

B.Sc. Biotechnology
Semester- 3 and 4
(With Effect from June 2012)

				Exam		
		Instruction hrs week	Internal	Uni. Exam	Total	Credit
Semester-III						
Core Compulsory Course (CCC)						
CCC-I-3	Core Course-I (Paper-3) (Biotechnology)	3	30	70	100	3
CCC-I-4	Core Course-I (Paper-4) (Biotechnology)	3	30	70	100	3
CCC-II-3	Core Course-II (Paper-3)	3	30	70	100	3
CCC-II-4	Core Course-II I(Paper-4)	3	30	70	100	3
Practical Core Course (PCC)						
PCC-I-3	Practical Core Course-I (Paper-3) (Biotechnology)	3		50	50	1.5
PCC-I-4	Practical Core Course-I (Paper-4) (Biotechnology)	3		50	50	1.5
PCC-II-3	Practical Core Course-II (Paper-3)	3		50	50	1.5
PCC-II-4	Practical Core Course-II (Paper-4)	3		50	50	1.5
Foundation Course (FC)						
FCG-3	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
Elective Course (EC)						
ECG-3	Elective (Generic) Course -I	2		50	50	2
ECS-3	Elective (Subject) Course –I (Biotechnology)	2		50	50	2
		30	135	615	750	24
Instruction hrs/week Internal exam Uni. Exam Total Credit						

Semester-IV						
Core Compulsory Course (CCC)						
CCC-I-5	Core Course-I (Paper-5) (Biotechnology)	3	30	70	100	3
CCC-I-6	Core Course-I (Paper-6) (Biotechnology)	3	30	70	100	3
CCC-II-5	Core Course-II (Paper-5)	3	30	70	100	3
CCC-II-6	Core Course- II(Paper-6	3	30	70	100	3
Practical Core Course (PCC)						
PCC-I-5	Practical Core Course-I (Paper-5) (Biotechnology)	3		50	50	1.5
PCC-I-6	Practical Core Course-I (Paper-6) (Biotechnology)	3		50	50	1.5
PCC-II-5	Practical Core Course-II (Paper-)	3		50	50	1.5
PCC-II-6	Practical Core Course-II (Paper-6)	3		50	50	1.5
Foundation Course (FC)						
FCG-4	Foundation (Compulsory) course (Generic) - English (L.L.)	2	15	35	50	2
Elective Course (EC)						
ECG-4	Elective (Generic) Course - I	2		50	50	2
ECS-4	Elective (Subject) Course - I	2		50	50	2
		30	135	615	750	24

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Semester- 3

Core compulsory Course- I Paper 3
Paper: Cellular metabolism-I

Unit-1 Bioenergetics and Thermodynamics

1. Bioenergetics: Definitions of System, universe, Enthalpy, Entropy, Endothermic and Exothermic reactions, Gibbs Free energy, Equilibrium constant & its biological significance.
2. Laws of thermodynamics, Relationship between standard free energy change, free energy change and equilibrium constant,
3. ATP as a universal energy currency of biological systems.
4. Biological oxidation: Redox reactions and Reduction potential, standard reduction potential E° Free-Energy Change

Unit-2 Basics of Enzyme

1. Enzymes: Enzyme as a biocatalyst, coenzyme, cofactor, Nomenclature and Classification of enzyme, Basic concept of enzyme substrate reaction.
2. Factor affecting on enzyme catalyze reaction
3. Overview of catalytic mechanisms of enzyme:
4. Enzyme kinetics: : M-M kinetics , Double reciprocal plot

Unit-3 Enzyme kinetics and regulation

1. Inhibition of enzyme.
2. Quaternary structure of protein: Hemoglobin
3. Regulations of enzymes- allosteric and Covalent regulation :
4. Basic concept of metabolism.

Unit-4 Glucose Metabolism

1. Glycolysis and fate of pyruvate (Alcohol and lactic acid fermentation.)
2. TCA cycle
3. Pentose phosphate pathway
4. Gluconeogenesis.

