

MNPE-09425068494

In Collaboration with

**Karnataka State Open
University**

Manasagangotri, Mysore-6

**Syllabus of
Bachelor of Science in Biotechnology (B.Sc. BT)**

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Bachelor of Science in Biotechnology (B.Sc. BT)

Code	Course Title	Credits	Code	Course Title	Credits
1st Semester			2nd Semester		
BBT-101	Introductory Bio Technology	3	BBT-201	Genetic Taxonomy & Genome	3
BBT-102	General Microbiology	3	BBT -202	Enzymology	3
BBT-103	Bio Chemistry	3	BBT -203	Immunology	3
BBT-104	Introductory Biology	3	BBT -204	Genetic Engineering	4
BBT-105	Communication & Soft Skills	3	BBT -205	Practical	3
BBT-106	Practical	3			
	Total Credits	18		Total Credits	16
3rd Semester			4th Semester		
Code	Course Title	Credits	Code	Course Title	Credits
BBT-301	Fermentation Techniques	3	BBT-401	Bio Chemical Techniques	3
BBT-302	Cell Biology	3	BBT-402	Bio- Physical Techniques	3
BBT-303	Tissue Culture	3	BBT-403	Industrial Bio-Technology	4
BBT-304	Molecular Biology	3	BBT-404	Instrumentation	3
BBT-305	Practical	3	BBT-405	Practical	3
	Total Credits	15		Total Credits	16

5th Semester			6th Semester		
Code	Course Title	Credits	Code	Course Title	Credits
BBT-501	Animal Bio-Technology	3	BBT-601	Bio-Informatics	3
BBT -502	Plant Bio-Technology	3	BBT-602	Drug Design	3
BBT -503	Environment Bio-Technology	3	BBT-603	Research Methodology	3
BBT – 504	Pharmaceutical Bio Technology	3	BBT-604	Information Technology & Bio Informatics	4
BBT -505	Practical	3	BBT-129	Practical	3
	Total Credits	15		Total Credits	16

SEMESTER I

BBT-101: Introductory Biotechnology

Total Credit : 3

Block 1

Unit 1

1. What is Biotechnology?
2. What is agriculture? What is biology?
3. History of biotechnology? What do you do with it? Why do it?
4. Who does it?
5. Science method to solve a problem.
6. The role of biotechnology in our society.
7. The role of genetic variation and natural selection in evolution. Applications of biotechnology
8. Careers in biotechnology.

Unit 2

1. Atoms, Elements, Compounds Chemical bonds
2. Life's key elements
3. Relate 5 key elements to the essential compounds of all living organisms. Chemical reactions
4. Organic compounds
5. Proteins, Carbohydrates, Lipids, Nucleic Acids
6. Compare and contrast the role of Proteins, Carbohydrates, Lipids, and Nucleic Acids in life. Enzymes
7. Explain the role of enzymes in living organisms. Carbon - Oxygen cycle
8. Cells & Basic structure
9. Identify and locate cell structures and relate them to their functions. Using energy
10. Discover the importance of glucose to living organisms. Fermentation
11. Using a microscope to compare different types of cells.

Unit 3

Molecular Biology

1. Nucleotides
2. Key elements and molecules
3. The structure of DNA. Base pairing
4. The way in which genetic material is copied. DNA and RNA
5. Describe the structure and function of RNA as it relates to protein synthesis. Explain how proteins are made.
6. Replication, Transcription, Translation and Protein Synthesis
7. TLW--Extract DNA from known substances.
8. Restriction enzymes
9. The value of gel electrophoresis in learning the genetic code.
10. Amplification & Cloning

Unit 4

Genetics

1. Genes and Inheritance
2. Genes and DNA
3. Relate genes and heredity to DNA.
4. Discover patterns of inheritance in living organisms. Homozygous and Heterozygous
5. Dominance and Recessiveness
6. Punnet squares
7. F1, F2, F...
8. Using a Punnet Square to determine patterns of inheritance in monohybrid (1-factor) and dihybrid (2- factor) crosses.
9. Problem solving
10. Using a computer model to solve genetic/heredity problems.
11. Isolate and fingerprint DNA to discover the infinite potential of the genetic code. Karyotype chromosomes to discover how sex and certain diseases are inherited. Disease and disorders
12. Genetic counseling

Block 2

Unit 1

Microbiology

1. Bacteria and viruses as pathogens
2. The characteristics of bacteria. The characteristics of viruses.
3. Harmful versus helpful bacteria and viruses
4. Antigen and Antibody
5. Understanding how the immune system combats pathogens. Cultures, Sterile techniques
6. Using sterile techniques to culture bacteria. Transformation, Plasmids and Conjugation
Engineering with microbes
7. Why bacteria and viruses are essential tools of biotechnology. Immune system
8. How the immune response is used in the development of consumer products, industry, and medicine.

Unit 2

Applications of Biotechnology Plants

1. Plant systems
2. The anatomical and physical development of plants. Photosynthesis / Respiration
3. Sexual vs. Asexual Reproduction
4. Describe the principles of sexual and asexual reproduction in plants. Propagate plant tissue using tissue culture techniques.

Unit 3

Animals

1. Animal systems
2. The anatomical and physical development of animals.
3. Digestion / Rumination
4. The digestion process in a ruminant animal. The principles of reproductions in animals.
Reproduction Technologies
Artificial Insemination
Embryo Transfer

Embryo Sexing
Cloning Embryos

Unit 4

1. The process of embryo sexing, splitting, and cloning.
Recombinant DNA
 - a. BST
 - b. Genetic Engineering in Animals
2. appropriate techniques in setting up animal tissue cultures.

Block 3

Unit 1

Food Science

1. Food composition Food safety Food preservation
2. How biotechnology is used to insure the safety of food and food processing. The role of biotechnology in consumer foods.
3. Fermentation
Industrial
Traditional

Unit 2

Medical

1. Antibody Antigen Using the interactions between antigen and antibody to determine hormone levels. Vaccines
2. How vaccines provide immunity to diseases. Infectious diseases
3. Viruses
4. Blood typing
5. Describe the production, use, and abuse of antibiotics. Describe the current research being done on HIV and cancer.

Unit 3

The Human Genome Project

1. The Human Genome
2. Goals of the Human Genome Project
3. Genetic Linkage Maps Polymorphic DNA Markers Physical Maps
4. Sequence - Tagged Sites Integrating Genetic Linkage DNA Sequencing
5. Ethical, Legal and Social Implications

Unit 4

Ethical Issues and the Future

1. The positives, negatives, and importance of biotechnology. What are the issues?
2. Is there a right and wrong? Crime / forensics & DNA?
3. Super humans and eugenics
4. Is Jurassic Park possible?
5. Environmental impact / "over-engineering" Saving endangered species
6. Current issue in biotechnology.
7. The ethics of genetic engineering and biotechnology.

BBT-102: General Microbiology

Total Credit : 3

Block 1

Unit 1

1. Introduction to microbiology
2. Scope of microbiology
3. -history of Microbiology
4. Applied areas of Microbiology

Unit 2

1. -The Microscopic examination of microorganisms
2. -Microscopes and microscopy
3. -Limitation of electron microscopy
4. -Preparations of light-microscope Examination

Unit 3

1. The morphology and fine structure of bacteria
2. Cultivation of bacteria
3. Reproduction and growth
4. Pure cultural and cultural characteristics

Unit 4

1. -Enzymes and their regulation
2. -Microbial metabolism; Energy production
3. -Bacterial recombination, Transduction, Transformation
4. -The regulation and expression of gene activity, Lac Operon

Block 2

Unit 1

1. -Bacterial Classification
2. -Microorganisms, Fungi (Yeast, Molds)
3. -Virus of bacteria, Algae
4. -Viruses of plant and animals

Unit 2

1. -Control of microorganisms by physical agent
2. -Control of microorganisms by chemical agent
3. -Antibiotics
4. -Chemotherapeutics agents

Unit 3

1. -Microbial flora of soil
2. -Biochemical Transformation of carbon, sulphur compounds, carbon,sulphur cycle
3. -Biodegradation of herbicide and pesticide
4. -Nitrogen cycle

Unit 4

1. -Distribution of Microorganisms in the aquatic Environment
2. -The Role of Aquatic microbial ecosystem
3. -Microbial flora of fresh foods and preservation (Meats, Egg, Fruit vegetables, milk)
4. -Industrial uses of bacteria and molds, alcohol fermentation, baker's yeast, food yeast,

Block 3

Unit 1

1. -Pathogenicity, Virulence and infection
2. -Immune response,
3. -Hypersensitivity
4. -immune system

Unit 2

1. -Microbial agent of disease
2. -pseudomonas
3. -anaerobic gram negative rods(e.coli,salmonella,shigella)

Unit 3

1. -Mycobacteria
2. -Microbial agents of disease -viruses
3. -Application of microbiology in day to day life.

