Programme	BS-Biochemistry	Course Code	BC. 201	Credit Hours	2+1
Course Title	**Carbohydrates and Lipids**				

Course Introduction

This course provides an introduction to Carbohydrates and Lipids, designed for undergraduate students majoring in Biochemistry. The curriculum covers the occurrence, classification, chemical structure, physical properties and biological importance of different types of carbohydrates and lipids. Students will be able to identify and explain the structures of simple sugars, complex carbohydrates, as well as various lipids including fatty acids, triglycerides, phospholipids, and sterols.

Learning Outcomes

On the completion of the course, the students will:

- Acquire detailed knowledge of structures, properties and involvement of different types of carbohydrates and lipids in different parts of biological system
- Analyze different types of carbohydrates and lipids
- Use different instruments and equipment for analysis of biomolecules

BS-Biochemistry	Course Code

Course Content

Theory Unit-I

- Introduction to Carbohydrates, Basic definitions and classification
- Carbohydrates structural, chemical and physical properties
- Nomenclature of carbohydrates, Monosccrides, Disaccharide and Polysaccharides
- Sugar derivatives, Glycosaminoglycans; Glycoproteins, Bacterial cell wall
- Blood Group Carbohydrates, Role in Transfusion and Organ transplant
- Introduction to Lipids, Basic Concepts
- Fatty Acids, Triglycerides, Phospholipids
- Eicosanoids: Prostaglandins, thromboxanes and leukotrienes
- Waxes, Overview, structure and composition of structural Lipids
- Amphipathic compounds, Micelles, Reactions of glycerol
- Phospholipids: Glycerophospholipids, Sphinogomyelins and glycolipids; their properties and functions.
- Steroids: Structure, classification, nomenclature and their biological role.
- Lipids as signals, cofactors and pigments.
- Glycerophospholipids unique in plants Chloroplasts Galactolipids and Sulfolipids
- Bile salts: Composition, Derivatives; Sterols: Structure and composition; Cholesterol, Lipid soluble vitamins
- Lipoprotein system, Chylomicrons, HDL, LDL, IDL, VLDL, Role in distribution of lipids

Practical Unit-

- Qualitative Analysis of known carbohydrates (e.g., Glucose, galactose, fructose, maltose, lactose, sucrose, starch glycogen and cellulose).
- Qualitative Analysis of carbohydrates of given unknown samples.
- Extraction of starch from plant sources and its confirmative tests (e.g., Potato, Wheat, Rice, Pulses, Barely, Maize etc).

- Extraction of Glycogen from animal sources (e.g., liver, muscle, etc) & its confirmative tests. Qualitative tests for lipids and fatty acids;
- Extraction of lipids from animal and plant sources
- Saponification value, rancidity, acid value, iodine value and Reichert – Meissl number.

Textbooks and Reading Material

- Jeremy M. Berg, John L. Tymoczko, Gregory J. Gatto Jr. (2022) "*Biochemistry 8th Edition*, CRC Press.
- George W. A. Milne, Albert A.P. Williams, Barbara R. Conner. (2022) *Carbohydrates Chemistry and Biochemistry: Sources, Methods and Applications 2nd Edition,* Springer Nature.
- Donald Voet, Judith G. Voet, Charlotte W. Pratt. (2021) *Fundamentals of Biochemistry: life at the Molecular Level 5TH Edition* Press.

Laboratory Manual.

- Linda E. Smith and Robert K. Adams (2021) *Industrial Biotechnology: A Laboratory Manual 3rd Edition*.

Teaching Learning Strategies

- Active Learning; Promoting student participation and interaction blended learning
- Experimental learning
- Formative assessment
- Inquiry based instructions
- Growth mindset

Assignments: Types and Number with Calendar

- Short assignment; Before mid term exam
- Long assignment; Before final term exam
- Class room participations; before and after midterm exam
- Quizzes; before and after midterm exam

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.
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.