Unit-1 Classical genetics

1. Mendel's laws of heredity, Test cross, Complete and Incomplete dominance
2. Types of linkages, Sex linkage in drosophila & Mechanism of Crossing over
3. Multiple allele
4. Genetic interaction

Unit-2 Mutation

1. Mutagenic agents and its types
2. Chromosomal mutation: Variation in Number & Structure: Euploidy, Aneuploidy, Polyploidy, Deletion, Duplication, Inversion, Translocation, Position Effect, Centromeric & Non-centromeric breaks in chromosomes, Chromosomal Mosaics
3. Mutation at Molecular level
4. Inborn metabolic error in human

Unit-3 Spectroscopy

1. Interaction of EM radiation with matter : Overview of Electromagnetic spectrum;
2. UV-Vis spectrophotometer: Principle, Instrumentation, working and Application
3. Atomic spectroscopy: Principles and application of Atomic Absorption / Emission Spectrometer
4. Basics of IR, X-Ray diffraction and NMR and their application in biotechnology

Unit-4 Chromatography

1. Chromatography :Basic Theory of Chromatography, Partition theory and solvent extraction
2. Partition and adsorption chromatography
3. Application -Planner Chromatography, (Paper Chromatography, TLC) ,
4. Column chromatography : GC, Ion exchange, Gel exclusion, Affinity and HPLC

Practical Core Course (PCC-I-3 & PCC-I-4)
(Course I (Paper 3 and 4))
Semester- 3
Practical

Estimation of Protein & Sugar

1. Quantification of protein using by Biuret test
2. Quantification of protein using by Folin -Lowary assay.
3. Quantification of protein using by Bradford's method
4. Estimation of Reducing Sugar by DNSA method

Assaying of various enzymes (any three):

5. Amylases.
6. Phosphatases
7. Invertase.
8. Proteolytic enzymes.
9. Lipases

Enzyme Kinetics:

10. Effect of Substrate concentration (Determination of K_m and V_{max}).
11. Determine temperature optima of the enzyme.
12. Effect of pH on enzyme activity.
13. Effect of enzyme concentration

Analytical techniques

14. To determine maximum absorption spectra of colored solution.
15. Paper Chromatography of Amino acids
16. TLC Chromatography of Amino acids

Unit -1 Biostatistics

1. **Definition and Scope of Biostatistics**: Collection, Classification and tabulation of data and its graphical and Diagrammatic representation.
2. Types and significance of **Sampling** in Biostatistics
3. **Measure of central tendency**: Mean, Mode and median, Harmonic and geometric mean
4. **Measure of dispersion**

Unit -2 Biostatistics

1. Comparison of sample mean by **Student's "t" test**
2. Comparison of sample mean by **ANOVA**
3. Chi square analysis
4. Probability distribution: Binomial and Poisson

Unit -1 Animal hormones-I

1. Definition, General Functions, Types Vertebrate Hormones :
2. **Steroid Hormones**: Ovarian hormones, Testicular hormones,
3. **Steroid Hormones**: Adrenal cortical hormones, Corpus luteal hormone
4. Amino Acid Derivatives : Thyroidal hormones, Adrenal medullary hormones

Unit -2 Animal hormones-II

- 1 Peptide Hormones : Pancreatic hormones, Hypophyseal hormones, Parathyroidal hormones
- 2 Peptide Hormones: Gastro-intestinal tract hormones, Corpus luteal hormone
- 3 Parahormones or Tissue Hormones
- 4 Hormone from Thymus

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Semester - 4

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Core compulsory Course I (Paper 5)

Paper: Cellular metabolism-II

Unit-1 Lipid and amino acid metabolism

1. Lipid metabolism.: Lipid oxidation (Beta Oxidation)
2. Fatty acid biosynthesis
3. Amino acid metabolism: Oxidation, transamination, Deamination,
4. Urea cycle

Unit-2 Nucleotide metabolism and Oxidative phosphorylation

1. Catabolism of nucleotides :
2. Overview of biosynthesis of nucleotides of nucleotides :
3. Oxidative phosphorylation: ETC of mitochondria, electron carriers, complexes of ETC,
4. ATP generation coupled to electron transport

Unit-3 Nucleotide metabolism and Oxidative phosphorylation

1. Photophosphorylation in bacteria,
2. Photophosphorylation in plant
3. Carbohydrate synthesis coupled to photophosphorilation. C3 cycle.
4. C4 cycle

Unit-4 Membrane transport & signal transduction

1. Membrane transport: Diffusion, Active Passive transport
2. Introduction to signal transduction pathways
3. Types of signaling receptors
4. Signaling pathways: epinephrine, insulin

Unit-1 Introduction to Microorganisms

1. **Bacteria:** Major Characteristics of microorganism. Taxonomic group, General methods of classifying bacterial. Nomenclature, Introduction to Bergey's manual.
2. **Fungi:** General characteristics and Economic importance of fungi.
3. **Algae & Protozoa :** Biological and economical importance
4. **Virus:** General characteristics, structure and Classification of Bacteriophage. Lytic cycle and lysogenic cycle.