Unit 4

1. -Microbial agent of disease
2. -Protozoa
3. -Fungi

BBT-103: Biochemistry

Total Credit : 3

Block 1

Unit 1

- Introduction to Biochemistry and role of medical microbiologist.
- Ethics.
- Safety measure and hazards in clinical biochemistry lab and first aid.

Unit 2

Basic aspects of Bioenergetics.
Entropy, enthalpy and concept of free energy.

Thermodynamic law first and second.

Unit 3

- pH and buffers
- biological buffer systems
- Phosphate buffer system, bicarbonate buffer system
- Protein and hemoglobin buffer system

Unit 4

- Water –The solvent of life
- Properties of water
- Structure and role of water in life
- structure of atom and chemical bonds

Block 2

Unit-1

- Carbohydrate- general structure, classification
- Analysis of carbohydrates
- Isomerism,kiliani cyanohydrins synthesis

Unit 2

- Protein general structure, properties, classification
- Chemical bonds involved in Protein structure
- Protein configuration (Primay,secondry,teriatory,quaternary Structure)

Unit 3

- lipids, structure, properties
- Classification
- Properties of fats and oil

Unit 4

- Nucleic acids-Types
- difference b/w Nucleosides,and Nucleotides
- Historical resume

Block 3

Unit 1

- Enzymes-Nomenclature and classification
- Mechanism of enzyme action,
- Energy mechanics of enzymatic reaction
- Michaelis Menton hypothesis

Unit 2

- Catabolism Vs Anabolism
- Concept of energy
- Glycolysis
- Pyruvate oxidation and citric acid cycle

Unit 3

- Electron Transport and Oxidative phosphorylation
- Oxidation of fatty acids
- Oxidation of amino acids
- Biosynthesis of proteins

Unit -4

- Biochemical Techniques, homogenization, centrifugation
- Chromatography
- Spectrophotometry, Electrophoresis

BBT-104: Introductory Biology

Total Credit : 3

Block 1

Unit 1

1. Nature and Scope of Biology
2. Basis and origin of life, Living and non – living common features of life process.
3. Energy Transformation.

Unit-2

- 1-Kingdoms of life, or Biological Classification, species and population,
- 2-Biotic community, Biosphere.

3-Cell as a unit of life : Prokaryotic and Eukaryotic cell, Plant and animal cell,

Unit-3

- 1-cell structure, membrane organization and cell organelles.
- 2- Cell function, cell division mitosis and meiosis, cell cycle .

3-Introduction to Bio Molecules: Structure and properties of mono, oligo and poly Saccharides

Structure and properties of fatty acids, glycerolipids, phospholipids, glycolipids, steroids.

Unit-4

- 1-Structures and Properties of amino acids peptides and protein.
- 2-Structure and properties of purines, Pyrimidines, nucleosides, nucleotides, polynucleotides,
- 3- Ribonucleic acids and Deoxyribonucleic acids, nucleoprotein complexes.

4. Metabolism: Introduction of Respiration and Photosynthesis.

Block -2

Unit-1

- 1-Evidence of Origin of Life, -
- 2-Staneley-Miller Experiment
- 3-,Lamarkism,Darwinism,

Unit -2

- 1- Discovery of Antibiotic
- 2- History of Antibiotic- Penicillin,
- 3- Application of Antibiotics in Medical field.

Unit -3

- 1-Val-Helmont's Experiment.
- 2-Differnce between Living and Nonliving Cell,
- 3- Viruses ,

Unit -4

- 1-Prokaryotic Cells
- 2- Eukaryotic cell
- 3-Cell organelle –Structure anf Function

Block 3

Unit-1

- 1-Discovery ofCell,their history.
- 2-Unit of measurement of cell
- 3-Plasma membrane.

Unit-2

- 1-Introduction of Biomolecule
- 2-Isomerism
- 3-Hydrophobic and Hydrophilic bond

Unit-3

- 1-History and Definition of Carbohydrate :
- 2-Classification of carbohydrate
- 3-Structure of Carbohydrate.

Unit-4

- 1-Definition of Amino acid –
- 2- Essential and Nonessential Amino acid
- 3-Polypeptide chain.

BBT-105: Communication & Soft Skills

Total Credit : 3

Block-1

Unit 1

1. Parts of Speech
2. Punctuation
3. Vocabulary Building

Unit 2

1. Phonetics
2. Introduction for Communication Skills
3. Need for Communication Skills

Unit 3

1. Office Management, types of correspondence
2. Receipt and Dispatch of Mail
3. Filing Systems

Unit 4

1. Classification of Mail
2. Role and function of correspondence, MIS
3. Managing Computers.

Block-2

Unit 1

1. Types of Letters-Formal / Informal
2. Importance and Function
3. Drafting the Applications

Unit 2

1. Elements of Structure
2. Preparing the Resume
3. Do's & Don'ts of Resume, Helpful hints.

Unit 3

1. Importance of Presentation skills
2. Capturing Data
3. Voice and Picture Integration

Unit 4

1. Guidelines to make Presentation Interesting
2. Body Language
3. Voice Modulation

Block-3

Unit 1

1. Audience Awareness
2. Presentation Plan
3. Visual Aids

Unit 2

1. Forms of Layout
2. Styles of Presentation.
3. Oral representation

Unit 3

1. Types of Interview
2. Preparing for the Interviews
3. Attending the Interview

Unit 4

1. Interview Process
2. Employers Expectations
3. General Etiquette, dressing sense, postures & Gestures

BBT 106 : Practical

Total Credit : 3

Block 1

Unit -1

- 1- Cleaning of glass ware.
- 2- Cleaning of equipments.
- 3- Cleaning of Laminarairflow.

Unit -2

- 1- Operation of Incubator.
- 2- Operation of Waterbath.
- 3- Operation of Bacterial colony counter.

Unit-3

- 1- Operation of Electronic balance.
- 2- Operation of Centrifuge.
- 3- Operation of Autoclave.

Unit-4

- 1- Blood glucose and its determination by different Methods
- 2- Glucose tolerance test. (GTT)
- 3- Estimation of blood urea.
- 4- Estimation of blood creatinine.
- 5- Estimation of blood cholesterol.

Block-2

Unit -1

- 1- Operation of pH meter.
- 2- Operation of Microscope.
- 3- Operation of Magnetic stirrer with hot plate.

Unit -2

- 1- Operation of BOD incubator.
- 2- Operation of Colorimeter.
- 3- Operation of spectrophotometer.

Unit-3

- 1- Preparation of Media.
- 2- Preparation of broth.
- 3- Preparation of Gel.

Unit -4

- 1- Estimation of serum calcium and phosphorus.
- 2- Estimation of plasma protein.
- 3- Determination of Protein in Urine.

Block 3

Unit-1

- 1- Preparation of Glass ware.
- 2- Pouring.
- 3- Slant formation

Unit-2

- 1- Serial dilution.
- 2- Sterilization of glassware through autoclave.
- 3- Transfer of bacterial colony onto petriplate.

Unit-3

- 1- Spreading technique.
- 2- Streaking technique
- 3- Swabbing.

Unit -4

- 1- Sugar in given sample.
- 2- Extraction and separation of lipids.
Estimation of Protein.
- 3- Cleaning of glassware and sterilization.
- 4- Preparation of media.

SEMESTER II

BBT-201: Genetic Taxonomy & Genome

Total Credit: 3

Block 1

Unit 1

- 1- Historical Vapors and fluid theories, performance
- 2- Theory of genetics
- 3- Scope of genetics, Importance of genetics,
- 4- Branches of genetics Symbols of genetics

Unit 2

- 1- Mendel and his work.
- 2- Types of genetic interaction, kinds of epistatic interaction, interallelic Inheritance of multiple genes,
- 3- skin and eye color in man.

