, L-Tryptophan, L-Aspartic acid, Production of Polysaccharides, Production of Microbial Polysaccharides,

UNIT-III

Xanthan, Dextran, Alginate, Scleroglucan, Gellan, Pullulan, Curdlan, Production of Polyhydroxyalkanoates, 3-Hydroxybutyrate-Co-3-Hydroxyvalerate, Polyhydroxybutyrate (PHB), Biosynthesis of PHB, Biopol-A Biodegradable Plastic

UNIT-IV

Microbial Lipids, Single Cell Protein, Production of Bacterial and Actinomycetous Biomass, Production of Yeast Biomass, Antibiotics, Cephalosporins, Aminoglycosides, Tetracyclins, Macrolides, Aromatic Antibiotics

UNIT-V

Biosensors, Features of Biosensors, Types of Bio-sensors, Applications of bio sensors, Bioremediation, Advantages of Bio pesticides over chemical pesticides, Bio-augmentation, Bio-Fuels, Energy Rich Crops

APPLIED BIOTECHNOLOGY

MSE 203

UNIT-I

Microbial fermentation and production of small and macro molecules, Biochemistry of fermentation, Citric Acid production, L-Lysine Production, Antibiotics, Application of immunological principles(vaccines, diagnostics)

UNIT-II

Tissue and cell culture methods for plants and animals, Conditions required for plant tissue culture, Tissue and Cell culture for Plants and Animals, Significance of Embryo culture, Significance of Cell Suspension culture

UNIT-III

Transgenic animals and plants, Transgenic Plants, Methods of Gene transfer into Plant Cells, Direct Gene Transfers, Molecular approaches to diagnosis and strain identification.

UNIT-IV

Genomics and its application to health and agriculture, including gene therapy, Functional genomics, Sequencing of Genomes, Gene therapy, Bio-resource and uses of biodiversity.

UNIT-V

Breeding in plants and animals, including marker-assisted selection, Bioremediation and phyto-remediation, Microbial bio remediation, Biosensors, Types of Bio sensors, Hybridization

COMPUTER APPLICATIONS

MSE 204

UNIT – I

Fundamentals of Computers – Characteristics of Computers, History of Computers, Technical Evolution of Computers, Categories of Commercial Computers, Systems Software, Application Software, Uses and Impact of Computers, Central Processing Unit, Types of Computer Memory, Number System, Input Concepts, Input Devices, Output Concepts, Output Devices, Soft Copy Devices, Storage Devices, File Organisation

UNIT – II

Disk Operating Systems and Windows - DOS Files, Organising Files, DOS Commands, Preparing Fixed Disk, Making more memory available, Control Keys Functions, Windows all versions, Starting and Quitting a Program, Organising Files and Folders, Setting up a Printer, Commonly used Commands, Network Neighborhood, Shared Folders or Printers, Optimizing Computer

UNIT – III

Microsoft Office 2000 – MS-Word – Creating, Saving, Finding & Replacing text, Copying and Moving Text, Creating hyperlinks, Auto Text, Fonts, Underline, Boldface, Animation Effects, Subscript & Superscript, Margins, Tab Stops, Line Spacing, Alignment, Indenting, Borders and Shading, Numbering and Bullets, Header & Footers, Tables, Mail Merge ;MS-Excel – Workbook, Cells, Formatting, Simple calculations, Referencing formulas, Worksheets, Copy Formulas, Graphs ;MS-PowerPoint – Introduction, Preparing Presentation, AutoContent Wizard, Formatting, Editing, Printing slides, Organisation Chart, Transitions, Animations,

UNIT – IV

Database Systems – Data Modeling for a Database, Data Integration, DBMS, Entity-Relationship Model, Relational Data Model, Network Data Model, Hierarchical Model, SQL, Data base Design, Normalization, Reliability, Transactions, Database Security, Distributed Databases, Expert Systems

UNIT – V

Internet and Web Designing – The Internet, Commerce on Internet, Governance on Internet, Domain Names, Internal Access, World Wide Web, Web Browsers, Search Engines, “Surfing” the Net, Cookies, Downloading, Electronic Mail (E-Mail), Advantages of e-Mail, Different E-Mail Protocols, E-Mail Addresses, Junk e-mailers, Free Web Based Email Service: Hotmail, Spamming,

***** MSE 205 Practical – II *****