

DISCIPLINE SPECIFIC CORE COURSE– 5 (DSC-5): Fundamentals of Biomolecules

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 (if any)
		Lecture	Tutorial	Practical/ Practice		
Fundamentals of Biomolecules	04	02	0	02	Class XII pass with Biology/ Biotechnology	NIL

Learning Objectives

The learning objectives of this course are as follows:

- To provide fundamental and precise knowledge of biomolecules that play a crucial role in all processes of life and the development of diseases.
- To make the students understand the fundamental building blocks of living organisms that include carbohydrates, proteins, lipids, nucleic acids
- To apprise the students of the various functions of the molecules like providing structural integrity to the tissue-engineered constructs.
- Through this course, the students would be able to understand the physiological importance of these biomolecules.
- The enzymatic study would enable them to understand the various metabolic pathways and physiological reactions.

Learning Outcomes

By studying this course, students will be able to

- Interpret the structure-functional relationships of carbohydrates, proteins, lipids and nucleic acids.
- Understand the qualitative analysis of functional groups
- understand the properties of various biomolecules.
- appreciate the action of the enzyme and the various factors that affect their action detail.

SYLLABUS OF DSC-5

UNIT – I Carbohydrates

06 Hours

Structure and biological importance: with emphasis on aldose, ketose, chiral centre, polarised Light, Fischer nomenclature, Haworth projection formula, mutarotation of glucose, anomers, pyranose, furanose, glycosidic linkage; reducing and non-reducing sugars: monosaccharides, disaccharides, polysaccharides and glycoconjugates.

UNIT – II Lipids

04 Hours

Structure and Significance: Physiologically important saturated and unsaturated fatty acids, tri-acylglycerols, phospholipids, glycolipids, steroids.

UNIT – III Proteins**08 Hours**

Amino acids: Structure, classification and general properties of α -amino acids; physiological importance of essential and non-essential amino acids; proteins: bonds stabilizing protein structure; Levels of organization in protein motifs, folds and domains; Denaturation.

UNIT – IV Nucleic Acids**04 Hours**

Structure: purines and pyrimidines, nucleosides, nucleotides, nucleic acids; Cot Curves: Base pairing, Denaturation and Renaturation of DNA; Types of DNA and RNA.

UNIT – V Enzymes**08 Hours**

Nomenclature and classification, cofactors; specificity of enzyme action, Isozymes, Mechanism of enzyme action; Enzyme kinetics; factors affecting rate of enzyme-catalysed reactions; derivation of Michaelis-Menten equation, concept of K_m and V_{max} , Lineweaver-Burk plot, multi-substrate reactions, enzyme inhibition; Allosteric enzymes and their kinetics; Regulation of enzyme reaction.

Practical component – 60 Hours

1. Understanding the structures of biomolecules through ball and stick models.
2. To understand the preparation and roles of two important biological buffer systems: phosphate and bicarbonate; Preparation of buffers and determination of pH.
3. Identification of the functional groups by qualitative tests:
 - a. Carbohydrates
 - b. Lipids
 - c. Proteins
4. Separation of amino acids by paper chromatography.
5. Study the action of salivary amylase under optimum conditions.
6. Study the effect of pH, temperature and inhibitors on the action of salivary amylase.

Essential/recommended readings

1. Nelson, D.L., Cox, M.M. (2017). Lehninger: Principles of Biochemistry (7th ed.). New York, WH: Freeman Company.
2. Murray, R.K., Bender, D.A., Botham, K.M., Kennelly, P.J., Rodwell, V.W. and Well, P.A. (2009). Harper's Illustrated Biochemistry. XXVIII Edition, International Edition, The McGraw- Hill Companies Inc.

Suggestive readings

1. Stryer, L., Berg, J., Tymoczko, J., Gatto, G. (2019). Biochemistry (9th ed.). New York, WH: Freeman.
2. Voet, D., Voet, J. G. (2013). Biochemistry (4th ed.). New Jersey, John Wiley & Sons Asia Pvt. Ltd.