SYLLABUS MANUAL

PROFESSIONAL PROGRAMME
### PROGRAMME CODE--- 319
Bachelor of Science in Bio Technology (BSCBT)

#### SEMESTER I

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<tr>
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<tr>
<td>BSCBT11</td>
<td>Introductory Biotechnology</td>
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<td>BSCBT12</td>
<td>General Microbiology</td>
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<td>Cell Biology</td>
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<td>Tissue Culture</td>
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Detailed Syllabus

SEMESTER – I

BSCBT11: Introductory Biotechnology
UNIT 1: An Introduction to Biotechnology
UNIT 2: Substrates for Bio-Technology
UNIT 3: Genetics and Biotechnology
UNIT 4: Fermentation technology and Industrial Microbiology
UNIT 5: Downstream Processing in Bio Technology
UNIT 6: Production of Enzymes
UNIT 7: Biological Fuel Generation
UNIT 8: Single Cell Protein and Recombinant Proteins of High Value
UNIT 9: Biotechnology and Medicine
UNIT 10: Biotechnology in the Agricultural and Forestry Industries
UNIT 11: Food and beverage Biotechnology
UNIT 12: Biotransformation

BSCBT12: General Microbiology
UNIT 1: Microbial Diversity and Taxonomy
UNIT 2: Methods in microbiology
UNIT 3: The structure and organization of bacteria
UNIT 4: Viruses, Viroids and Prions
UNIT 5: Microbial growth
UNIT 6: Microbial Metabolism
UNIT 7: Microbial Genetics
UNIT 8: Genetic Engineering and Biotechnology
UNIT 9: Soil Microbiology
UNIT 10: Atmospheric Microbiology
UNIT 11: Aquatic and Sanitary Microbiology
UNIT 12: Agricultural Microbiology
UNIT 13: Dairy and Food Microbiology

BSCBT13: Biochemistry
UNIT 1: Chemical and Physical Foundations
UNIT 2: Solute-solvent interactions
UNIT 3: Biomolecules: Structure, Assembly
UNIT 4: Catalysis and Binding
UNIT 5: Enzyme reaction mechanisms and kinetics

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UNIT 6: Major Metabolic Pathways
UNIT 7: Anabolism and Catabolism
UNIT 8: Bioenergetics (including respiration and photosynthesis)
UNIT 9: Covalent modification of enzymes
UNIT 10: Spectroscopy
UNIT 11: Separation techniques (for example, centrifugation, chromatography, and electrophoresis)
UNIT 12: Immunotechniques

BSCBT14: Introductory Biology
UNIT 1: Biology: The Science of Our Lives
UNIT 2: Science and the Scientific Method
UNIT 3: Theories Contributing to Modern Biology
UNIT 4: Development of the Theory of Evolution
UNIT 5: Water and Fitness of the environment
UNIT 6: The chemical content of life
UNIT 7: Introduction to metabolism
UNIT 8: Enzymes and control of metabolism
UNIT 9: Fermentation and respiratory regulation
UNIT 10: The cell cycle: Mitosis and Meiosis

BSCBT15P: Practical

SEMESTER – II

BSCBT21: Genetic Taxonomy & Genome

Unit I
Nature of gene : chemical nature.
Gene cistron relationship in Prokaryotes and eukaryotes.
Gene families and pseudogens.

Unit II
Overlapping gene.
Transgenes.
Transposable elements.

Unit III
Gene Mutation.
Physical and Chemical Mutagens.
Molecular Mechanism.

Unit IV
Gene organisation (Principle)
Separation Techniques: Northern and Southern.

Unit V
Gene libraries
Ligation and selection technique.
Selection by genetic recombination.
BSCBT22: Enzymology

Unit 1: Enzyme : Introduction
Unit 2: classification
Unit 3: Protein and non protein enzymes
Unit 4: Catalytic reaction of enzyme.
Unit 5: Kinetics of enzyme.
Unit 6: In vitro activity of purified enzymes and their applications in industry.
Unit 7: Enzyme uses in food processing
Unit 8: Medicine, diagnostics and production of new compounds.
Unit 9: Enzymes as research tool - modification of biological compounds with the help of enzyme.

BSCBT23: Immunology

Unit I: Immune system : Immunity, Organs of the immune system with function.
Unit II: Antigen - Antibody and their structure. Antigen antibody interaction.

