Syllabus for Master of Science in Biotechnology

Subject Code: 02BT0401

Subject Name: Biochemistry (Core)

M. Sc. Semester - I

Objective: To provide students with a systematic approach of molecules of living systems and their biological functions and applications.

Credits Earned: 4 Credits

Course Outcomes: After completion of this course, students will be able to:

1. Understand the concepts, properties and behaviour of biomolecules and their reactions.
2. Explain the structure, composition, properties and metabolism of various biomolecules like carbohydrate, nucleic acids, lipids, proteins and vitamins etc.
3. Apply knowledge in developing concepts about biological functions and applications of biomolecules in various fields.
4. Explain the metabolic disorders associated with abnormal metabolism.

Pre-requisite of course: Basic knowledge of Biomolecules

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	IA (M)	CSE (I)	Viva (V)	Practical/ TW	
4	0	0	4	50	30	20	0	0	100

Contents:

Unit	Topics	Contact Hours
1	**Introduction to Biochemistry and Biomolecules** Introduction to the chemistry of life, Properties of Water, Concept of acids, bases & buffer, Thermodynamics, concept of free energy, High energy compounds and their importance in life. Carbohydrates, lipids, amino acids, vitamins and nucleic acids: classification, structure, properties and biological functions. Glycoproteins and glycolipids, membrane lipids, lipoproteins. Assembly of lipids, micelle, biomembrane organization, Difference in structure of RNA and DNA. Peptide linkage, Protein Folding, Primary, Secondary, Tertiary, Quaternary structures of Proteins, Protein Motifs & Domains, Ramachandran plot, structure-function relationships in model proteins, basic principles of protein purification.	20
2	**Carbohydrate and lipid metabolism** Carbohydrate metabolism: Glycolysis, Kreb's cycle, Electron transport and oxidative phosphorylation, F1-F0 ATP Synthase, Photosynthesis, chloroplasts and two photosystems, pentose phosphate pathway, gluconeogenesis, reciprocal regulations of glycolysis and gluconeogenesis, glycogenesis, glycogenolysis, reciprocal regulation of glycogen synthesis and breakdown, roles of epinephrine, glucagon and insulin in glycogen metabolism, glycogen storage disorders, Cori's disease and Pomes disease, glyoxalate pathway	16
3	**Amino acids metabolism** Biosynthesis and degradation of amino acids, regulation of amino acid metabolism, Inborn errors of amino acid metabolism.	10
4	**Lipid and Nucleic acids metabolism** Lipid metabolism: Biosynthesis and degradation of lipids, regulation of lipid metabolism. Biosynthesis and degradation of nucleic acid, regulation of nucleic acid metabolism.	14
	Total Hours	60

References:

1. Lehninger's Principles of Biochemistry, 6th edition, (2013) by David L. Nelson and Michael M. Cox; W. H. Freeman.
2. Fundamentals of Biochemistry, (2016) 5th Edition, Donald Voet, Judith G. Voet, W. Pratt; Wiley publishers.
3. Biochemistry (2013), 4th Edition by U. Satyanarayana, Elsevier.
4. Physical biochemistry: Principles and applications (2009), 2nd Edition, by David Sheeham; John Wiley and Sons.
5. Physical biochemistry: Applications to Biochemistry & Molecular Biology, (1982), by David Freifelder; W. H. Freeman.
6. Biochemistry by G. Zubay
7. Biochemistry by Stryer

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	25%	25%	15%	10%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, etc.

b. The internal evaluation will be done on the basis of continuous evaluation of students in the classroom in the form of attendance, assignments, verbal interactions etc.

c. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory.