M.Sc. Biotechnology
(Semester-I)

M-BT-101: Cell & Molecular Biology and Genetics (5 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-101: Cell & Molecular Biology and Genetics (5 Credits)	
Unit I	**Cell Biology:**Diversity of cell; Cell organization, sub-cellular structure of prokaryotic and eukaryotic cells; Organelle biogenesis; Synthesis and sorting of plasma membrane, Transport of nutrient ions and macromolecule across cell membranes; Signal transduction and regulation Cell cycle: Molecular events and model system, control mechanism Biology of cancer: Oncogenes and tumour suppressor genes, viral and cellular oncogenes; Apoptosis
Unit II	**DNA replication, repair and recombination:**DNA replication models; DNA polymerases- mode of action; RNA polymerases and reverse transcriptase; Enzymes involved in DNA modifications, methylases, demethylases, DNases, DNA gyrase, Topoisomerase; DNA repair and recombination Gene transfer mechanisms in prokaryotes: Transformation, conjugation, transduction and transfection
Unit III	**Transcription:** Concept of template surfaces, Transcriptions, Post-transcriptional processing and transport of RNA, Regulation of transcription, Transcription factors; Structures and function of ribonucleoproteins **Translation:** Genetic code; Prokaryotic and eukaryotic translation, regulation of translation, co- and post translational modifications of proteins **Gene expression and regulation:** Operons and regulons, repression and activation of *Lac* and *Trp* operons, feed back inhibition; Regulation of eukaryotic gene expression
Unit IV	**Antisense technology:** Molecular mechanism of antisense molecules, application of antisense technologies. **Mutation and Mutagenesis:** Molecular basis of mutations; mutagens; Spontaneous and induced mutation; Ames test for mutagenesis; Biochemical mutation; One gene-one enzyme hypothesis. **Transposons:** Structure of transposons; replicative and non-replicative transposition; Retroposon; Transposon mutagenesis.
Unit V	**Extrachromosomal inheritance:**Cytoplasmic inheritance in plants and animals; Genome organization of Mitochondria and Chloroplast **Sex determination:**Sex determination in dioecious plant (*Melandrium, Coccinia*) and animals (*Drosophila*, human beings); Sex link, Sex limited and Sex influenced inheritance; Sex differentiation **Population Genetics:** Hardy-Weinberg equilibrium; Gene and genotypic frequencies

M.Sc. Biotechnology
(Semester-I)
M-BT-102: Microbiology (5 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-102: Microbiology (5 Credits)	
Unit I	General introduction; History and scope of microbiology; theory of spontaneous generation. **Methods of microbiology**: Sterilization-Different types of sterilization (moist heat, dry heat, filtration, radiation and chemicals); Microbiological Media: types and significance; techniques of pure culture; maintenance and preservation of microorganisms; Staining: types of microbial staining techniques **Microbial growth**: Mathematical expression of growth, Growth curve, Measurement of growth; Various factors affecting growth **Microbial systematics**: A general idea of classification of microbes; Whittaker's five kingdoms and Woese *et al* 's three domains; morphological, physiological, biochemical and molecular criteria for the classification of bacteria (scheme not required); Nutritional classification of microorganisms
Unit II	**Diversity of microorganisms:** Bacteria- purple and green bacteria, cyanobacteria, homoacetogenic bacteria, gliding and sheathed bacteria, lactic acid bacteria, endospore forming rods and cocci, chlamydias and mycoplasma Archea- Concept of Archea, halophiles, acidophiles, thermophiles, methanogenes **Structure of bacteria:** Ultra structure of Gram positive and Gram negative bacteria with special reference to cell membrane, cell wall, flagella, capsule and slime layer, genome, ribosome, plasmid and endospores; Biosynthesis of peptidoglycan
Unit III	**Eukarya**- Fungi, slime mold and protozoa **Viruses-** A general idea of structure of different kinds of viruses; Plant viruses: tobacco mosaic virus; structure of bacteriophages belonging to 'T' series; Lytic cycle and its regulation; lysogeny and its regulation in lambda phage; a brief account of viroids and prions
Unit IV	**Host-parasite relationships:** Entry of pathogens into the host, colonization and factors predisposed to infections; types of toxins (Exo-, endo- and entero-) and their structure, mode of action, virulence and pathogenesis **Microbial diseases:** Overview of microbial diseases; diseases caused by Gram positive cocci - pneumonia; diseases caused by Gram negative cocci - gonorrhea; diseases caused by Gram positive bacilli - tuberculosis, tetanus; diseases caused by Gram negative bacteria of family Enterobacteriaceae - enteric fever; diseases caused by other Gram negative bacilli - cholera; sexually transmitted diseases; AIDS
Unit V	**Antibiotics**: Different types of antimicrobial agents, Mode of action; Resistance to antibiotics. **Biological nitrogen fixation**: Free living and symbiotic nitrogen fixing organisms; Mechanism of nitrogen fixation

