

Institute of Microbiology and Molecular Genetics
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline



Programme	BS	Course Code	MMG105	Credit Hours	3(2+1)
Course Title	PRINCIPLES OF BIOCHEMISTRY				
COURSE INTRODUCTION					
<p>This course introduces the basic concepts in biochemistry in-depth knowledge of occurrence, classification, chemical structure, physical properties, and biological importance of major macromolecules. To impart basic laboratory skills and practical knowledge of different methods for qualitative and quantitative analysis of macromolecules. To provide a concept of carbohydrates, lipids, and protein metabolism. To understand glycolytic and energy-generating pathways and other intermediary pathways related to macromolecules. To enhance knowledge about biosynthesis and degradative pathways of fatty acids and lipids.</p>					
LEARNING OUTCOMES					
<p>On the completion of the course, the students will be able to:</p> <ol style="list-style-type: none"> 1. Understand the biochemical basis of life 2. Acquire basic knowledge of biomolecules 3. Know the structures, properties, and involvement of different types of macromolecules in biological systems. 4. Acquire the knowledge about intermediary biochemical processes 5. Demonstrate the metabolic pathways of carbohydrates, lipids, and protein, the energy-yielding and energy-requiring reactions in life. 6. Understand the diversity of metabolic regulation of macromolecules, and how this is specifically achieved in different cells. 					
COURSE CONTENT					
<p>Carbohydrates: Monosaccharides, Oligosaccharides, Polysaccharides, Glycoconjugates, Glycosaminoglycans, Proteoglycans, Glycoproteins. Amino Acids; Peptides and Proteins; The Covalent and 3-D structure of proteins sequences and evolution.; Enzymes: Nature and Function of enzyme, Classification and Nomenclature; Mechanism of enzyme action and enzyme kinetics. Lipids: Storage Lipids, Fatty acids and their types, Triacylglycerols, Structural Lipids, Phospholipids, Sphingolipids, and Glycolipids.</p> <p>Glycolysis and fate of pyruvate. Gluconeogenesis, Biosynthesis, and breakdown of glycogen in animals, Regulation of glycogen metabolism; Krebs cycle, Electron transport chain and oxidative phosphorylation in mitochondria, Photosynthesis Photophosphorylation, and light absorption. Mobilization and transport of fats, Biosynthesis of triacylglycerols fatty acids, and phospholipids; Degradation of fatty acids through oxidation and its types. Amino acids biosynthesis and degradation.</p>					

PRACTICALS

Normal solutions; Various qualitative tests for Monosaccharides, oligosaccharides, and polysaccharides; Study of hydrolysis of starch by using mineral acids; Detection of reducing sugars in the presence of non-reducing sugars; Qualitative tests for different lipids; Paper and thin-layer chromatography of sugars; Paper chromatography of various amino acids; Determination of pK values of amino acids (Glycine, Alanine) by preparation of titration curves.

Estimation of glucose from unknown samples through UV spectrophotometry. Extraction and salting out of proteins; Quantitative analysis of proteins by UV spectrophotometry; Extraction and quantitative analysis of amino acids. Determination of acid value of fats.

TEXTBOOKS AND READING MATERIAL

1. McKee, T., McKee, J. R. (2003). *Biochemistry: The Molecular Basis of Life*. 3rd edition. McGraw-Hill Companies. Inc., N. Y.
2. Boyer, R. (2004). *Concepts in Biochemistry*. 3rd edition. John Wiley and Sons. Inc., N.Y.
3. Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). *Biochemistry: International*, 6th edition. W. H. Freeman, U.S.A.
4. Cox, M. and Nelson, D. L. (2005). *Lehninger Principles of Biochemistry*, 4th edition, Palgrave Macmillan, U.K.
5. Devlin, T. M. (2002). *Textbook of Biochemistry with Clinical Correlations*, 5th Edition, John Wiley and Sons. Inc., New York.
6. Zubay, G. (1995). *Biochemistry*, 4th edition. W. C. Brown Publishers, Inc., U.K.
7. Murray, R., Granner, D., Mayes, P. and Rodwell, V. 2006. *Harper's Illustrated Biochemistry*, 27th Edition, McGraw-Hill Companies, N.Y.
8. Plummer, D. T. (1990). *An Introduction to Practical Biochemistry*, 4th edition, McGraw-Hill Book Company, London.
9. Voet, D., Voet, J. G. and Pratt, C. W. (2002). *Fundamentals of Biochemistry*, John Wiley and Sons. Inc., N.Y.
10. Wilson, K. and Walker, J. (1994). *Practical Biochemistry: Principles and Techniques*, 4th edition. Cambridge Univ. Press, London

ASSESSMENT

Sr. No.	Elements	Weightage	Details
1.	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
2.	Formative Assessment	25%	Continuous assessment includes Classroom participation, assignments, presentations, viva voce, attitude and behavior, hands-on activities, short tests, projects, practicals, reflections, readings, quizzes etc.
3.	Final Assessment	40%	Written Examination at the end of the semester. It is mostly in the form of a test, but owing to the nature of the course the teacher may assess their students based on term paper, research proposal development, fieldwork , report writing etc.