GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering
Subject Code: 3130403
Semester – III
Basic Biochemistry and Calculations

Type of course: Professional Core Course

Prerequisite: Basic Knowledge of Chemistry

Rationale: It is basic subject for the students of Bio-technology. Biotechnology deals with micro- and macro-molecules which carry out all the functions in the organism. Study of these molecules is important for research related to study of action of these molecules and metabolic diseases related to these molecules.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
L	T	P	C	Theory Marks		Practical Marks		
				ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Contents:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Chemical Basis of Life** Chemical basis of life: Miller-Urey experiment, abiotic formation of amino acid oligomers, composition of living matter; Water – properties of water, essential role of water for life on earth pH, buffer, ionization and hydrophobicity, emergent properties of biomolecules in water	6	11%
2	**Carbohydrates** Mono-, Di- and Polysaccharides, Glycoconjugates, Glycolysis, Gluconeogenesis, The Pentose Phosphate Pathway, Glycogen Metabolism, Citric Acid Cycle, Regulation of pathways.	12	21%
3	**Amino acids, Peptides and Proteins** Amino acids – structure and functional group properties, peptides and covalent structure of proteins, elucidation of primary and higher order structures, Motifs and Domains, Ramachandran plot, Biosynthesis of Amino Acids, Metabolic Fates of Amino Groups, Nitrogen Excretion and the Urea Cycle, Pathways of Amino Acid Degradation	14	26%
4	**Nucleic Acids**	12	21%

	Nucleosides, Nucleotides, nucleic acids – structure, Three-Dimensional Forms of DNA, types of RNA, Biosynthesis and degradation of nucleotides		
5	**Lipids** Lipids – structure and properties of important members of storage and membrane lipids; lipoproteins, Mobilization and Transport of Fats, , Oxidation of Fatty Acids, Ketone Bodies, Biosynthesis of Membrane Lipids and Steroids	12	21%

Suggested Specification table with Marks (Theory): (For BE only)

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
5	**40**	**20**	**20**	**15**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books:

1. Stryer, L. (2015). Biochemistry. (8th Ed.) New York: Freeman.
2. Lehninger, A. L. (2012). Principles of Biochemistry (6th Ed.). New York, NY: Worth.
3. Voet, D., & Voet, J. G. (2016). Biochemistry (5th Ed.). Hoboken, NJ: J. Wiley & Sons.
4. Murray, R.K., Granner, B.K., Mayes, P.A., Rodwell. V.W., Harper's Biochemistry, Prentice Hall International.
5. Creighton. T.E., Proteins, Structure and Molecular Properties, 2nd Edition, W.H. Freeman and Co., 1993.

Course Outcome:

Sr. No.	**CO Statement**	**Marks % Weightage**
CO-1	To gain fundamental knowledge in biochemistry	35%
CO-2	To build upon undergraduate level knowledge of biochemical principles with specific emphasis on different metabolic pathways.	35%
CO-3	To understand regulation of various biochemical pathways.	15%
CO-4	To learn and apply various quantitative and qualitative methods of estimation of biomolecules.	15%

LIST OF PRACTICALS:

1. Preparation of solutions and Buffers.
2. Spectrophotometry and its calculations.
3. Qualitative Analysis of Carbohydrates
4. Quantitative Analysis of Carbohydrates
   a. Estimation of monosaccharides and disaccharides by Cole's method
   b. Estimation of reducing sugar by Dinitrosalicylic acid method.
   c. Determination of total carbohydrate by Anthrone Method.
   d. Estimation of ketose sugar by Roe's method.
5. Estimation of amino acids by Ninhydrin test.
6. Comparing different methods of protein estimation.
7. Estimation of free fatty acids
8. Estimation of DNA
9. Estimation of RNA

Reference Books:

1. Biochemical Methods by S. Sadasivam and A. Manickam, New Age International Publishers, 2nd Edition.
2. Introductory Practical Biochemistry by S. K. Sawhney and Randhir Singh, Narosa Publishing House,

Major Equipment:

1. Spectrophotometer
2. Colorimeter

List of Open Source Software/learning website:

1) Literature available in any laboratory manual of Basic Biochemistry.

2) NPTEL

3) MIT Open course lecture on Biochemistry.