Unit 3

- 1- Linkage-sutton-boveri chromosome theory of heredity.
- 2- Morgan views on linkage
- 3- Significance of linkage

Unit 4

- 1- Crossing over. Types, mechanism of meiotic crossing over
- 2- Synapsis, cytological detection of crossing over
- 3- Significance of crossing over

Block 2

Unit 1

- 1- Multiple alleles, characters of multiple alleles
- 2- Fine structure of gene
- 3- Test for allelism

Unit 2

- 1- Sex linked inheritance, characteristics
- 2- Examples of inheritance of X linked recessive genes,
- 3- Inheritance of Y-linked genes

Unit 3

- 1- Chromosomal mutation-I, Structural changes in chromosomes, Types
- 2- Chromosomal mutation II, Euoploidy, monoploidy, polyploidy, autopolloidy
- 3- Allopolyploids, aneuploidy, nullisomy, trisomy

Unit 4

- 1- Gene mutations, occurrence, kinds of mutations
- 2- Chemical mutagens, classification
- 3- Application of mutations, significance

Block 3

Unit- 1

- 1- Human genetics, pedigree analysis, Amniocentesis, twins
- 2- Eugenics, need of eugenics
- 3- Euphenics, gene therapy

Unit- 2

- 1- Transposable genetic elements, jumping or mobile genes
- 2- Mode of discovery of transposable elements
- 3- Insertion sequence, simple or complex transposons

Unit- 3

- 1- Genetic code, basis of cryptoanalysis; codon assignment
- 2- Characteristics of genetic code,
- 3- Wobblers hypothesis

Unit- 4

- 1- Regulation of gene action in prokaryotes
- 2- Transcriptional control mechanisms
- 3- Hormonal control of gene expression

BBT-202: Enzymology

Block 1

Total Credit : 3

Unit 1

- 1- Enzyme nomenclature and classification
- 2- Importance of enzymes
- 3- Historical resumes

Unit 2

- 1- Chemical composition of enzymes
- 2- Isoenzymes, multienzyme systems
- 3- Characteristics of enzymes

Unit 3

- 1- Biological roles of enzymes
- 2- Three-dimensional structure of the enzymes
- 3- Ribonuclease, lysozyme, chymotrypsin

Unit 4

- 1- Specificity of enzyme action
- 2- Thermostability, reversibility of reaction.
- 3- Inhibition of enzyme.

Block 2

Unit- 1

- 1- Energy Mechanics of enzymatic reactions
- 2- Michaelis- menton hypothesis
- 3- Michaelis-menton equation

Unit 2

- 1- Lineweaver-Burk Equation
- 2- Significance of K_m and V_m Value
- 3- Alloestric enzymes

Unit- 3

- 1- Active site, modifiers of enzyme activity(Organic, Inorganic modifiers)
- 2- Protein and non protein enzymes.
- 3- Enzyme uses in food processing, medicine, diagnostics and production of new compounds.

Unit-4

- 1- Enzymes as research tool –
- 2- Modification of biological compounds with the help of enzyme.
- 3- As biocatalysts, specificity and kinetics, assay and inhibition of enzyme activity,

Block 3

Unit 1

- 1- Purification of enzymes through different techniques
- 2- Spectrophotometry

Unit- 2

- 1- Electrophoresis,
- 2- Centrifugation,
- 3- Isotachphoresis

Unit- 3

- 1- Application of enzymes in industry
- 2- Application of enzymes in food industry
- 3- Application of enzyme in Pharma industry

Unit 4

- 1- Assays of Enzyme diagnostic.
- 2- Kinetic studies on enzymes.
- 3- Immobilized enzyme.

BBT-203: Immunology

Total Credit : 3

Block 1

Unit 1

- 1-Immune response : Type of Immunity, Antigens and haptens.
- 2-Anatomy of Lymphoid organs; primary and secondary Lymphoid organs.
- 3-Immunoglobulin Structure, function and synthesis, memory cells Lymphocyte differentiation..

Unit 2

- 1-Biology of complement systems : structure and function of MHC class I & II molecules.
- 2-Antigen recognition and presentation, cell mediated immune responses.
- 3-Hypersensitivity reactions; Immune suppression and Immune Tolerance immune disorders, Transplantation.

Unit 3

- 1-Antigen - Isolation, purification and characterization of various antigens and haptens from pathogens and other biological molecules by biophysical and chemical and affinity separation methods.
- 2- Production of antibodies, purification of antibodies,
- 3-Quantitation of immunoglobulin by RID, EID and nephelometry.

Unit 4

- 1-Purification of mononuclear from peripheral blood; isolation and characterization of T cell subsets; B cells and macrophages.
- 2-Fluorescent Activated cell sorter (FACS); Mitogen and Antigen induced Lymphoproliferation assay.
- 3-Cell mediated Lympholysis; Mixed Lymphocyte reaction.
- 4-Assessment of delayed hypersensitivity reactions; Macrophage cultures.

Block 2

Unit 1

- 1- Cells and Organs Of the immune system.
- 2- Innate and Adaptive immunity.
- 3- Basic structure of Antibodies.

Unit -2

- 1- Antibody binding site, Antibody mediated effector functions.
- 2- Antibody classes and Biological Activity.
- 3- Antigenic Determinants on immunoglobulins.

Unit- 3

- 1- Cell of the immune system : Mononuclear cells and granulocytes, Lymphocytes and their subsets
- 2- Role of complement system in immune responses.
- 3- Hybridoma and monoclonal antibody production.

Unit -4

- 1-Immuno-diagnosis and Applications of monoclonal antibodies in biomedical research; human monoclonal antibodies,
- 2-Catalytic antibodies; complement fixation test; assessment of immune complex in tissues.
- 3-T-cell Receptor:

Block 3

Unit 1

- 1- Hematopoiesis
- 2- Cells of the immune system.
- 3- Organ of the immune system.

Unit 2

- 1- Infection and immunity.
- 2- Soluble molecule and membrane associated receptors.
- 3- Cell type of Innate immunity.

Unit 3

- 1-Isolation of antibody through different method.
- 2- Describe Isotype, Allotype, Idotype.
- 3-Multigene Organization of Ig Genes

Unit 4

- 1-Cytotoxic Tcells and their mechanism of action,
- 2-NK cells and mechanism of target cell destruction.
- 3-Vaccine technology including DNA vaccines; identification of T & B epitopes for vaccine developments,
- 4-Immune technology and infectious diseases. Immunoscreening of recombinant Library.

BBT-204: Genetic Engineering

Total Credit : 4

Block 1

Unit 1

- 1- Concept of gene.
- 2- Structure of gene.
- 3- Significance of gene.

Unit 2

- 1- Introduction of Genetic Engineering.
- 2- Tools of Genetic Engineering: Vectors and Enzyme.
- 3- Laboratory requirement and Safety of Genetic Engineering techniques.

Unit 3

- 1- Genetic Material,
Properties of genetic material, identification
- 2- Experiments of Griffith, Macleod and Macarty, Hershey and chase.
- 3- Primary and secondary structure of genetic materials

Unit 4

- 1- Genetic material organization- C value paradox
- 2- Plasmids and episomes, Copy number
- 3- Transposable elements, Insertion sequence, retroviruses

Block 2

Unit 1

- 1- Genetic material replication, semi conservative
- 2- Replication in eukaryotes
- 3- DNA replication is bidirectional

Unit 2

- 1- Evolution of globin genes
- 2- Genetic maps, definition, genetics map, linkage maps
- 3- Cytogenetic map, physical maps, genetic markers

Unit 3

- 1- Genes and protein,
- 2- Protein structure, Amino acid sequence of protein
- 3- RFLP .application

Unit- 4

- 1- Transcription, regulation
- 2- Translation, regulation,
- 3- genetic code

Block 3

Unit-1

- 1- Protein transport and signal transduction
- 2- Carrier proteins Receptors
- 3- G protein activation

Unit-2

- 1- Regulation of gene in prokaryotes
- 2- Regulation of genes in eukaryotes
- 3- Baacteriophage

Unit-3

- 1- Mutation molecular basis
- 2- Mutation induction and detection
- 3- Point mutation.

Unit-4

- 1- Techniques in genetics
- 2- Southern and Northern hybridization
- 3- Westrn blotting,DNA fingerprinting

Block-4

Unit -1

- 1-Core techniques in gene manipulation ; Cloning strategies ;
- 2- Construction of-gene libraries; Probe construction;
- 3-Recombinant selection and screening -DNA sequencing, RFLP, DNA finger printing;

Unit -2

- 1-Expression systems and their applications; Production of protein from cloned genes; gene cloning in research, medicine and agriculture;
- 2- Intellectual Property Rights (1PR) and patents, biosafety, containment facilities forGenetic Engineering experiments.
- 3-Regulations on field experiments and release of GMO's (Genetically Modified Organisms),

Unit -3

- 1-E.Coli vectors - Plasmid biology - pBR 322 and its derivatives - gene markers.
2- Cloning vectors for gramnegative bacteria & phage - filamentous phages - Cosmid - phasmid.
- 3-Cloning in Gram - Positive bacteria

Unit -4

- 1-Gene expression in eukaryotes - Cloning in Yeast Saccharomyces cerevisiae genetics - life cycle – types of vectors - gene expression system.
- 2- Eukaryotic Vectors - SV40 - molecular genetics - markers- expression system.
- 3-Cloning and gene expression in Streptomyces.
- 4-Specialised cloning vectors for cDNA - synthesis of specific RNA in vitro- selection of vectors for

BBT-205: Practical

Total Credit : 3

Block 1

Unit 1

- 1- Prepare molar solution
- 2- Prepare normal solution
- 3- Prepare molal solution.

Unit-2

- 1- Isolation of microorganism from soil
- 2- Isolation of microorganism from food stuff.
- 3- Isolation of microorganism from sewage water.

Unit -3

- 1- Pippeting
- 2- Heamoglobin test.
- 3- ESR.

Unit-4

- 1- Slide formation .
- 2- Gram staining.
- 3- Acid Fast staining.

Block-2

Unit -1

- 1- Purification of antigens.
- 2- Purification of antibodies

Unit-2

- 1- Conjugation of antibodies
- 2- Labeling of antibodies.
- 3- ELISA

Unit -3

- 1- RIA
- 2- Isolation of enzyme.
- 3- Labeling of antibodies

Unit-4

1. TLC
2. DLC
3. Blood group

Block-3

Unit-1

- 1- Verification of Beer's law.
Determination of absorption maximum.
- 2- Electrophoresis of Proteins - native and under denaturing conditions.

Unit-2

- 1- Amino acid and carbohydrate separations by paper and thin layer chromatography. Separation of blood cells by density gradient centrifugation.
- 2- Chromatographic method for separation of macromolecules.
Separation of sub cellular organelles by differential centrifugation.

Unit-3

- 1- Electrophoresis of DNA - linear, circular and super coiled.
- 2- Isolation of DNA through Lysis Buffer

Unit-4

- 1- Operation of UV-Visible spectrophotometer.
- 2- Operation of IR Spectrophotometer.

SEMESTER III

BBT-301: Fermentation Techniques

Total Credit : 3

Block I

Unit 1

Introduction : Fermentation
processes-Microbial Biomass,
Microbial enzymes
Transformation processes

Unit 2

Microbial growth kinetics, ,
uses of fed-batch culture
Batch culture, Continuous culture

Unit 3

The isolation, preservation of industrially microorganism.
improvement of industrially important micro-organisms
Fed-batch culture, Application

Unit 4

Media for industrial fermentors,
Typical media
Carbon sources, oxygen sources, nitrogen sources

Block- 2

Unit 1

Sterilization, Medium sterilization
Sterilization of, fermentors, feeds, waste and liquid waste
Filter sterilization

Unit 2

The development of inocula for industrial fermentations
The aseptic inoculation of plant fermenters
Sterilization of raw material for fermentor.

Unit 3

Design of fermenters.
Agitation and aeration of fermentor
Mass transfer

Unit 4

Instrumentation of fermentor.
Controlling of Fermentor.
Different types of Baffles and Valves in fermentor.

Block 3

Unit 1

Computer application in fermentation technology
Production of Alcohol (Beer, Wine)
Production of Acetic acid.

Unit 2

Aeration and Agitation
Recovery and purification of fermentation products
Application of fermentation product.

Unit 3

Disposal of Effluents.
Physical chemical and Biological treatment Processes.
Aerobic processes.

Unit 4

Isolation of microorganism of potential industrial interest.
Strain improvement.
Market potential.

BBT-302: Cell Biology

Total Credit: 3

Block-1

Unit 1

Cell theory, Discovery of cell
Exception of cell theory, cell shape, size, cell number
Prokaryotes vs Eukaryotic cells

Unit 2

- a. Techniques for cell study-Light microscopy
- b. Electron Microscopy, chromatography
- c. Electrophoresis, X-ray diffraction and NMR spectroscopy

Unit 3

- a. Chemistry of cell , Carbohydrates,fatty acids
- b. Amino acids, Lipids, Nucleotides
- c. Proteins, polysaccharides

Unit 4

- a. Enzymes and energy transfer during Metabolism
- b. Glycolysis and gluconeogenesis.
- c. Krebs's cycle.

Block 2

Unit 1

1. Cell Division: Mitosis.
2. Meiosis: The reduction division.
3. Significance of DNA.

Unit 2

- a. Cell structure, cytoskeleton (microtubules, Actin filaments and intermediate filaments
- b. Cell membrane including plasma membrane
- c. Protein complex in membranes

Unit 3

- a. Cell organelles; Mitochondria, plasmids
- b. ER, Ribosomes, endosomes, golgi, lysosomes
- c. Peroxisome and centromere

Unit 4

- a. Cell nucleus
- b. Membrane function
- c. Energy conversions; Photosynthesis, respiration

Block 3

Unit 1

The cell division cycle molecular basis
Growth-levels of growth
Reproduction

Unit 2

Gaematogenesis
spermatogenesis
Structure of mature egg

Unit- 3

Fertilization
Types of fertilization
Significance Of fertilization.

Unit-4

Parthenogenesis,
Complete and incomplete parthenogenesis
Significance of parthenogenesis

BBT-303: Tissue Culture

Total Credit : 3

Block-1

Unit 1

1-Basic principles of Biotechnology as applicable to animal Science
2-Artificial Insemination, pregnancy diagnosis,
3-In-vitro fertilization - EmbryoTransfer Technology
4-Transgenic Animals.

Unit -2

1-Animal Cell culture – Applications in Animal biotechnology.
2-Bio hazard and Insecurity in Animal Biotechnology-
3-Ethical aspects in Animal
Biotechnology.

Unit -3

1-Befouling and Control technology.
2-Bioremediation.
3- Use transgenic technology to study fish growth and development

Unit -4

1-Genetic engineering and ploidy manipulation to enhance grow reproduction .
2-Development of disease resistance in aquaculture species.
3-Cryobiology in Marine germplasm preservation Pharmaceuticals from marine organisms.

Block-2

Unit 1

- 1- Cell and environment.
- 2- Transport of ions across membrane.
- 3- Mechanism of synaptic transmission.

Unit 2

- 1- History of animal cell culture.
- 2- Types of primary cell culture.
- 3- Chicken embryo fibroblast culture.

Unit 3

- 1- Chicken liver and kidney culture.
- 2- Behavior of cells in culture condition.
- 3- Selection of medium and serum.

Unit 4

- 1- Metabolism and estimation of cell number.
- 2- Development of cell lines.
- 3- Stem cell, Characterization and maintenance of cell lines.

Block 3

Unit 1

- 1- Cell culture : laboratory design and equipments.
- 2- Physiochemical properties of Media.
- 3- Secondary culture.

Unit 2

- 1- Organ and suspension culture.
- 2- Balance salt solution, antibiotic and growth supplements.
- 3- Continuous cell lines.

Unit 3

- 1- Cell cloning and selection
- 2- Transfection and transformation of cells.
- 3- Application of cell culture for in vitro testing of drugs.

Unit 4

- 1- Anchorage and non Anchorage depends of growth.
- 2- Growth kinetics and organ culture.
- 3- Application of Tissue culture for gene expression.

BBT-304: Molecular Biology

Total Credit : 3

Block-1

Unit – 1

- 1- Discovery & definition of transposons, simple transposons (IS elements),
- 2- Composite transposons (Tn3, Tn5, Tn9, Tn10), Ac/Ds elements in maize, P elements in drosophila,
- 3- Retxotransposons, mechanisms of transposition.

Unit 2

- 1- Structure, classes & function of RNA.
- 2- RNA transcription and processing in Eukaryotes.
- 3- prokaryotes genetic code and protein synthesis .

Unit 3

- 1- The operon concept regulatory gene, promoter gene, operator gene and structural gene,
- 2- Role of CAMP and CRP in gene expression, catabolite repression, induces, repressor corepressor.
- 3- Brief account of Eukaryotic gene expression (Britson & Davidson model).

Unit 4

- 1- Physical and Chemical Basis of Mutation:
- 2-Mechanism of mutagenesis, Mutation of DNA & protein levels.
- 3-Recombination in Bacteria - Transformation, transduction and conjugation,
- 4- Mechanism of gene transfer and application.

Block-2

Unit 1

- 1-Jumping gene, Transposon, IS element.
- 2- Transcription and Translational controls.
- 3- Protein localization: synthesis of secretory and membrane protein.