BSCBT24: Genetic Engineering

UNIT 1: Genomics
UNIT 2: Genome structure and Physical mapping
UNIT 3: Repeated DNA and gene families
UNIT 4: Genome Maintenance
UNIT 5: DNA replication
UNIT 6: DNA damage and repair
UNIT 7: DNA modification
UNIT 8: DNA recombination and gene conversion
UNIT 9: the genetic code and Transcription
UNIT 10: Gene Regulation in Prokaryotes

BSCBT25: Practical


Semester III

BSCBT31: Fermentation Techniques

Unit II: Local condition with in a fermentor. Ideal Fermentor.
Unit III: Types of Fermentors (Principle and Parts), Batch fermentor (BF), Continuous stirred-tank Fermentor (CSTF)
Unit IV: Tubular Fermentor (TF) (Principle and parts), Fluidiced bed Fermentor (FBF)

BSCBT32: Cell Biology

UNIT 1: Cellular Compartments of Prokaryotes and Eukaryotes: Organization, Dynamics, and Functions
UNIT 2: Cell Surface and Communication Extracellular matrix (including cell walls)
UNIT 3: Cell adhesion and junctions
UNIT 4: Cytoskeleton, Motility, and Shape Actin-based systems (including muscle contraction)
UNIT 5: Protein Synthesis and Processing
UNIT 6: Posttranslational modification
UNIT 7: Cell Division, Differentiation, and Development
UNIT 8: Eukaryotic cell cycles, mitosis, and cytokinesis
UNIT 9: Genome replication and regulation
UNIT 10: Virus assembly Virus-host interactions

BSCBT33: Tissue Culture
Unit I: Introduction of Tissue culture.
Unit II: History of development.
Unit III: Primary and secondary culture.
Unit IV: Anchorage and non Anchorage depends of growth.
Unit V: Growth kinetics and organ culture.
Unit VI: Application of Tissue culture for gene expression.

BSCBT34: Molecular Biology
UNIT 1: The Dynamic Cell
UNIT 2: Protein Structure and Function
UNIT 3: Nucleic Acids, the Genetic Code, and the Synthesis of Macromolecules
UNIT 4: Biomembranes and the Subcellular Organization of Eukaryotic Cells
UNIT 5: Manipulating Cells and Viruses in Culture
UNIT 6: Recombinant DNA and Genomics
UNIT 7: Genetic Analysis in Cell Biology
UNIT 8: Molecular Structure of Genes and Chromosomes
UNIT 9: Regulation of Transcription Initiation
UNIT 10: RNA Processing, Nuclear Transport, and Post-Transcriptional Control
UNIT 11: Regulation of the Eukaryotic Cell Cycle

Semester IV

BSCBT41: Bio-chemical Techniques

Unit I: Nature of Biological material.

Unit II: General properties of organic compounds.
Unit III: Hydrophilic and Hydrophobic groups in biological molecules.

Unit IV: Perspectives of biological macromolecules: the repeating units in nucleic acids and proteins.

Unit V: Helicity, bending, looping, pleats, salt bridges and their determents.

Unit VI: The basis for intermolecules interaction eg: enzyme substrate and antigen antibody recognition.

BSCBT42: Bio-physical Techniques

Unit I: Principle & application of Light Microscope

Unit II: Phase Contrast Microscope

Unit III: Fluorescence Microscope

Unit IV: SEM & TEM

Unit V: Principles & applications of paper chromatography

Unit VI: Thin layer chromatography

Unit VII: Affinity & Ion Exchange Chromatography

Unit VIII: HPLC

Unit IX: Fixation Staining

Unit X: Principles of biophysical methods used for analysis of biopolymer structure.

Unit XI: X-ray diffraction, NMR & ESR spectroscopy

Unit XII: Principles and Applications of traces techniques in Biology

Unit XIII: Radiation dosimetry, Radioactive isotopes & half life on isotopes, Scintillation spectrophotometry

Unit XIV: Energetics of a living body. Principle of Colorimetry and spectrophotometer. Strategies of light reception in microbes :- Plant and animals. Unit XV: Intra and intermolecular interactions in biological systems. Spatial and charge compatibility as determination of such interaction.

Unit XV: General spectroscopy of UV-Vis, Fluorescence, Atomic absorption.

BSCBT43: Industrial Biotechnology

Unit I: Application of Biotechnology in Agriculture, Biofertilizer and Nitrogen fixers, Bio-pesticides, Bio-weedicides Biotechnology.

Unit II: Application of Biotechnology in Medicine, Vaccine, Steroids transformation, Protein formation.

Unit III: Application of Biotechnology in Paper industry and plant petroleum.