M.Sc. Biotechnology
(Semester-I)

M-BT-103: Biomolecule and Basic Enzymology (4 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-103: Biomolecule and Basic Enzymology (4 Credits)	
Unit I	**Chemical foundation of Biology:** pH, pK, acid, bases, weak bonds, covalent bonds **Carbohydrates:** Classification, types, Optical isomerism, Mutarotation, Basic structure and functions of monosaccharides, Oligosaccharides, polysaccharides
Unit II	**Amino Acids:** Structure, properties, classification and functions; non-protein amino acid; Synthesis of major amino acids (Glycin, Proline, Serine, Glutamic acid) **Structure of Proteins:** Primary, Secondary (α-helix, β-sheet), Tertiary and Quaternary structures of proteins; Conjugated and metal binding proteins
Unit III	**Lipids**: Classification, structure, properties and function of fatty acids; Phospholipids; Glycolipid;Lipoprotein
Unit IV	**Nucleic acids:** Structure, properties of DNA and RNA; Melting of DNA, Denaturation and Renaturation kinetics. **Ribozyme technology:** Types of ribozymes, application of ribozyme technologies **Immobilization of enzyme:** Physical and chemical methods of immobilization of enzymes and cells; immobilization supports; kinetics of immobilized enzymes; Advantages and industrial applications of immobilize enzymes and cells
Unit V	**Enzymes:** Characteristics, Co-enzymes, kinetics, determination of Km and Vmax using different plots; mechanism of action - binding of substrate and lowering of activation energy, covalent catalysis, acid-base catalysis; regulation- general concepts, allosteric regulation

M-BT -104: Practical-I (Based on BT-M-101, 102 & 103) [6 Credits]

M.Sc. Biotechnology
(Semester-II)

M-BT-201: Biophysics and Instrumentation (5 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-201: Biophysics and Instrumentation (5 Credits)	
Unit I	**Bioenergetics:** Principles of thermodynamics, redox potential and free energy change of the reaction; Biological energy transducers **Spectroscopy:** Beer Lambert's Law • UV-VIS spectroscopy • Infrared (IR) spectroscopy • Fluorescence spectroscopy • Atomic absorption spectroscopy • Nuclear magnetic resonance (NMR) • Mass spectroscopy • X-ray diffraction
Unit II	**Chromatography:** Principles, types (Paper, TLC, Affinity, Ion-exchange, Gel filtration, GLC, HPLC) and their applications
Unit III	**Centrifugation:** Principles, types; Differential and density gradient centrifugation and their applications
Unit IV	**Microscopy**: Phase-contrast and fluorescent microscopes; Electron Microscope-TEM and SEM Autoradiography; Flow cytometry
Unit V	**Electrophoresis:** Principles and types [Polyacrylamide gel electrophoresis (PAGE), SDS-PAGE, agarose gel electrophoresis, 2D electrophoresis] and their applications **Immunoelectrophoresis:** Types (crossed, rocket) and their applications **Isoelectric focusing (IEF):** Principles and applications