Unit 2

- 1- Mutation: Spontaneous mutation , Induced mutation, .
- 2- Genetic Code: Basis of Cryptanalysis, Codon assignment,
- 3- Wobble Hypothesis

Unit 3

- 1- Antibiotic and Protein Synthesis.
- 2- Regulation of Gene action

3- Post-transcriptional Control.

Unit 4

- 1-Regulation of gene action in Eukaryotes.
- 2- Translational Control.
- 3-Hormonal Control of gene Culture.

Block-3

Unit 1

- 1- Numerical change in Chromosome: Aneuploidy, Monosomy, Nullisomy
- 2- Euploidy: Monoploidy and haploidy
- 3- Origin and production of Haploids

Unit 2

- 1-Polyploidy: Autopolyploidy, Allopolyploidy.
- 2- Segmental allopolyploids
- 3-Inborn errors of Metabolism in Man.

Unit 3

- 1- Eye transplantation in *Drosophila*.
- 2- Biochemical mutation in *Neurospora*
- 3- Calculation of Mutation Rates and frequencies.

Unit 4

- 1- Biochemical mutations and Biosynthetic Pathways.
- 2- Mutation and Nucleotide sequence in nucleic acids.
- 3- Effect of radiation on nucleotides sequence.

BBT-305: Practical

Total Credit : 3

Block-1

Unit-1

- 1- Cell counting method.
- 2- Cytological preparation.
- 3- Fixation.

Unit-2

- 1- Gram staining.
- 2- Squash in stain.
- 3- TLC

Unit-3

- 1- Embedding.
- 2- Sectioning.
- 3- Separation of cell from blood.

Unit-4

- 1- Blood glucose and its determination by different Methods
- 2- Glucose tolerance test. (GTT)
- 3- Estimation of blood urea.
- 4- Estimation of blood creatinine.
- 5- Estimation of blood cholesterol.

Block-2

Unit -1

- 1- Operation of pH meter.
- 2- Operation of Microscope.
- 3- Operation of Magnetic stirrer with hot plate.

Unit -2

- Operation of BOD incubator.
- Operation of Colorimeter.
- Operation of spectrophotometer.

Unit-3

- Preparation of Media.
- Preparation of broth.
- Preparation of Gel.

Unit -4

- Estimation of serum calcium and phosphorus.
- Estimation of plasma protein.
- Determination of Protein in Urine.

Block-3

Unit-1

- 1- Verification of Beer's law.
Determination of absorption maximum.
- 2-Electrophoresis of Proteins - native and under denaturing conditions.

Unit-2

- 1- Amino acid and carbohydrate separations by paper and thin layer chromatography. Separation of blood cells by density gradient centrifugation.
- 2- Chromatographic method for separation of macromolecules.
Separation of sub cellular organelles by differential centrifugation.

Unit-3

- 1- Electrophoresis of DNA - linear, circular and super coiled.
- 2- Isolation of DNA through Lysis Buffer

Unit-4

- 1-Operation of UV-Visible spectrophotometer.
- 2- Operation of IR Spectrophotometer.

SEMESTER IV

BBT-401: Bio-chemical Techniques

Total Credit : 3

Block-I

Unit 1

- 1- Nature of Biological material.
- 2- General properties of organic compounds.
- 3- Hydrophilic and Hydrophobic groups in biological molecules.

Unit 2

- 1- Perspectives of biological macromolecules : the repeating units in nucleic acids and proteins. Helicity, bending, looping, pleats, salt bridges and their determents.
- 2- The basis for intermolecules interaction eg : enzyme substract and antigen antibody recognition.

Unit- 3

- 1- Observation on tissues-Perfusion, Tissue slices
- 2- Homogenization,
- 3- Differential centrifugation

Unit- 4

- 1- Chromatography,
- 2- Electrophoresis
- 3- Ultracentrifugation

Block 2

Unit 1

- 1- Energetics of a living body.
- 2- ,Isotopic tracer technique
- 3- Application of radioisotopes in medical field.

Unit 2

- 1- Principle of Colorimetry and its instrumentation
- 2- Spectrophotometer and its application.
- 3- Strategies of light reception in microbes :- Plant and animals.

Unit 3

- 1- Intra and intermolecular interactions in biological systems.
- 2- Spatial and charge compatibility as determination of such interaction.
- 3- Isomerism.

Unit 4

- 1- Water; properties, universal solvent.
- 2- Ionic and solubility product.
- 3- Colloidal system.

Block 3

Unit 1

- 1- General spectroscopy of UV-Vis
- 2- Fluorescence
- 3- Atomic absorption

Unit 2

- 1- NMR spectroscopy
- 2- Mass spectroscopy
- 3- Optical rotatory dichorism.

Unit 3

- 1- Northern Blotting Techniques
- 2- Western Blotting Technique.
- 3- Southern Blotting Technique.

Unit 4

- 1- Isotechophoresis.
- 2- Isoelectrophoresis.
- 3- Isozyme and Ribozyme.

BBT-402: Bio-physical Techniques

Total Credit : 3

Block 1

Unit 1

- 1- Principle & application of Light Microscope
- 2- Phase Contrast Microscope FLuorescence Microscope
- 3- Electron microscope (SEM & TEM)

Unit 2

- 1- Electronic theory of valency dipole moment. Electron displacement, electronic effect, resonance.
- 2- The hydrogen bond, hydrophobic interactions. Atomic theory and molecular orbital.
- 3- Hybridization. Free radicals in biological systems, antioxidants.

Unit 3

- 1- Isomerism : Structural and stereoisomerism optical activity, meso compounds.
- 2- Specific rotation, chirality, chiral, enantiomers, conformation and configuration.
- 3- Conformational analysis of monosaccharides, boat and chair forms, eclipsed. Mutarotation, glycosides epimers

Unit 4

- 1- Fixation Staining
- 2- Acid fast staining
- 3- Labeling of isotope

Block 2

Unit 1

- 1- Fluorimetry : Principle, instrument and application.
- 2- Flame techniques,
- 3- Atomic absorption spectroscopy.

Unit 2

- 1- Centrifugation : Principle, types, analytical and prepared centrifugation, differential density, gradient centrifugation, sedimentation and coefficient centrifuge and its application.
- 2- Electrophoresis : Principles, types and application (paper, starch, gel polyacrylamide and agar electrophoresis).
- 3- Chromatography : Principle type and application, (Paper, thin layer, gas ion exchange and molecular sieve). Affinity chromatography, HPLC, FPLC.

Unit 3

- 1- Isoelectric focusing and Isotachopheresis
- 2- Photometry : Basic Principle of UV-Vis spectrophotometry
- 3- colorimetry.

Unit 4

- 1- Principles of biophysical methods used for analysis of biopolymer structure.
- 2- X-ray diffraction,
- 3- Application of X-Rays in medical field

Block 3

Unit 1

- 1- Principles and Applications of trace techniques in Biology
- 2- Radiation dosimetry
- 3- Geiger Muller Counter.

Unit 2

- 1- Radioactive isotopes & half Life on isotopes
- 2- Scintillation spectrophotometry
- 3- Interaction of radioactivity with matter.

Unit 3

- 1-ESR : Principle, instrumentation and its application.
- 2-NMR : Principle, instrumentation .
- 3- Application of NMR.

Unit 4

- 1-ORD Principle, instrumentation and its application
- 2-CD Principle, instrumentation and its application..
- 2-Polarimetry : Principle, instrumentation and its application.

BBT-403: Industrial Biotechnology

Total Credit : 4

Block-I

Unit 1

1. Application of Biotechnology in Agriculture.
2. Biofertilizer and Nitrogen fixers.
3. Bio-weedicides Biotechnology.

Unit 2

1. Production of antibiotics by microorganisms
2. Drug discovery
3. Drug designing.

Unit 3

- 1-Biopesticides
- 2-Integrated management
- 3- DDT and BHC and their advantage and disadvantages.

Unit 4

- 1-Industrial biocatalysis
- 2-Uses of enzymes in industry
- 3-Application of enzyme in Dairy industry

Block 2

Unit 1

1. Application of Biotechnology in Medicine
2. Vaccine
3. Recombinant DNA vaccine.

Unit 2

1. Steroids transformation.
2. Protein formation.

Unit 3

1. Single cell protein
2. Application of single cell protein.
3. Mushroom and edible algae.

Unit 4

- 1- Application of Biotechnology in Paper industry .
- 2- plant petroleum.
- 3- Biodiesel from Jatropha plant.

