

Subject Code: 1SC2000104	Subject Title: Biochemistry
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 will learn the fundamental aspects of such biomolecules by opting for such course.

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	2	4	2	6	60	40	30	20	150

Unit	Content	Lectures	Weightage
1	<p>Unit :1 : Carbohydrates</p> <ul style="list-style-type: none"> ✓ Structure of monosaccharides, stereoisomerism and optical isomerism of sugars, reactions of aldehydes and ketone groups, ring structure and anomeric forms, mutarotation. ✓ Chemical reactions of sugars, important derivatives of monosaccharides, di- and tri- saccharides Structure ✓ Occurrence and biological importance of monosaccharides, oligosaccharides and polysaccharides, e.g. glycogen, Starch, cellulose, chitin ✓ Pathways for the Metabolism of Carbohydrates: Glycolysis(EMP), ED Pathway, Pentose Phosphate Pathway, Kreb's Cycle, Gluconeogenesis 	15	25%
2	<p>Unit :2: Proteins</p> <ul style="list-style-type: none"> ✓ Types & physico-chemical properties of amino acids, Unusual amino Acids ✓ Primary structure of proteins ✓ Secondary structure of proteins : α helix, β pleated sheet structures ✓ Tertiary structure of proteins: Forces that stabilize the structure, Concept of domains, Protein denaturation ✓ Quaternary structure of proteins: Subunit interaction ✓ Catabolic Reactions of Proteins: Deamination, Dehydrogenation, Transamination 	15	25%
3	Unit: 3: Lipids	15	25%

	<ul style="list-style-type: none"> ✓ Fatty acids: introduction, classification, nomenclature, structure and properties of saturated and unsaturated fatty acids ✓ Essential fatty acids ✓ Triacylglycerols: nomenclature, physical properties, chemical properties and characterization of fats - hydrolysis, saponification value, acid value, rancidity of fats, Reichert-Meissel number and reaction of glycerol. ✓ Biological significance of fats. ✓ Glycerophospholipids (lecithins, lysolecithins, cephalins. phosphatidyl serine, phosphatidyl inositol, plasmalogens), sphingomyelins, glycolipids-cerebrosides, gangliosides. ✓ Oxidation of Fatty Acids: α-, β- & ω- mode of Fatty Acid Oxidation and their energetics 		
4	<p>Unit :4: Nucleic Acids</p> <ul style="list-style-type: none"> ✓ Chemical structure & base composition of nucleic acids, Chargaff's rules. ✓ Double helical structures, Watson-Crick Model (B-DNA), Deviations from Watson-Crick Model, Other DNA helices (A-& Z-DNA) ✓ Forces stabilizing nucleic acid structures, Denaturation & renaturation, Sugar phosphate chain conformation, Base pairing, Base stacking, Hydrophobic and ionic interactions ✓ T_m & buoyant density and their relationship with G-C content in DNA, Satellite DNA ✓ DNA sequencing: Maxam-Gilbert & Sanger's dideoxynucleotide sequencing ✓ Structure of m-RNA, r-RNA & t-RNA 	15	25%

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. Biochemistry by Geoffrey L. Zubay. Fourth Edition, Addison-Wesley educational publishers Inc., 2008
2. Lehninger-Principles of Biochemistry by David L. Nelson and Michael M. Cox. Fifth Edition, W.H. Freeman and Company; 2008.
3. Microbial lipids edited by C. Ratledge and SG Wilkinson, second edition, Academic Press; 1988.

4. Microbial Physiology by Albert G. Moat and John W. Foster. Third edition, John Wiley and Sons; 2002
5. The Physiology and Biochemistry of Prokaryotes by David White. Second Edition, Oxford University Press; 2000.
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.
8. Physical Biochemistry: Principles and Applications by David Sheehan., John Wiley and Sons Ltd,
9. The Amino Sugars Vol.- 1A Roger W Jeanloz
10. The Proteins - 1 to 4(2nd ed.) Hans
11. Amino Acids, Peptides & Proteins Vol. 1 to Vol.4 (Review) G T. Young
12. Biochemistry: Chemical Reactions of the Living Cells(Vol.I & II) D.Metzerler
13. Biochemistry, Lubert Stryer, 6th Edition, WH Freeman, 2006.
14. Harper's illustrated Biochemistry by Robert K. Murray, David A Bender, Kathleen
15. M.Botham, Peter J. Kennelly, Victor W.Rodwell, P. Anthony Weil. 28th Edition, McGrawHill, 2009.
16. Biochemistry, Donald Voet and Judith Voet, 2nd Edition, Publisher: John Wiley and Sons, 1995.
17. Biochemistry by Mary K.Campbell & Shawn O.Farrell, 5th Edition, Cengage Learning, 2005.
18. Harper's Biochemistry –Murray, Granner, Mayes, and Rodwell –Prentice Hall International Inc
19. Biochemistry –Stryer–W. H. Freeman & Co.–New York
20. Text Book of Biochemistry–West, Todd, Mason, Bruggen–Amerind Publishing Co. Pvt., Ltd
21. Biophysical Chemistry, Principles & Techniques–Upadhyay, Upadhyay & Nath–Himalaya Publ. House
22. The Tools of Biochemistry–T. G. Cooper
23. Textbook of Biochemistry – S.Chand Publications
24. Principles & Techniques of Biochemistry–Keith Wilson & John Walker-Cambridge Univ. Press
25. Principles of Biochemistry–White, Handler, Smith–McGraw Hill Publ
26. Biologist's Physical Chemistry–T. G. Morris
27. Chromatography–G. Abbott
28. Methods in Experimental Biology–R. Ralph
29. Physical biochemistry–vanHolde–Prentice Hall Inc
30. Physical Biochemistry–D. Friefelder–W. H. Freeman & Co
31. Chromatography: A Lab Handbook of chromatographic and electrophoretic methods–Erich Heftman–Van Nostrand Reinhold, NY