M.Sc. Biotechnology
(Semester-II)
M-BT-202: Biology of Immune system (5 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-202: Biology of Immune system (5 Credits)	
Unit I	**Immune responses**: Innate and adaptive immune responses **Cells and organs of the immune system**: hematopoiesis, cells of the immune system; Primary and secondary lymphoid organs
Unit II	**Antigens**: Properties of antigens; superantigens; haptens, adjuvants **Antibody**: Classes, structure and function; Immunoglobulin superfamily; Generation of antibody diversity
Unit III	**T-cell receptors**:Structure; organization of T-cell receptor genes and generation of its diversity **Major histocompatibility complex**: Different classes of MHC and its role in antigen processing and presentation **Transplantation immunology:** Types of grafts, grafts rejection, GVH reactions, mechanism of graft rejection, and prevention of graft rejection
Unit IV	**Immune responses**: Generation of humoral and cell-mediated immune responses and effector mechanisms; Complement system- different pathways and biological function of complement proteins **Antigen-antibody interactions**: Antigen-antibody interactions and its *in vivo* and *in vitro* applications
Unit V	**Hypersensitivity**: Type I, Type II, Type III and Type IV and their significance Autoimmunity; Immunological tolerance; Immunosuppression; Immunodeficiency; Immunotherapy **Vaccines**: Different types of vaccines and its merits and demerits

M.Sc. Biotechnology
(Semester-II)

M-BT-203: Bioprocess Technology (4 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-203: Bioprocess Technology (4 Credits)	
Unit I	Industrially important microbes and their development for fermentation industry. Isolation, preservation and improvement of industrially important microorganisms Screening methods for industrial microbes; detection and assay of fermentation products; classification of fermentation types; genetic control of fermentation; strain selection and improvement; Mutation and recombinant DNA techniques for strain development
Unit II	**Microbial growth kinetics**: Batch culture, continuous culture, industrial applications of continuous culture processes, fed-batch culture **Media for industrial fermentation**: Typical media, media formulation, water, energy sources, carbon sources, nitrogen sources, minerals, vitamin sources, nutrient recycle, buffers, precursors and metabolic regulators, oxygen requirement; Sterilization of air and media; Inoculum development and aseptic transfers
Unit III	**Design of fermenter**: Construction, aeration and agitation, baffles, achievement and maintenance of aseptic conditions, valves **Instrumentation and control**: Control systems, manual, automatic, methods of measurements of process variables, flow, temperature, pressure, agitator shaft power, foam sensing and control, measurement and control of dissolved oxygen, on-line analysis of process parameters, computer control of fermenters.
Unit IV	**Downstream processing**: Removal of microbial cells and solid matter, foam separation, precipitation, filtration, centrifugation, liquid-liquid extraction, chromatography, drying and crystallization
Unit V	**Process technology for the production of primary metabolites**: Baker's yeast, ethanol, beer, wine, distilled spirits, acetone-butanol, citric acid, amino acids (Glutamic acid) **Microbial production of industrial enzymes**: Cellulase and amylase **Production of secondary metabolites**: Penicillin

M-BT-204: Practical-II (Based on BT-M-201, 202 &203) [6 Credits]

M.Sc. Biotechnology
(Semester-III)

M-BT-301: Recombinant DNA Technology (5 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-301: Recombinant DNA Technology (5 Credits)	
Unit I	**rDNA technology**: Core techniques and essential enzymes; Restriction enzymes-types and cleavage pattern; DNA ligase- types and ligation of DNA molecule *in vitro*; Isolation of genomic and plasmid DNA **Cloning vectors**: Plasmids (natural, pBR322, pUC, Ti plasmid vectors), phages, cosmid, animal virus vectors, artificial chromosome vector; Shuttle vectors; Expression vector
Unit II	**Passenger DNA**: Different strategies used for isolation/synthesis of gene; Organ chemical synthesis of gene; Construction of genomic and cDNA libraries **Construction of rDNA**: Different strategies for construction of rDNA (Use of restriction enzymes, Linkers, Adaptors, Homopolymer tailing) **Methods of DNA transfer in suitable host**: electroporation, electrofusion, microinjection, particle gun method, direct uptake of DNA ($CaCl_2$ method), *Agrobacterium* mediated transformation, liposomes as transforming vehicle
Unit III	**Selection strategies**: Different methods for selection of clone (antibiotic resistant markers, colony hybridization, plaque hybridization, immuno screening) **Probe construction**: different methodologies used to prepare radioactive (Nick translation, end filling and random priming) and non-radioactive (biotinylated and horseradish peroxidase) labelled probes **Mapping of Genome**: Molecular markers as tool for mapping, Restriction Fragment Length Polymorphism (RFLPs), Randomly Amplified Polymorphic DNA (RAPD)
Unit IV	**Blotting**: Principles, types of blotting- Southern, Northern, Western and Dot blots **Amplification of DNA**: Polymerase Chain Reaction (PCR) and its application **DNA sequencing**: Various methods of DNA sequencing
Unit V	**Application of rDNA technology**: In medicine, agriculture and environment protection **DNA finger printing**: Methodology and its application **Intellectual property rights, bioethics and patenting**: IPR, sovereignty rights, CBD, bioethics and patenting; General agreement on trade and tariffs; Indian sui-generis system for plant variety and farmer's rights protection act **Safety of recombinant DNA technology**: Restriction and regulation for the release of GMOs; Social and ethical issue

M.Sc. Biotechnology
(Semester-III)
M-BT-302: Plant and Animal Biotechnology (5 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-302: Plant and Animal Biotechnology (5 Credits)	
Unit I	History of plant cell, tissue and organ culture; laboratory organization; aseptic techniques; nutritional components of growth medium Basic techniques involved in culture of various explants Single cell suspension culture and their applications Embryo culture, factors and applications Process of somatic embryogenesis and organogenesis; synthetic seeds; *In vitro* pollination
Unit II	Micropropagation techniques, its application and limitations; Production of virus free plants Production and exploitation of haploids and triploids Somaclonal variations: applications and limitations
Unit III	Protoplast isolation and culture techniques; testing of viability of isolated protoplasts; Osmotimum Somatic hybridization (parasexual hybridization technique) and production of somatic hybrids and its applications *Agrobacterium* mediated gene transfer method in plant; Ti plasmid Production of secondary metabolites using *in vitro* techniques Practical applications of tissue and organ culture;Commercial applications of plant tissue culture; Transgenic plants and its products, Cryopreservation and *ex situ* conservation of germplasm
Unit IV	**Animal Cell and Tissue Culture:** Principles of cell and tissue culture techniques; equipment and materials for animal cell culture technology Culture media: Chemical, physical and metabolic functions of different constituents of culture medium; role of carbon dioxide, serum and other supplements; Serum and protein free defined media and their applications **Animal cell culture methods**: Different methods **Cell lines**: primary and established cell lines Measurement of viability and cytotoxicity
Unit V	Applications of animal tissue cultures **Stem cell cultures technology**: Different types of stem cells; embryonic stem cells and their applications Transgenic animals Cell culture based vaccines **Hybridoma technology**: Hybridoma technology and production of Monoclonal antibody and its applications

M.Sc. Biotechnology
(Semester-III)

M-BT-303: Biostatistics and Bioinformatics (4 Credits)

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-303: Biostatistics and Bioinformatics (4 Credits)	
Unit I	Scope and limitations of biostatistics, collection, classification and tabulation of data, graphical and diagrammatic representation, scale diagrams, histograms, frequency polygon, frequency curves, ogives **Measures of central tendency**: arithmetic mean, median and mode; Measure of dispersion, Moments, Skewness and Kurtosis Probability-Normal distribution etc.
Unit II	Concept of Probability, Addition and multiplication theorem
Unit III	**Correlation and regression**: Simple correlation, correlation coefficient, regression simple linear regression; Basic ideas of significance test, Hypothesis testing level of significance, Student 't' test, goodness of fit and 'chi' square test ; 'F' test – ANOVA; Minitab
Unit IV	**Introduction:** definition & scope of bioinformatics.terminologies, types of format, motifs, patterns. **Databases**: types of databases; sequence databases, structural databases) Protein data bank, Swiss-prot, NCBI, examples and applications. **Sequence analysis: nucleic acid sequence, protein sequence** Similarity search Tools: BLAST and FASTA
Unit V	Pair wise sequence comparison, Multiple sequence alignments sequence queries., multifunctional tools for sequence analysis; Phylogenetic analysis

M-BT-304: Practical-III (Based on BT-M-301, 302 & 303) [6 Credits]

M.Sc. Biotechnology
(Semester-IV)

M-BT-401: Major Elective (Environmental Biotechnology) [4 Credits]