Block 3

Unit 1

Application of Biotechnology in Environment.
Biotechnological inputs in producing good quality natural fibres

Unit 2

Plant and animal wastes.
Animal oil
Conventional fuel and their environmental impacts.

Unit 3

Application of Biotechnology in Food Industry. Beverages.
Bakery, milk
Dairy Product.

Unit 4

Production of organic compound by microbial fermentation,
Production of enzymes by Micro-organisms
Production of Gluconic acid.

Block-4

Unit-1

1-Introduction to bioprocess engineering, bioreactors,
2-Isolation, preservation and maintenance of industrial microorganisms;
3-Kinetic of microbial growth and death;
4-Media for industrial fermentation,
5- Air and media sterilization.

Unit 2

1-Types of fermentation processes,
2-Analysis of batch, fed-batch Bioreactor .
3- Analysis of continuous bio-reactors, stability of microbial reactors, analysis of mixed microbial populations,
4-Specialized bioreactors (pulsed, fluidized, photo bioreactors etc.);
5-Measurement and control of bioprocess parameters.

Unit 3

1-Downstream processing: introduction, removal of microbial cells and solid matter, foam reparation, Precipitation/filtration,
2-Centrifugation, cell disruptions, liquid-liquid extraction, chromatography;
3-Membrane process, drying and crystallization;
4-Effluent treatment- D.O.C. and C.O.D. treatment and disposal of effluents;
5-whole cell immobilization and their industrial applications.

Unit 4

1-Industrial production alcohol (ethanol), acids (citric acetic and gluconic)
2-Industrial production of solvents, (glycerol acetone butenol),
3-Industrial production of antibiotics (penicillin), amino acids (lysine),
4- Industrial production of single cell-protein.

BBT-404: Instrumentation

Total Credit : 3

Block 1-

Unit 1-

- 1-Electronic theory of valency dipole moment. Electron displacement, electronic effect, resonance. The hydrogen bond, hydrophobic interactions.
- 2-Atomic theory and molecular orbital.
- 3-Hybridization. Free radicals in biological systems, antioxidants.
- 4-Isomerism : Structural and stereoisomerism optical activity, meso compounds. Specific rotation, chirality, chiral, enantiomers, conformation and configuration.

Unit 2-

- 1-Centrifugation : Principle, types, analytical and prepared centrifugation, differential density, gradient centrifugation,
- 2-Sedimentation and coefficient centrifuge and its application.
- 3-Electrophoresis : Principles, types and application (paper, starch, gel polyacrylamide and agar electrophoresis).

Unit 3-

- 1-Photometry : Basic Principle of UV-Vis spectrophotometry and colorimetry.
- 2-Fluorimetry : Principle, instrument and application.
- 3-Flame techniques, atomic absorption spectroscopy.

Unit 4-

- 1-Microscopy : Light, phase contrast, interference and electron microscopy. X-ray crystallography.
- 2-Radioactivity : Radioisotopes, half life, units. Geiger Mueller counter. Scintillation ;
- 3-Liquid, Crystal and gamma counter.

Block 2

Unit 1-

- 1- Electrolysis Dissociation and Electrolyte
- 2- Basis of Acids and Bases.
- 3- Electrometric determination of Ph.

Unit-2

- 1- Ion Specific Electrode .
- 2- Colloids:-Classification of colloids, Properties of colloids.
- 3- Methods of determination of Diffusion Coefficient.

Unit-3

- 1- Diffusion of water across membrane.
- 2- Osmosis.
- 3- Osmotic behavior of cells.

Unit-4

- 1 Ultra- Violet Spectrophotometry.
- 2-Nephelometry.
- 3-Infra-red Spectroscopy.

Block 3

Unit -1

- 1-Spectrophotometry.:Lambert;s Beer law and application.
- 2- Atomic absorption spectrophotometry.
- 3-NMR

Unit -2

- 1- Centrifugation
- 2- Chromatography:- TLC ,Paper chromatography, Column chromatography.
- 3- GLC, HPLC.

Unit -3

- 1- Affinity chromatography
- 2- Electrophoresis: Principle and its application
- 3- Gel electrophoresis

Unit -4

- 1- ESR : Principle, instrumentation and its application.
- 2-ORD: Principle, instrumentation and its application.
- 3-Polarimetry : Principle, instrumentation and its application.

BBT-405: Practical

Total Credit : 3

Block-1

Unit-1

- 1- Isolation of genomic DNA from bacterial cells.
- 2- Isolation of plasmid DNA from bacterial cells.
- 3- Isolation of microorganism from stool.

Unit-2

- 1- of Enzymes.
- 2- Isolation of enzymes from raw material.
- 3- Isolation of enzyme from molecular sieve technique.

Unit-3

- 1- Isolation of genomic DNA from plant cells.
- 2- Transformation of CaCl_2
- 3- Gel preparation.

Unit-4

- 1- of fungal mycelia.
- 2- Isolation of DNA from Animal cell.
- 3- Serial dilution.

Block-2

Unit-1

- 1- Study of transduction in E.Coli,
- 2- Transformation in E.Coli,
- 3- conjugation in E.coli.

Unit-2

- 1- Study of mutation in E.coli.
- 2- Preparation of King's B media.
- 3- Preparation of Potato Dextrose Agar media.

Unit-3

- 1- Preparation of Nutrient Agar Media.
- 2- Preparation of Oat Agar Media.

- 3- Homogenized Tissue.

Unit-4

- 1- Preparation of seminar.
- 2- Preparation of Project .
- 3- Scientific writing of research paper.

Block-3

Unit-1

- 1- Kinetic studies on enzyme.
- 2- - ALkaLine phorphatase estimation. 3- ELISA test

Unit-2

- 1- Immobilization of Enzymes.
- 2- Urease estimation by coLorimetric method.

Unit-3

- 1- Isolation of genomic DNA from bacterial cells.
- 2- Isolation of plasmid DNA from bacterial cells.
- 3- . Isolation of genomic DNA from plant cells.

Unit-4

- 1- Transformation ofCaCl₂
- 2- . Study of transduction, transformation, conjugation in E.coli. 3- Study of mutation is E.coli.

SEMESTE V

BBT-501: Animal Biotechnology

Total Credit : 3

Block-1

Unit - 1

- 1-Basic principles of Biotechnology as applicable to animal Science
- 2-Artificial Insemination, pregnancy diagnosis,
- 3-In-vitro fertilization - Embryo Transfer Technology
- 4-Transgenic Animals.

Unit - 2

- 1-Animal Cell culture – Applications in Animal biotechnology.
- 2-Bio hazard and Insecurity in Animal Biotechnology-
- 3-Ethical aspects in Animal Biotechnology.

Unit - 3

- 1-Biofouling and Control technology.
- 2-Bioremediation.
- 3- Use transgenic technology to study fish growth and development

Unit 4

- 1-Genetic engineering and ploidy manipulation to enhance growth reproduction .
- 2-Development of disease resistance in aquaculture species.
- 3-Cryobiology in Marine germplasm preservation Pharmaceuticals from marine organisms.

Block-2

Unit 1

- 1- Cell and environment.
- 2- Transport of ions across membrane.
- 3- Mechanism of synaptic transmission.

Unit 2

- 1- History of animal cell culture.
- 2- Types of primary cell culture.
- 3- Chicken embryo fibroblast culture.

Unit 3

- 1- Chicken liver and kidney culture.
- 2- Behavior of cells in culture condition.
- 3- Selection of medium and serum.

Unit 4

- 1- Metabolism of estimation of cell number.
- 2- Development of cell lines.
- 3- Stem cell ,Charecterization and maintenance of cell lines.

Block 3-

Unit 1

- 1- Cell culture : laboratory design and equipments.
- 2- Physiochemical properties of Media.
- 3- Secndry culture.

Unit 2

- 1- Organ and suspension culture.
- 2- Balance salt solution , antibiotic and growth supplemets.
- 3- Continuous cell lines.

Unit 3

- 1- Cell cloning and selection
- 2- Transfection and transformation of cells.
- 3- Application of cell culture for in vitro testing of drugs.

Unit 4

- 1- Cell culture reactors.
- 2- Scale up suspension.
- 3- Fluized bed reactor for suspension culture.