BSCBT44: Instrumentation

Unit-1: Centrifugation: principle, types, analytical and preparatory centrifugation, differential density gradient centrifugation, sedimentation and coefficient centrifuge and its application. Electrophoresis: principles, types and application (paper, starch, polyacrylamide and agarose electrophoresis. Chromatography: principle, types and application of paper, thin layer, ion exchange, gas chromatography and HPLC.

Unit – 2: Microscopy: light, phase contrast, interference & electron microscopy. Radioactivity: saddy-fajans & russel group displacement law, half life period, disintegration or decay constant, transmutation or isintegration of elements. Radio carbon dating method, application of transmutation reaction (artificial radioactivity). Geiger muller counter, scintillation, liquid, crystal & gamma counter.

Unit -3: Basic principles of spectroscopy; electromagnetic radiations, wave properties & parameters, electromagnetic spectrum spectroscopic methods in each region, types of spectra & interaction mechanisms. UV-vis spectroscopy, TR spectroscopy, nuclear magnetic resonance spectroscopy (NMR), electron spin resonance spectroscopy (ESR).


BSCBT45: Practical

INDUSTRIAL APPLICATION PRACTICAL

Study of Products which are manufactured in industry, on the basis of biotechnology principle.

Semester V

BSCBT51: Animal Biotechnology

Unit I: General metabolism, Secondary metabolites/Products (insulin, Growth hormone, Interferon, factor VIII etc.), Expressing cloned proteins in animal cells, production and processing of chosen protein.

Unit II: Introduction to invitromethod: Terms and definition, growth regulators, Embryo culture, embryo rescue after wide hybridization, and its application, Introduction to the process of embryogenesis and organogenesis and their practical application.

Unit III: Haploids and their application, Somaclonal variation and application, Clonal multiplication of elite species.
BSCBT52: Plant Biotechnology

Unit I: Introduction to protoplast isolation: Principle and application, Testing of viability of isolated protoplast, Various steps in the regeneration of protoplast.

Unit II: Introduction to somatic hybridization, Various method for fusing protoplast, Use of markers for selection of hybrid cells.

BSCBT53: Environmental Biotechnology

Unit I: Renewable and non-renewable resources, Renewable should be bio-assimilable/bio degradable, Major consumer items: Food, fuel and fibres.

Unit II: Conventional fuel and their environmental impacts, Firewood, Plant and animal wastes, Coal, Gas, Animal oil.

Unit III: Modern fuels and their environmental impacts, Methogenic bacteria and biogas, Microbial hydrogen production, Conversion of sugars to ethanol, Cellulose degradation for combustible fuel, Plant based petroleum industry.

Unit IV: Biotechnological inputs in producing good quality national fibres, Microbiological quality of food and water.

Unit V: Biofertilizers, Treatment of municipal waste and industrial effluents, Degradation of pesticides and other toxic chemicals by micro-organism.

BSCBT54: Pharmaceutical Biotechnology

Unit I: Production recombinant pharmaceuticals: Recombinant insulin, Human Growth factor synthesis, Recombinant factor VIII.

Unit II: Synthesis of: Recombinant vaccine, Recombine Protein, Live recombinant vaccine.

Unit III: Identification of genes responsible for human disease, Breast cancer, Autosomal dominant and recessive disorders, X-linked disorders.

Unit IV: Gene therapy of somatic cell, Genetic Manipulation of Grem cell.

Unit V: Prospects and Ethics of gene therapy.

BSCBT55: Practical

Practical application of genetic transformation (theory), Practical application of somatic hybridization (theory).

Practical application of tissue and organ culture (summarizing the practical application of all the above mentioned techniques in paper) only theory.
Semester VI

BSCBT61: Bio-Informatics & Drug Design

Unit I: Introduction to Bioinformatics, Uses of Bioinformatics, Applications of Bioinformatics, Websites for Bioinformatics.

Unit II: Fact file of Bioinformatics.

Unit III: Pharmacology.

Unit IV: Drug metabolism.

Unit V: Pharmacogenetics.

Unit VI: Frontiers in pharmacology.

Unit V: Statistical methods in Pharmacology.

Unit VI: Introduction to Research in pharmacology.

Unit VII: Introduction to Pharmacoinformatics.

BSCBT62: Information Technology & Bioinformatics

Unit I: Overview of computers.

Unit II: Operating system and networking concept (Windows, UNIX, Linux)

Unit III: Basics of internet and websites.

Unit IV: MS-Office.

Unit V: Data structure and Algorithms.

Unit VI: Bioinformatics Internet Applications

BSCBT63: Practical

Windows, UNIX, Linux, MS-Office.