Institute of Zoology
Faculty of Life Sciences
University of the Punjab, Lahore
Course Outline

Programme	BS Zoology	**Course Code**	**ZOOL-305**	**Credit Hours**	2
Course Title	**Biochemistry-II**				

Course Introduction

Biochemistry is the branch of science which deals with the chemistry of life that explores the chemical processes of the living organisms. It is a combination of biology, chemistry and molecular biology. The main focus of biochemistry is to understand that how biological molecules give rise to the processes which occur within living cells.

The course aims to:

1. To understand the principles of bioenergetics, how organisms harvest and use energy required for the metabolic activity of the cell.
2. To describe the biosynthesis of proteins, lipids, nucleic acids, and carbohydrates along with their regulation.
3. To describe the breakdown of proteins, lipids, nucleic acids, and carbohydrates along with their regulation.

Learning Outcomes

After successfully completion of this course, students should be able:

1. To describe how living organisms acquire and transform energy in order to perform biological functions?
2. To know how the simple compounds are synthesize in the cell and converted into or linked with other compounds to form the macromolecules necessary for cellular and metabolic activity.
3. To know how complex compounds breakdown and produce energy indispensable for activity of cells.

Course Content		**Assignments/Readings**
Week 1	**Bioenergetics** Concept of Free Energy; Standard Free Energy change: Energy rich compounds and their role in metabolism	
Week 2	**Carbohydrate metabolism** Detailed description of Glycolysis, Regulation and Bioenergetics of Glycolysis.	
Week 3	Anabolic role of Glycolysis Catabolism of other Hexoses;	
Week 4	Fate of Pyruvate under Aerobic and Anaerobic conditions, Lactate and Alcoholic Fermentation	
Week 5	Gluconeogenesis, its Regulation and significance in the tissues; Feeder Pathways in Glycolysis; Utilization of other carbohydrates in Glycolysis	
Week 6	Phosphorolysis of Glycogen and Starch; Regulation of Glycogen metabolism; Utilization of dietary polysaccharides (Starch) and Disaccharides (Sucrose and Galactose). Biosynthesis of Glycogen, Starch and Sucrose	

Week 7	Pentose phosphate pathway of Glucose oxidation and its major role in the animal tissues. Citric acid (TCA) cycle: Conversion of Pyruvate to Acetyl CoA, Pyruvate dehydrogenase, a multi-enzyme complex;	
Week 8	Detailed description of citric acid cycle; Bioenergetics and conservation of Energy produced in the cycle. Anabolic or Biosynthetic role of citric acid cycle intermediates; Replenishing or Anaplerotic reactions and their role; Regulation of Citric acid cycle.	
Week 9	**Lipid metabolism** Digestion, mobilization and transport of Fats; Biosynthesis of Triacylglycerol; Utilization of Triacylglycerol	
Week 10	Oxidation of Fatty acids; Activation of Fatty acids and their transportation to mitochondria; Beta (ß)-Oxidation; Bioenergetics of ß-oxidation; Omega (ω)-Oxidation pathway	
Week 11	Biosynthesis of Saturated Fatty acid, Supply of raw material for palmitic acid synthesis; Fatty acid synthetase (FAS) multienzyme complex;	
Week 12	**Cholesterol metabolism** Cholesterol biosynthesis and its Regulation; Steroid hormones, their types and main functions; Prostaglandins, their types, synthesis, inhibition and main functions.	
Week 13	**Nitrogen metabolism** Metabolic fate of amino acids; Catabolism of amino acids; Deamination and Transamination; Role of glutamate, glutamine and alanine in transport of ammonia in tissues;	
Week 14	Nitrogen excretion and urea cycle; Regulation of urea cycle; Pathways of amino acid degradation showing entry points in Citric acid cycle; Decarboxylation of amino acids to biological amines.	
Week 15	Biosynthesis of some amino acids; Incorporation of ammonia in glutamate and glutamine	
Week 16	Purine and Pyrimidine biosynthesis	
Textbooks and Reading Material		

1. Plummer, David T., 1990. An Introduction to Practical Biochemistry, 4th Edition McGraw Hill Book Company, London.
2. Wilson, K and Walker, J., 1994. Practical Biochemistry: Principles and Techniques, 4th Edition, Cambridge University Press.
3. Alexander, R.R. and Griffiths, J.M. 1993. Basic biochemical methods. Wiley– Liss, New York.
4. Sawhney, S. K. and Singh, R., 2006. Introductory Practical Biochemistry, 2nd Edition, Narosa Publishing House.
5. Oser, B. L., (Latest Edition). Hawk's Physiological Chemistry, McGraw Hill Book Company.
6. David L. Nelson, and Michael M. Cox, 2005. Lehninger Principles of Biochemistry 4th Edition, Macmillan Worth Publishers, New York.
7. James R. Mckee; Trudy Meckee, . 6th Edition.Oxford University Press.

Additional Readings:

1. Lubert Stryer, 1995. Biochemistry, 4th Edition, W.H. Freeman & Company, New York.
2. Murray, R. K., Granner, D. K., Mayer, P. A. and Rodwells, V. W., 2000.
3. Harper's Biochemistry, McGraw Hill Bok Company, New York.
4. Elliott, W. H. and Elliot, D. C., 2002. Biochemistry and Molecular Biology, Oxford Medical Publications, Oxford University Press.
5. Voet, D., Voet, J. G. and Pratt, C. W., 1999. Biochemistry, John Wiley & Sons.
6. Zubay, G. 1993. Biochemistry, Wm. C. Brown Publishers, Oxford.

Teaching Learning Strategies

Teaching will be a combination of class lectures, class discussions, and group work. Short videos/films will be shown on occasion.

Assignments: Types and Number with Calendar

The sessional work will be a combination of written assignments, class quizzes, presentation, and class participation/attendance.

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, practical, reflections, readings, quizzes etc. class Attendence
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, field work and report writing etc.