BBT-502: Plant Biotechnology

Total Credit : 3

Block 1-

Unit I

- 1-Plant genome organization, structure of representative plant genes and gene famiLies in pLants –
- 2-Organisation of chLoroplast genome, nucLear encoded and chLoroplast encoded genes for chLoroplast proteins, targeting of oroteins to chLoroplast –
- 3- Organisation of mitochondria! genome - encoded genes for mitochondrial proteins - RNA editing for pLant mitochondria

Unit 2

- 1- Symbiotic nitrogen fixation in Legumes by Rhizobia - Nitrogen fixation in Cyanophyta. the biochemistry ,moLecuLar bioLogy and gene rearrangement.
- 2- Agrobacterium and crown gall tumors - Mechanism of TDNA transfer to pLants, Ti pLasmid vectors and its utiliLity –

3 -Classification and molecular biology of plant viruses –

Unit 3

- 1-Genetic engineering in plants, selectable' markets, reporter genes and promoter used in plants by physical means –
- 2-Genetic engineering of plants for construction of genome Libraries and CDNA Libraries,
- 3-3-Molecular breeding.

Unit 4

- 1- cytoplasmic male sterility - Seed storage proteins - maize transposable elements, their organisation and function,
- 2-Transposable elements in transgenic plants .
- 3- Regulation of gene expression in plant development

Block 2

Unit 1

- 1-Laboratory organisation.
- 2-Different Type of sterilization technique.
- 3-Different type Culture.

Unit 2

- 1--Plant hormones and phytochrome.
- 2- Micropropagation.
- 3-Technique for single cell culture.

Unit 3

- 1-Describe Anther culture, Microspore culture.
- 2- Significance and uses of haploids
- 3-Explain Protoplast Isolation .

Unit 4

- 1-Describe the Somatic Hybridization.
- 2- Identification and selection of hybrid cells.
- 3-Verification and characterization of somatic hybrids.

Block 3

Unit 1

- 1- Explain Nutrition medium.
- 2- Describe the different technique of sterilization of explants.
- 3- Embryo culture.. callus culture .

-

Unit 2

- 1- Organogenesis, Embryogenesis.
- 2- Production of secondary metabolite.
- 3- Biotransformation.

Unit 3

- 1-Chromosome elimination techniques for production of haploids
- 2-Somaclonal variation
- 3- Cryopreservation

Unit 4

- 1-Cytodifferentiation ,Organogenic differentiation.
- 2- Gametoclonal variation
- 3- Slow growth method,

BBT-503: Environmental Biotechnology

Total Credit : 3

Block 1

Unit-1

- 1-Environment: basic concepts and issues ; environmental pollution : types and methods for the measurement;
- 2- Methodology of environmental management- problem solving approach, its Limitations;
- 3-Air pollution and its control through biotechnology, air sampling techniques;

Unit -2

- 1-Water pollution and its control: water as a scarce natural resource, need for water management, sources and measurement of water pollution,
- 2-Waste water treatment-physical, chemical and biological treatment processes;
- 3-Algal blooms and human health.

Unit-3

- 1-Microbiology of waste water treatments : aerobic process- activated sludge, oxidation switches, trickling filter, towers, rotating discs, rotating drums, oxidation ponds;
- 2-Anaerobic processes- anaerobic digestion, anaerobic filters,
- 3-Upflow anaerobic sludge blanket reactors;

Unit-4

- 1-Microbial degradation of xenobiotics in the environment - ecological considerations, decay behaviour .
- 2-Degradative plasmids, hydrocarbons, substituted hydrocarbons, oil pollution, surfactants, pesticides;
- 3-Bioaccumulation of metals and radio-nuclerds and detoxification ;
- 4-Bioremediation.

Block 2

Unit-1

- 1- Environment Priorities in India.
- 2- Environmental components.
- 3- Origin and evolution of Biosphere.

Unit 2

- 1- Man and Environment.
- 2- Environmental Ethics.
- 3- Current Status of Major resources.

Unit 3

- 1- Environmental Pollution.
- 2- Air pollution and Controlling through biotechnological approach.
- 3- Water pollution and its control.

Unit 4

- 1- Noise pollution .
- 2- Nuclear pollution and its effect on Human beings.
- 3- Land pollution

Block 3

Unit-1

- 1- Biogeochemical cycle.
- 2- Source and nature of pollutants.
- 3- Marine pollution.

Unit 2

- 1- Agricultural wastes and Sewage Sludges.
- 2- Biomedical waste and its control.
- 3- Green House gases and Global Climate Change.

Unit 3

- 1- Biodiversity :conservation and management.
- 2- Treatment schemes for waste waters of dairy, distillery, tannery industries;
- 3- Biotechnological Applications of microbes from extreme environment.

Unit 4

- 1-Biological N₂ fixation, H₂ production, biofertilizers and biopesticides;
- 2-Solid wastes: sources and management (composting, wormiculture and methane production).
- 3- Single cell protein (Spin/Una, yeast, mushroom);

BSCBT-504: Pharmaceutical Biotechnology

Total Credit : 3

Block-1

Unit 1

- 1-Production recombinant Pharmaceuticals
- 2-: Recombinant insulin
- 3-Human Growth factor synthesis
- 4-Recombinant factor VIII

Unit 2

- 1-Synthesis of:
Recombinant vaccine
- 2-Recombine Protein
- 3-Live recombinant vaccine

Unit 3

- 1-Identification of genes responsible for human disease.
- 2-Breast cancer
- 3-Autosomal dominant and recessive disorders.
- 4-X-linked disorders.

Unit 4

- 1-Gene therapy of somatic cell.
- 2-Genetic Manipulation of Germ cell.
- 3-Prospects and Ethics of gene therapy

Block-2

Unit-1

- 1- Metabolic pathway.
- 2- Regulatory mechanism of metabolic pathway
- 3- Glycolysis enzyme regulation.

Unit 2

- 1- Immobilized technology
- 2- Design and operation of immobilized enzyme reactor.
- 3- Enzymes in organic solvent and ionic liquid.

Unit 3

- 1- Agitation and aeration.
- 2- Mass and energy balance in microbial processes.
- 3- Kinetics of sterilization.

Unit 4

- 1- Heat transfer in bioreactor .
- 2- Instrumentation and control of bioprocesses.
- 3- Role of Dissolved oxygen concentration in the mass transfer.

Block-3

Unit 1

- 1- Structure of DNA –A,B and Z form.and triplex DNA.
- 2- Replication of single strand circular DNA.
- 3- Setellite DNA,DNA melting and buoyant density.

Unit 2

- 1- Prokaryotic Transcription.
- 2- Termination Rho dependent and independent.
- 3- Operon.

Unit 3

- 1- Ultra violet and infra red spectroscopy.
- 2- Nuclear magnetic Resonance.
- 3- Mass spectrophotometry.

Unit 4

- 1- Chromatography- Principle and application.
- 2- Vaccume and High performance liquid chromatography.
- 3- Counter current chromatography.

BBT-505: Practical

Total Credit : 3

Block -1

Unit-1

- 1- Practical application of tissue culture
- 2- Organ culture
- 3- Isolation of microorganism from soil

Unit-2

- 1- Isolation of antibiotic
- 2- BOD
- 3- COD

Unit-3

- 1- Primary cell culture.
- 2- Broth for animal culture.
- 3- Effect of antibiotic on bacterial growth.

Block-2

Unit -1

- 1- Operation of pH meter.
- 2- Operation of Microscope.
- 3- Operation of Magnetic stirrer with hot plate.

Unit -2

- 1- Operation of BOD incubator.
- 2- Operation of Colorimeter.
- 3- Operation of spectrophotometer.

Unit-3

- 1- Preparation of Media.
- 2- Preparation of broth.
- 3- Preparation of Gel.

Unit -4

- 1- Estimation of serum calcium and phosphorus.
- 2- Estimation of plasma protein.
- 3- Determination of Protein in Urine.

Block-3

Unit-1

- 1- Verification of Beer's law.
- 2- Determination of absorption maximum.
- 3- Electrophoresis of Proteins - native and under denaturing conditions.

Unit-2

- 1- Amino acid and carbohydrate separations by paper and thin layer chromatography.
- 2- Separation of blood cells by density gradient centrifugation.
- 3- Chromatographic method for separation of macromolecules.
Separation of sub cellular organelles by differential centrifugation.

Unit-3

- 1- Electrophoresis of DNA - linear, circular and super coiled.
- 2- Isolation of DNA through Lysis Buffer

Unit-4

- 1- Operation of UV-Visible spectrophotometer.
- 2- Operation of IR Spectrophotometer.

SEMESTER VI

BSCBT 601- Bioinformatics

Total Credit : 3

Block-1

Unit-1

- 1-Overview of Bio-Informatics-
- 2-Database types,
- 3-sequence database-

Unit-2

- 1-nucleotide sequence database,
- 2-Protein sequence data base,
- 3-primary and secondary database,

Unit -3

- 1-Gene Bank,
- 2-Structure database
- 3--protein Data Bank(PDB),

Unit-4

- 1- Visualization of structural information,
- 2- Genomics and the genome.
- 3- Project sequencing and sequence assembling using computers.