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.
Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).
Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).
Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-401: Major Elective (Environmental Biotechnology) [4 Credits]	
Unit I	**Biogeochemical cycling:** carbon, nitrogen and sulfur cycle **Environmental problems**- Ozone depletion, green house effect and acid rain, their impact and biotechnological approaches for management. **Biomonitoring:** Biomonitoring of water pollution (physical, chemical and biological), Role of microbes in biomonitoring of water quality; indicator organisms; biosensors for ecotoxicity measurement
Unit II	**Treatment of wastes:** Treatment of solid wastes: Composting, Land filling, Incineration Wastewater treatment methods: Oxidation pond, Trickling filter– design, operation; Activated sludge–design, operation; Anaerobic treatment of wastewater and sludge Waste water treatments by plants and vermiculture
Unit III	**Bioremediation:** Microorganisms in removal of organic and metal pollutants; Bioremediation of contaminated ground water and phytoremediation of soil; biodegradation and bioaugmentation; Oil spillage and degradation of hydrocarbons; Degradation of xenobiotics (Pesticides and Plastics)
Unit IV	**Biofuels:** Brief idea about renewable and non-renewable energy resources Production of ethanol fuel from domestic and agro-wastes Methanogenesis and biogas production Plant based fuel (biodiesel) Hydrogen as fuel and its microbial production (biohydrogen)
Unit V	**Biofertilizer:** Types and applications; Characteristics, mass cultivation and quality control of ➢ Nitrogen fixers: *Rhizobium*, *Azospirillum*, *Azotobacter* and Cyanobacteria; Azolla-Anabaena association ➢ Phosphate solubilizers ➢ Plant growth promoting rhizobacteria (PGPR) ➢ Mycorrhiza **Biopesticides:** Bacterial, viral and fungal biopesticides and their and applications **Microbial mining:** Microbial enhanced recovery of mineral resources; Use of microbes in oil recovery

M.Sc. Biotechnology
(Semester-IV)

M-BT-402:Major Elective (Microbial Biotechnology) [4 Credits]

Time: 3hrs Marks: 70

The question paper will consist of 7 questions divided into 3 sections.

Section A: Question No.1 will be compulsory comprising ten objective types questions (two from each Unit) each carrying two marks (10x2=20 marks).

Section B: Question No. 2 will also be compulsory and comprise five short answer types questions (one from each Unit) and students will have to attempt only four questions (4 x 5=20marks).

Section C: Five long answer types questions are to be set (one from each Unit) of which any three questions are to be answered (3 x 10=30 marks).

BT-M-402:Major Elective (Microbial Biotechnology) [4 Credits]	
Unit I	Scope of Microbial biotechnology; Bioprospecting of microbial diversity Microbial products as primary and secondary metabolites; Trophophase-Ideophase relationships in production of secondary metabolite; Role of secondary metabolites in physiology of organisms; Pathways for the synthesis of primary and secondary metabolites of commercial importance Metabolic control mechanisms: substrate induction; catabolic regulation; feedback regulation; amino acid regulation of RNA synthesis; Energy charge regulation and permeability control; Bypassing/ disorganization of regulatory mechanisms for overproduction of primary and secondary metabolites
Unit II	**Organic acids**: Citric acid; Acetic acid, Lactic acid, Gluconic acid, Kojic acid and itaconic acid **Amino acids**: Use of amino acids in industry; methods of production; Production of some amino acids (L-Glutamic acid; L-Lysin; L-Tryptophan)
Unit III	**Enzymes production and commercial applications**: Amylases; Glucose Isomerase; L-Asparaginase, Proteases Renin; Lactases; Pectinases; Lipases Vitamins production: Vitamin B_{12}, Riboflavin Antibiotics production: Penicillin, Streptomycin
Unit IV	**Fermented beverages**: Production of wine, beer and sake **Fermented foods**: soya sauce, koji, tempeh, sauerkraut **Fermented dairy products**: Buttermilk, yogurt, acidophilus milk, bulgarian milk, cheeses
Unit V	**Single cell protein**: Microorganisms used; raw material used as substrate; condition for growth and production; nutritive value and uses of SCP **Mushroom production**: Cultivation of different types of mushroom; edible mushroom; diseases of mushrooms therapeutic value of an edible mushroom Properties, beneficial effects and production of probiotic and prebiotic Bioplastics (PHB; PHA)

M-BT-403: Practical-IV (Based on BT-M-401 & 402) [6 Credits]
M-BT-404: Project Dissertation & Viva [6 Credits]