

Name of the Department: Microbiology

Semester-III

DSC 3 : Microbial biochemistry, genetics and physiology

Course Title: Microbial biochemistry, genetics and physiology	Course code: 21BSC3C3MBL
Total Contact Hours: 52 Hours	Course Credits: 04
Internal Assessment Marks: 30 Marks	Duration of SEE/ Exam: 03 Hours
Semester End Examination Marks: 70 Marks	

Course Outcomes (CO's):

At the end of the course, students will be able to:

1. To understand the aqueous nature of solutions and clinical biochemistry
2. To understand the role of microorganisms in the metabolism of biomolecules.
3. To learn the microbial physiology.
4. To study the genetics and gene regulation

DSC 3: Microbial Biochemistry, Genetics and physiology

Unit	Description	Hours
1	Aqueous solutions and Acid Biochemistry: Structure and properties of water molecule. units of expressing and inter-converting concentration of solutions: molarity, moles, normality, osmolarity, molality, mole fraction, Bronsted Concept of conjugate acid – conjugate base pairs, ionization of solutions, pH, titration curves. Buffers: preparation, action and their use in Biology, Henderson-Hasselbalch equation, buffer capacity, polyprotic acids, amphoteric salts, ionic strengths.	10 Hrs
2	Biomolecules: Structure and function of protein and peptide bond, classification, Ramachandran plot, factors determining secondary, tertiary structures: Structure and function of Carbohydrates; classification, Structure and function of Lipid, classification, structure of lipids in membranes, Structure and function of Nucleic acids.	10 Hrs
3	Metabolism of Biomolecules Glycolysis, regulation. Glycogenesis, glycogenolysis, gluconeogenesis, regulations; TCA cycle, regulations. Amphibolic nature of TCA cycle. HMP shunt. Fatty acid oxidation (β -oxidation), energetics of palmitic acid	10Hrs

	oxidation. Ketone bodies, ketogenesis, Ketonemia, ketonuria, ketosis, Biosynthesis and degradation of cholesterol. Transamination, deamination, decarboxylation; Urea cycle - regulation. Metabolism of ammonia; Synthesis and degradation of Glycine, phenylalanine; Synthesis and degradation of Sulfur containing amino acids. Nucleotide metabolism of IMP, AMP and GMP, Salvage pathway for purines, degradation of purine nucleotides. Biosynthesis and degradation of pyrimidine nucleotides.	
4	<p>Microbial physiology: Classification of microbes based on their physical adaptation. Classification of organisms based on nutritional sources such as carbon source, energy source and electron source, macro and micronutrients. Microbial Photosynthesis; Fermentation Reaction: Homo and Heterofermentation pathways; Biological Oxidation: Electron Transport System, Oxidative Phosphorylation; Introduction to two component signaling systems; Bacterial response to environmental stress, heat shock response, Quorum sensing, bioluminescence systems</p>	10 Hrs
5	<p>Genetics and gene regulation: Definition and scope of Genetics. Premendelian genetic concepts – Preformationism, Epigenesis, Inheritance of acquired characters, traits, Germplasm theory. Hereditary and Environment, Genotype and Phenotype. Microbes as genetic tools for genetic studies.</p> <p>Gene Regulation and expression: Operon concept, Repression of the lac operon, positive and negative regulation, inducers and co-repressors.</p> <p>Mutations: Types of mutations, null, leaky, and conditional mutations, mutations as random or adaptive events</p>	10 Hrs
<p>References:</p> <ol style="list-style-type: none"> Larry Snyder and Wendy Champness. Molecular Genetics of Bacteria. 3rd edition, ASM Press, Washington, D.C. 2007 Baumberg. S. Prokaryotic gene expression. Oxford University Press. 2002. Daniel L. Hartl. Essential Genetics. A genomics perspective, 5th edition, 2009. Jeremy W. Dale and Simon F. Park. Molecular Genetics of Bacteria. 2010. Nancy Trun and Janine Trempy. Fundamental Bacterial Genetics. Wiley-Blackwell Watson. J. D, Baker. T. A, Bell. S. P, Gann. A, Levine. M, Losick. R. Molecular Biology of Gene. 5thEdn. The Benjamin / Cummings Pub. Co. Inc, 2003. William Hays, 1980; The genetics of bacteria and their viruses, CBS Publ. New Delhi Jenkins JB, 1995; Genetics, Houghton Mifflin Co., Boston. Strickberger MW, 1990; Genetics MacMillan Publ. Co. Inc. New York. Stent GS & Calendar R, 1978; Molecular Genetics, Freeman & Co., San Francisco. Benjamin Lewin, 2005, Genes - VIII, John Wiley & Sons, New York Watson JD et al, 2004; Molecular biology of the Gene, Pearson Education India Hartwell LH et al, 2000; Genetics – from Genes to Genomes, McGraw Hill Publ., 17. Biochemistry 3rd edition, Mathew, Van Holde and Ahern, Pearson Education Principles of Biochemistry, 4th edition, Zubay, G., Wm.C. Brown Publishers, 1998 Principles of 		

22. Voet&Voet, 1995; Biochemistry, John Wiley & Sons, New York. 23.Nelson& Cox, 2000; Lehninger's Principles of Biochemistry, Elsevier Publ
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Date

Course Coordinator

Subject Committee Chairperson