

Biotechnology

**POST GRADUATE DEGREE STANDARD**

**PAPER - I CODE:018**

**PAPER - I  
BASIC SCIENCES**

**UNIT I**

**MICROBIOLOGY:**

- (a) Microbiology classification, monophology, characterisation and isolation
- (b) Metabolism, Growth
- (c) Environmental effect
- (d) Axenic mixed culture concept - interaction and ecosystem model.

**UNIT II**

**IMMUNOLOGY AND VIROLOGY:**

- (a) Immunity and antibodies,
- (b) Immuno regulations
- (c) Molecular variability of antibody specificity
- (d) Immunological techniques - immuno electrophoresis - etc.,
- (e) Ultrastructure of viruses,
- (f) DNA and RNA viruses
- (g) Viral infections
- (h) Retroviruses
- (i) Interferons - mechanism of action ect.,

**UNIT III**

**CELL AND TISSUE CULTURE:**

- (a) Different cell lines - characterisation and maintenance
- (b) Hybridoma technology
- (c) Tissue organisation
- (d) Mechanical factors analysis.

**UNIT IV**

**GENETICS AND MOLECULAR BIOLOGY:**

- (a) Chromosome, Plasmids
- (b) Genetic mapping
- (c) Mandelian and Non-Mandelian Principles
- (d) Genetics and Society
- (e) DNA and RNA
- (f) Coding system - genetic regulation
- (g) Operon - promoter - repressor relation
- (h) Eucaryotic regulation

**UNIT V**

**APPLIED GENETICS**

- (a) R-DNA Protoplast Fusion
- (b) Role of d NTPs
- (c) In vitro DNA Synthesis
- (d) Site - directed mutagenesis - PCR, SSDNA and DSDNA Cloning

- (f) Vectors - Properties etc., Restriction mapping
- (g) c DNA and Genomic library
- (h) RFLP

UNIT VI  
PHYSIOLOGY

- (a) Special Sensory mechanisms
- (b) Body fluids - Properties etc.,
- (c) Histological studies of organs and tissues

UNIT VII  
BIOCHEMISTRY AND BIOPHYSICS:

- (a) Supra molecular assemblies
- (b) Biomembrane
- (c) Metabolism
- (d) Bioenergetis
- (e) Biopolymer structure and function
- (f) Irreversible thermodynamics in biology

UNIT VIII  
BIO-INORGANIC & BIO-ORGANIC CHEMISTRY :

- (a) Metalloproteins
- (b) Transition metal in biological reactions
- (c) Role of chelating agents and metals in medicine
- (d) Trace elements absorbtion
- (e) Transport and tissue storage
- (f) Carbohydrate biopolymers
- (g) Glycoproteins

UNIT IX  
MEMBRANE SCIENCE

- (a) Analysis of membrane assymetry
- (b) Lipid - protein interactions
- (c) Lipid components in membranes
- (d) Lipsomes
- (e) Membrane potentials
- (f) Membrane bound enzymes, transport and receptors

UNIT X  
BIO ANALYTICAL TECHNIQUES

- (a) IR, NMR, Mass spectrometry principles
- (b) Ion beam technique
- (c) Time resolved fluorescenes spectroscopy
- (d) X-ray crystallography
- (e) Microscopy
- (f) Spectrometry, fluorimetry etc.,

PAPER - II  
APPLIED & ENGINEERING SUBJECTS

UNIT I  
BIO-PROCESS TECHNOLOGY:- (a) Energy, Mass and momentum transfer

- (b) Material and enrgy balances

- (c) Upstreaming operations - Sterilization, air filter design
- (d) Biological process principle
- (e) Statistical optimisation techniques in biological system - Plackett - Burman, CCD, ANOVA analysis and contour interpretation.
- (f) Cellular and enzymatic reactions.

#### UNIT II

##### PROTEIN ENGINEERING AND BIO-INFORMATICS:-

- (a) Protein data bank
- (b) Protein structures; structure & function analysis
- (c) Domain analysis in proteins
- (d) Protein design, protein sequencing

#### UNIT III

##### BIO-CONVERSION AND FERMENTATION TECHNOLOGY:-

- (a) Bioconversion of starch, cellulose, corn
- (b) Bioenergy production
- (c) Industrial applications of cells and enzymes
- (d) Biopolymer design and synthesis
- (e) Fermentation technologies for waste stabilization and bio-product synthesis.
- (f) Antibiotics and steroid fermentation

#### UNIT IV

##### DOWNSTREAM TECHNOLOGY:-

- (a) Flocculation, Coagulation, Centrifugation
- (b) Equilibrium (stage) processes - distillation and liquid - liquid extraction.
- (c) Chromatography - GPC, Ion-exchange, affinity
- (d) Separation of intracellular products
- (e) Membrane Separations - Reverse Osmosis, ultrafiltration, Microfiltration
- (f) Aqueous two phase system
- (g) Supercritical fluid extraction.

#### UNIT V

##### KINETICS AND THERMODYNAMICS IN BIO-PROCESSES:-

- (a) Monod's equation - generalized Monod' equation
- (b) Structured models

(c) Application of Arrhenius equation

(d) Stability analysis of cellular and enzymatic processes -  $D^*$ ,  $DS^*$ ,  $DH^*$  calculation.

#### UNIT VI

##### BIO-REACTORS:-

(a) Basic principles of bioreactors

(b) Configuration and their analysis

(c) Non-ideal effects

(d) Control of bioreactor

(e) Bioreactor modelling and stability analysis

(f) Mechanical design concept

#### UNIT VII

##### PROCESS DESIGN AND SCALE-UP:-

(a) Flow sheet analysis

(b) Identification of crucial factors in processes

(c) Computer - aided design

(d) Scale-up criteria -  $k_a$ , power number etc.,

(e) Economic analysis for process scale-up and scale-down

#### UNIT VIII

##### FOOD TECHNOLOGY:-

(a) Components in food

(b) Basal metabolic rate

(c) Long term preservation - canning, freeze drying, spray drying

(d) UHT concept and pasteurization

#### UNIT IX

##### PHARMACEUTICAL SCIENCE AND ENGINEERING:-

(a) Pharmacokinetics

(b) Major unit operations in pharmaceutical processing of antibiotics, life saving drugs and their formulation.

(c) Concept of LD50.

#### UNIT X

##### LABORATORY HYGIENE AND ENVIRONMENT SAFETY:-

(a) Biosafety regulations

(b) Handling of genetically engineered organisms

(c) Disposal of radioactive components and other health hazard substances

(d) Public health and pollution problems

(e) Waste management, recycling