Unit-2 Microbial physiology

1. **Types of bacteria** based on Carbon , energy, electron sources and pH, temperature, and O₂ requirement
2. **Culture media** and its types, Methods of **isolation** of bacterial
3. Reproduction in bacteria, Bacterial **growth curve**.
4. Methods **Measurement** of bacterial growth

Unit-3 Control of microbial growth

1. Introduction of terms: Sterilization, Disinfection, Antiseptic, Germicide, Chemotherapy, Antibiotic etc.
2. **Physical agent:** Mode of action and application of Temperature. Radiation and Filtration.
3. **Chemical agent:** Mode of action and application of Phenol, alcoholic and halogen compounds.
4. **Chemical agent :** Mode of action and application of Heavy metal and Gaseous agent

Unit-4 Microbial Diseases and prevention

1. Overview on Origin of **Chemotherapy**.
2. **Antibiotics:** Class of antibiotics based on mode of action, Antifungal & Antiviral antibiotic
3. **Introduction of terms:** infection, pathogen, virulence, carrier, nosocomial and opportunistic infections, sepsis, septicemia, septic shock, virulence factors etc.
4. **Microbial pathogenesis:** Representative diseases to be studied in detail are **Bacteria:** cholera, typhoid, tuberculosis, **Viruses :** AIDS. **Fungi:** mycoses. **Protozoa:** amoebiasis,

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Semester- 4
(PCC-I-5 & PCC-I-6 (Paper 5 and 6))
Practical

Microbiology

1. Introduction to culture media , and growth on solid media and in liquid media
2. Introduction to Isolation techniques - Streak plate, pour plate, spread plate
3. Standard plate technique
4. Isolation of Yeast,
5. Isolation of Mold
6. Study the effect of Environment on growth –Temperature, -
7. Study the effect of Environment on growth – pH,
8. Study the effect of Chemicals ,
9. Study the effect of Heavy metal,
10. Study the effect of Antibiotics
11. Study of Biochemical test

Test for carbohydrate: Sugar fermentation, M-R, VP, Citrate utilization, TSI, Starch

Test for Nitrogen substrate: Indol, H₂S, Urea, Protein, Phynylalanine, Ammonia

Growth on specific media: EMB, Mac Conky;' agar, Catalase test

12. Study of pure culture: *E. coli*, *Bacillus*, *Proteus vulgaris*.
13. Isolation of Bacteriophage

Estimation of biomolecules

14. Lipid estimation
15. Amino acid estimation
16. Quantification of DNA.
17. Urea estimation by DAM

Mendelian genetics

18. Genetic problems based on Mendelian genetics.

Unit -1 : General

1. **Respiratory Tract infection** : Rhinitis (common cold), Pertussis, Tuberculosis, Pneumonia
2. **Urogenital Tract infection** : Vulvovaginitis, Gonorrhoea, Syphilis
3. **Infection of Digestive Glands and Peritoneum** : hepatitis, Yellow fever (liver)
4. **Eyes and ears infection** : Conjunctivitis/scleritis, Otitis media

Unit -2

1. **Gastrointestinal Tract infections** : Shigellosis (dysentery) Cholera, Salmonellosis, Amebosis
2. **Infections of Nervous System** : Meningitis, Tetanus, Botulism
3. **Infections of Hematopoietic and Lymphoreticular System** : Plague, HIV infection, Malaria
4. **Infections of Skin and Subcutaneous Connective Tissue** : Smallpox, Herpes, Measles

Unit -1 Plant hormones-I

1. Definition, General Functions, Types of Plant Hormones :
2. Auxins
3. Gibberellins
4. Cytokinins (= Kinins),

Unit -2 Growth Inhibitors

1. Abscisic Acid
2. Morphactins
3. Oligosaccharins and Other Natural Growth Hormones In Plants
4. Plant Hormones Versus Animal Hormones