

**DISCIPLINE SPECIFIC ELECTIVE COURSE— (BIOMED-DSE- ) MEDICAL BIOCHEMISTRY**

**CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the Course	Department offering the course
		Lecture	Tutorial	Practical/Practice			
Medical Biochemistry	4	3	-	1	XII Pass with Physics, Chemistry & biology	Basic knowledge of biology	Biomedical Science

**Learning objectives**

The Learning objectives of this course are as follows:

- The objective of this course is to educate students on the clinical significance of Biochemistry. Students would learn the principle and applications of the diagnostic enzymology, interplay of hormones in the metabolism and details of various biomolecules of diagnostic significance.
- These topics are incorporated in the course to impart relevant information on clinical biochemistry. This course will also focus on the contemporary methods and practical approaches that are used in the clinical laboratories for the investigation of the parameters to ascertain normal and diseased state.

**Learning outcomes**

The Learning outcomes of this course are as follows:

- Having successfully completed this course, students shall be able to learn and appreciate:
- To integrate the biochemical pathways of different biomolecules; the point of divergence and convergence and will have a comprehensive overview of the metabolic and hormonal regulation of pathways and cycles.
- Students will understand how disruptions in intermediary metabolism can lead to manifestations of diseases. Additionally, hormonal actions in maintaining body mass shall be understood and factors leading to disorders such as obesity and diabetes will also be learnt.

- The diagnostic significance of enzymes and isoenzymes as diagnostic markers in clinical tests. They will learn to assess how biochemical tools accomplish diagnostic and therapeutic interventions on metabolic and genetic disorders. They will also learn to correlate the tissue/organ-specific metabolic indicators with the physiological and clinical state of a patient.
- Students would be able to gain knowledge about several bimolecular conjugates, their structural complexities, physiological significance and clinical correlations, especially the disorders related to lipid metabolism.
- Students will learn about recommended daily allowance for vitamins, their role as dietary precursors and clinical significance of deficiency diseases.
- With the help of diagnostic kits that are used in clinical laboratories students will learn to perform qualitative and quantitative analyses of samples. Through the presentations made on the known case studies, students will learn how to apply the gained knowledge in diagnosis and prognosis of a disease and know the relevance of preventive measures taken in healthcare. Also, they will be introduced to quantitative analysis of biomolecules in clinical biochemistry and evaluation of relevant data.

## **SYLLABUS**

### **Unit I: Introduction to Medical Biochemistry with an Overview of Integrative Metabolism**

**(12 hrs)**

Basic Concepts and Scope of Medical Biochemistry.

Local and global regulation in tissue specific metabolism. Interplay of insulin and glucagon hormones. Integration of various metabolic pathways of proteins, lipids and carbohydrates. Obesity, role of leptin, ghrelin and adiponectin in regulation of body mass, hunger and satiety.

### **Unit II: Enzymes - Distribution and Diagnostic Significance**

**(12 hrs)**

Properties of enzymes used in diagnosis. Factors affecting levels of diagnostic enzymes in blood and the selection of a test. Clinical significance of diagnostically important enzymes: Creatine kinase, Lactate dehydrogenase, alanine- and aspartate aminotransferases, with a detailed account of the biochemical reactions catalyzed by these enzymes and of their clinical assays. Kinetic assay and end point assay for the enzymes. Isoenzymes: types of isoenzymes, allozymes, hybrid isoenzymes, isoforms, their tissue distribution, clinical and diagnostic significance.

### **Unit III: Structural Complexities and Diseases Associated with Carbohydrates and Lipids (14 hrs)**

*Carbohydrates:* Sugars as information molecules. Detailed account on Lectins: their role in physiological functions and their potential as drug targets in various infectious diseases. Dietary fibres

*Lipids:* Types of Lipoproteins (chylomicrons, VLDL, LDL, HDL). Disorders associated with lipid metabolism (hyperlipidemia). Prostaglandins: classification, biosynthesis, role of COX-1, COX-2, NSAIDS in synthesis, functions.

*Steroids:* Cholesterol- biosynthesis and regulation, inhibitors of cholesterol biosynthesis (Statins - structure and biochemical basis).

### **Unit IV: Vitamins (7 hrs)**

Definition, classification, functions, recommended dietary allowances, and dietary precursors. Diseases (1 each, due to deficiency of water-soluble and fat-soluble vitamins): symptoms and clinical significance

### **Practical (30 Hrs)**

(Wherever wet-lab experiments are not possible, the principles and concepts can be demonstrated through any other material or medium including videos/virtual labs, etc.)

1. Virtual demonstration of preparation of serum or plasma from whole blood.
2. Quantitative determination of the following (any 4):
  - i) SGPT/SGOT
  - ii) Albumin/Total protein and A:G ratio
  - iii) Urea
  - iv) Uric acid
  - v) Total Cholesterol, HDL, LDL
  - vi) Triglycerides
3. Interpretation of case studies (any 3)
4. Analysis of a given Diagnostic Test Report for KFT/LFT/Myocardial Infarction.
5. Profiling of Iron and Vitamin D/B12 deficiency in Indian Population, using recent published data.

### **Essential Reading:**

- Nelson, D.L. and Cox, M.M. (2021). *Lehninger: Principles of Biochemistry* (8<sup>th</sup> ed.). Macmillan.  
ISBN: 9781319322328

- Burtis, C.A., Bruns, D.E., Sawyer, B.G, Tietz, NW (2015). *Tietz Fundamentals of Clinical Chemistry and Molecular Diagnostics*. United States Of America: WB Saunders Company, ISBN: 9781455741656
- Chatterjee & Shinde (2012). *Textbook of Medical Biochemistry* (8<sup>th</sup> ed). New Delhi, India: Jaypee Publications ISBN: 978-93-5025-484-4
- Literature provided by Diagnostic Kit's manufacturer.

#### **Suggestive reading**

- Murray, R. Bender, D. Botham, M.K. Kennelly, P.J. Rodwell, V. Weil, P.A. (2018). *Harpers Illustrated Biochemistry*; New Delhi, India: McGraw-Hill Medical.
- Devlin, T.M. (2011). *Textbook of Biochemistry with Clinical Correlations*. New Jersey, United States of America: John Wiley & Sons, Inc.