Block-2

Unit-1

- 1-Introduction to Bioinformatics,
- 2-EMBL,
- 3- SQL,

Unit-2

- 1- NCBI,
- 2- Protein Data bank,
- 3- DDBJ,

Unit-3

- 1- Protiomics ,
- 2- Genomics,
- 3- Microarray

Unit-4

- 1- ,MALDI-TOF
- 2- ,Protein Chip.
- 3- Application of Protiomics Northern Blotting.

Block-3

Unit-1

- 1- Sequence Allignment,
- 2- Biological data base,
- 3- Search Tools,

Unit-2

- 1- Structure Allignment,
- 2- Biliding of a Tree,
- 3- Protein Identification using

Unit-3

- 1-Bioinformatics,
- 2-Gene prediction using Bioinformatices.
- 3-Human Genome Gene Expression,

Unit-4

- 1- Phylogenetic tree.
- 2- DDBJ
- 3- Nuclotide sequence database.

BSCBT-602 -Drug Design

Total Credit: 3

.Block-1

Unit-1

- 1- History of drug discovery, enzyme /receptors as drug
- 2- Receptors as drug targets
- 3- Enzyme as drug targets

Unit-2

- 1- Molecular biology for drug discovery
- 2- Recombinant proteins as drug
- 3- Monoclonal antibodies as drugs

Unit-3

- 1- Molecular basis of disease processes
- 2- Target identification .
- 3- Validation

Unit-4

- 1- Drug discovery in cancer research
- 2- Apoptosis.
- 3- Tumor formation and its cure.

Block-2

Unit-1

- 1-Solid phase synthesis for drug discovery
- 2-Parallel synthesis vs split-pool
- 3-Water toxicology.

Unit-2

- 1-Immunotoxins as drugs
- 2-Ricin a plant toxin used as Immunotoxins
- 3- High dosage drug.

Unit-3

- 1-Drug designing by blocking enzyme activity
- 2- Distribution of Drugs
- 3-Disease-related factors

Unit-4

- 1-Computational drug designing by docking.
- 2-Absorption of Drug.
- 3-Metabolism of Drug.

Block-3

Unit-1

- 1-Organic synthesis for drug discovery.

Target oriented organic synthesis
Excretion of Drug.

Unit-2

- 1-Applications of drug in day to day life.
- 2-Hepatic Clearance.
- 3-Biotransformation.

Unit-3

- 1-Patenting of drug,
- 2-International Pharma Top Organization
- 3- Rules and regulation for marketing of a drug

Unit-4

- 1-Intellectual property Rights and Protections
- 2-Patents
- 3-Copy Rights
- 4-Trade marks

BBT-603: Research Methodology

Total Credit: 3

Block-1

Unit-1

- 1-Introduction to Research:
- 2-Definition, Scope, Limitations, of Research
- 3- Types Of research.

Unit 2

- 1- Objectives of Research
- 2-Research Process
- 3-Research Designs

Unit 3

- 1-Data Collection: Secondary Data,
- 2-Primary Data,
- 3-Methods of Collection.

Unit 4

- 1-Scaling Techniques: Concept, Types,
- 2-Rating scales & Ranking Scales
- 3-Scale Construction Techniques, Multi Dimensional scaling.

Block-2

Unit 1-

- 1- Sampling Designs: Concepts, Types
- 2- Techniques of Sampling Design
- 3- Sample Size Decision

Unit 2

- 1 -Theory of Estimation and Testing of Hypothesis
- 2-Small & Large Sample Tests,
- 3-Tests of Significance based on t, F , Z test

Unit 3

- 1- Chi-Square Test.
- 2- Questionnaire. Designing
- 3 -Interviewing.

Unit 4

- 1- Tabulation,
- 2- Coding, Editing.
- 3- Interpretation and Report Writing.

Block-3

Unit-1

- 1-Formulation of Research problem
- 2-Charecterstics of research and research worker.
- 3-Classification of research in relation to nature method and nature of data.

Unit-2

- 1- Location and crieteria of selecting a research problem.
- 2- Reson for surveying related literature.
- 3- Allied and critical literature.

Unit –3

- 1- Hypotesis
- 2- Significancs of Hypothesis.
- 3- Types of Hypothesis.

Unit 4

- 1- Historical research.
- 2- Survey studies: Tool of survey and case studies.
- 3-Philosophical studies: Meaning, step in critical studies_

Block-1

Unit 1

- 1-Definition, scope Of biostatistics
- 2-Limitation of biostatistics;
- 3- concept of variables in biological systems;

Unit 2

- 1-Range, standard deviation variance,
- 2- Coefficient of variation;
- 3- Definition and basic properties of probability,

Unit 3

- 1- one way analysis of variance (sample size equal and unequal),
- 2- chi-square statistics, test of goodness of fit, test of independence of factor;
- 3- co-relation and its coefficient / Linear regression

Unit 4

- 1- Introduction to data base concept,
- 2- introduction to internet and its application,
- 3- introduction to MS office software,

Block 2

Unit I

- 1- Collection of data,
- 2- Classification of data,
- 3- Tabulation of data

Unit 2

- 1- Normal and binomial distribution function,
- 2- Test of significance, hypothesis, error,
- 3- Level of significance; t-statistics: test that a population mean equals a specified value, paired 't' test.

Unit 3

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- 1- Graphical diagrammatic representation of data,
- 2-Measures of central tendency (arithmetic, harmonic & geometric),
- 3- Median and mode; confidence Limit of population mean.

Unit 4

- 1- Coefficient regression equation & its diagram.
- 2-covering word processing, spreadsheets,
- 3-introduction to hardware graphics.

Block-3

Unit 1

- 1- Application of Biostatistics in Biotechnology
- 2- Partition coefficient
- 3- Binomial Theorem

Unit 2

- 1- Internet and its application
- 2- Explain www.
- 3- Regression.

Unit 3

- 1- Normal distribution.
- 2- Basis ANOVA.
- 3- Random sampling

Unit 4

- 1- Computer oriented statistical techniques by using Excel;
- 2- Frequency table of single discrete variable,
- 3- Computation of mean, variance and standard deviation;

Block -4

Unit-1

- 1-Introduction to Bioinformatics,
- 2-EMBL,
- 3- SQL,

Unit-2

- 4- NCBI,
- 5- Protein Data bank,
- 6- DDBJ,

Unit-3

- 4- Proteomics ,
- 5- Genomics,
- 6- Microarray

Unit-4

- 4- ,MALDI-TOF
- 5- ,Protein Chip.
- 6- Application of Proteomics Northern Blotting.

BBT-605- PRACTICAL

Total Credit : 3

Block -1

Unit-1

- 1- Isolation of industrially important microorganism for microbial processes.
- 2- Determination of thermal death point (TDP) and thermal death time (TDT) of microorganism for design of a sterilizer.
- 3- Comparative study of Ethanol production using different substrate .

Unit-2

- 1- Packing and sterilization of glass ware for cell culture.
- 2- Preparation of media and reagent for culture.
- 3- Primary culture technique for chicken embryo fibroblast

Unit-3

- 1- Isolation and Cultivation of lymphocytes.
- 2- Isolation of animal tissue.
- 3- Preparation of animal cell line.

Unit-4

- 1- Maintain cell line.
- 2- Preservation of Bacteria in mineral oil
- 3- Slant formation

Block -2

Unit-1

- 1- Cotton plugging
- 2- Data representation.
- 3- Estimation of carbohydrate in a given sample.

Unit-2

- 1- Collection of blood sample.
- 2- Formulation of drug.
- 3- Sub culturing

Unit-3

- 1- Selection in cell line development.
- 2- Storage of animal cell line.
- 3- Pipetting

Unit-4

- 1- Swabbing
- 2- Capping
- 3- Flaming

Block -3

Unit-1

- 1- Sterilization of media
- 2- Handling Dishes and Plates.
- 3- Uses of Liquid Nitrogen

Unit-2

- 1- Preparation of suspension culture.
- 2- Preparation of ECM.
- 3- Preparation of Screw caps.

Unit-3

- 1- Sterilization filter assemblies.
- 2- Preparation of BSS
- 3- Preparation of medium from 1 x STOCK.

Unit-4

- 1- Preparation of medium from 10 x STOCK.
- 2- Preparation of medium from powder.
- 3- Preparation of customized medium