

Subject Code: SC202000103	Subject Title: Cellular metabolism and Metabolic regulation.
COURSE TYPE: CORE COURSE	

Course Objective:

Living systems are based on the functions of various biochemical reactions that are basically based on biomolecules like, carbohydrates, lipids, proteins, and nucleic acids. The students would study metabolic pathways and their control.

Teaching scheme (hours) per week		Credit			Theory Marks		Practical Marks		Total
Theory	Practical	Theory	Practical	Total	Uni. Assessment	Cont. Assessment	Uni. Assessment	Cont. Assessment	
4	-	4	-	4	60	40	-	-	100

Unit	Content	Lectures	Weightage
1	Carbohydrate Metabolism Pathways for the Metabolism of Carbohydrates: Glycolysis (EMP), ED Pathway, Pentose Phosphate Pathway, Kreb's Cycle, Gluconeogenesis Metabolism of sugars other than glucose Fermentation Pathways.	15	25%
2	Nitrogen and Sulfur metabolism Biological Nitrogen fixation: The Nitrogen Fixation process, Symbiotic Nitrogen Fixation, Inorganic Nitrogen Metabolism, Assimilation of Inorganic Nitrogen, Regulation of Nitrogen fixation General Reactions of Amino Acids: Amino Acid Decarboxylases, Amino Acid Deaminases, Amino Acid Transaminases (Aminotransferases), Amino Acid Racemases, Role of pyridoxal-5'-Phosphate in Enzymatic Reactions with Amino Acids, The Stickland Reaction. Sulfur Metabolism: Sulfate assimilation, Sulfide formation and sulphide consumption by bacteria, Dissimilatory sulfate reduction, Microbial sulphur oxidation.	15	25%
3	lipid and Nucleotide metabolism Overview of amino acid biosynthesis, biosynthesis of six essential amino acid from oxaloacetate and pyruvate, synthesis of tryptophan, phenylalanine, and Tyrosine Biosynthesis of fatty acid Oxidation of Fatty Acids: α -, β - & ω - mode of Fatty Acid Oxidation and their energetics Degradation of nucleotides.	15	25%
4	Metabolic Regulation Concept of dynamic steady state Major Modes of Regulation Regulation of glycolysis and gluconeogenesis Regulation of Citric acid cycle Negative & Positive control of transcription	15	25%

	Regulation by Induction & Attenuation Control Mechanisms: <i>lac</i> & <i>trp</i> Operon Models		
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Learning Outcome:

Fundamental processes of life are governed by various metabolic reactions involving carbohydrates, lipids, proteins and Nucleic acids. The students will get in-depth knowledge of such processes by offering this course.

Reference Books:

1. Microbial Physiology by Albert G. Moat and John W. Foster. Third edition, John Wiley and Sons; 2002
2. Lehninger-Principles of Biochemistry by David L. Nelson and Michael M. Cox. Fifth Edition, W.H. Freeman and Company; 2008.
3. The Physiology and Biochemistry of Prokaryotes by David White. Second Edition, Oxford University Press; 2000.
4. Biochemistry by Geoffrey L. Zubay. Fourth Edition, Addison-Wesley educational publishers Inc., 2008
5. Microbial lipids edited by C. Ratledge and SG Wilkinson, second edition, Academic Press; 1988.
6. Biochemical Calculations by Irwin Segel., John Wiley and Sons, California, USA, 2004.
7. Guide to Protein Purification by M. P. Deutcher., Academic Press, San Diego, USA, 1993.