

<b>Programme</b>	Biochemistry	<b>Course Code</b>	BC. 202	<b>Credit Hours</b>	2+1
<b>Course Title</b>	<b>Proteins and Nucleic acids</b>				
<b>Course Introduction</b>					
This course provides an in-depth introduction to the fundamental building blocks of life, focusing on amino acids and proteins. Students will explore the structure, classification, and properties of amino acids. Additionally, the course introduces nucleic acids, discussing their types, chemistry, functions, and the structural organization of DNA and RNA, including their roles in genetic information storage and transmission.					
<b>Learning Outcomes</b>					
On the completion of the course, the students will be able to: <ul style="list-style-type: none"> <li>• Describe different levels of protein structure</li> <li>• Identify the different amino-acids and nucleic acids</li> <li>• Isolate and analyze the proteins and nucleic acids</li> </ul>					
<b>Course Contents</b>					

### **Theory Unit-I**

Introduction to Amino acids

Physical and chemical properties and classification of amino acids

20 standard amino acids and their structures

Configuration of amino acids, Uncommon amino acids, Amino acids as acids and bases

Titration curves of amino acids

Peptides and proteins: Protein structure; Primary and secondary structures

Super secondary structures of proteins, Motifs and domains

Tertiary and quaternary structure of proteins

Fibrous and Globular proteins:  $\alpha$ -Keratin, Collagen, Elastic, Silk Fibroin

Fibrous proteins; Heme proteins, hemoglobin, Myoglobin

Allosteric regulation of Hemoglobin, Hemoglobinopathies

Reversible binding of proteins with ligands,

Cooperative ligand binding

Protein interactions mediated by chemical energy; actin and myosin

Protein Folding, Molecular chaperones

Protein denaturation

Phosphodiester linkages in nucleic acids, Nucleic acid structure

DNA double helix, Watson and Crick Model

RNA; structure, function and composition

mRNA and its function

### **Practical Unit-**

Qualitative tests for amino acids: Ninhydrin test and Xanthoproteic test, Pauly's diazo test, Sakaguchi test, Millon's test, Hopkin's cole test, Elrich's test, Sodium Nitroprusside test, Lead Sulphide test, Biuret test

Separation of Amino Acids using Paper and Thin Layer Chromatography

Extraction of proteins from plant sources and their confirmative tests.

Determination of total proteins by using different methods (Bradford, lowery and biuret methods);

Protein estimation by using UV/Visible spectrophotometer

Isolation of DNA and RNA from plants and blood sample

Quantification of DNA and RNA

### Textbooks and Reading Materials

- David L. Nelson, Michael M. Cox W.H. Freeman; (November 21, 2012) *Lehninger Principles of Biochemistry* 6th Ed.
- Laurence A. Moran, Robert A Horton, Gray Scrimgeour and Marc Perry (2011) *Principles of Biochemistry* 5th Ed.
- D. J. Voet, G.J. Voet and C. W. Pratt. J. Wiley & Sons (2010) *Fundamentals of Biochemistry* 4th Ed. Joshi A. Rashmi. B. Jain Publishers, 2002 *Textbook of Practical Biochemistry*.
- S. K. Sawhney, Randhir Singh 2005. *Introductory Practical Biochemistry*. 2nd Ed Alpha Science International, Ltd.
- By Robert Murray, David Bender, Kathleen M. Botham, Peter J. Kennelly, Victor Rodwell, P. Anthony Weil. McGraw-Hill Medical Harpers Illustrated Biochemistry. (2012). 29<sup>th</sup> ed

### Teaching Learning Strategies

- Lectures
- Assignments and Presentations
- Group discussions
- Interactive sessions

### Assignments: Types and Number with Calendar

- Quiz in 4<sup>th</sup> Week of 5 marks
- Assigned in 8<sup>th</sup> Week of 10 marks
- Presentations in 12<sup>th</sup> week of 10 marks

### 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.