

# Syllabus

2<sup>nd</sup> Semester

**Bachelor of Science in Life Sciences**  
**Biotechnology**

Scheme of Programme : Bachelor of Life Sciences in Biotechnology

**(Scheme UG A1: Undergraduate Programmes: Biotechnology (Multidisciplinary))**

**Semester 1**

Course Code	Course Title	Course ID	L T P			Credits	Total Credits	MARKS					
			L	T	P			TI	TE	PI	PE	Total	
<b>Core Course(s)</b>													
CC-A1	Introduction to Biotechnology	CCB101	3	-	2	3	1	4	25	50	5	20	100

**Semester 2**

Course Code	Course Title	Course ID	L T P			Credits	Total Credits	MARKS					
			L	T	P			TI	TE	PI	PE	Total	
<b>Core Course(s)</b>													
CC-A2	Biomolecules	CCB102	3	-	2	3	1	4	25	50	5	20	100

**Semester 3**

Course Code	Course Title	Course ID	L T P			Credits	Total Credits	MARKS					
			L	T	P			TI	TE	PI	PE	Total	
<b>Core Course(s)</b>													
CC-A3	General Microbiology	CCB103	3	-	2	3	1	4	25	50	5	20	100

  
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240/BTOTL/CC201

# MULTIDISCIPLINARY PROGRAMME- BIOTECHNOLOGY

## Part A - Introduction

**Semester**

**II**

**Name of the Course ID:**

**BIOMOLECULES**

### Course Learning Outcomes (CLO):

1. After successful completion of the programme, students will gain significant knowledge of structural biochemistry and how these small biomolecules attribute in constructing higher living organism.
2. Students will learn the structure and properties of carbohydrates, proteins, lipids, cholesterol, DNA, RNA, complex lipids, and their importance in biological systems
3. Students will acquire an in-dept knowledge of nucleic acid (structural and properties) which will help in understanding the basis molecular processes of living beings.
4. The students will know the distribution, arrangement, and properties of biomolecules in dietary products, which will impart awareness in adapting healthy lifestyle and student can be acquainted in assisting dietician and nutritionist.
5. Students will know how to test the presence of biomolecules in our surrounding and how to differentiate between carbohydrates/ proteins/ lipids and nucleic acid. This will help in assessing the nutrition value of the food consumed.
6. The students will be able to implement the use of instruments like and UV-VIS spectroscopy, centrifugation, and chromatography.

Theory	Practical	Total
3	1	4
3	2	5

Contact Hours

**Max. Marks: 100**

**100 (50TE+ 25TI + 05 PI + 20PE)**

**Time: 3h (Theory), 4h (Practical)**

## Part B- Contents of the Course

### Instructions for Paper-Setter

  
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Nine questions will be set in all. Question No.1 comprising of objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each unit. The candidates will be required to attempt Q.No.1 & four others selecting one question from each unit. All questions carry equal marks.

	<b>CONTACT HOURS</b> 12
<p><b>UNIT I Amino acids &amp; Proteins: Structure &amp; Function</b></p> <p>e) Amino Acid: Structure, specific rotation, electrochemical properties, classification based on R-group, nutritional requirement, and metabolic fate</p> <p>f) Representation of peptide bond; Chemical bonds involved in protein structure</p> <p>g) Protein configuration: Primary structure, Secondary structure (<math>\alpha</math>- helix and <math>\beta</math>-pleated sheet), Tertiary structure (myoglobin) and Quaternary structure (Hemoglobin)</p> <p>h) Classification of Proteins: Based on shape, composition, biological function. Denaturation and renaturation of proteins</p>	12
<p><b>UNIT II Carbohydrates: Structure and Function</b></p> <p>e) Nomenclature and Definition; Classification: Monosaccharides, Oligosaccharides and Polysaccharides</p> <p>f) Monosaccharides: Isomerism; Mutarotation; Structure-Linear form and Ring form, pyranose and furanose structure; anomer; epimers</p> <p>g) Oligosaccharides: reducing and non-reducing sugar; disaccharides (sucrose, lactose, maltose, cellobiose, isomaltose, trehalose); artificial sweeteners</p> <p>h) Polysaccharides: Homopolysaccharides (Starch, Glycogen, Cellulose, Pectin &amp; Chitin), Heteropolysaccharides (Hyaluronic acid &amp; Chondroitin)</p>	11
<p><b>UNIT III Lipids: Structure and functions</b></p> <p>d) Importance and definition of lipids; basic structural components; Fatty Acid-saturated and unsaturated fatty acids (nomenclature &amp; structure); Biological roles of lipids</p> <p>e) Simple lipids (Fats &amp; Oils); Compound (Phospholipids &amp; Glycolipids)</p> <p>f) Derived Lipids (Steroids: cholesterol – its structure and biological properties; Terpenes; Carotenoids)</p>	

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**UNIT IV Nucleic acids: Structure and functions**

- e) Introduction; Types of nucleic acids; Structural components of nucleic acids
- f) Nitrogenous bases: Structure of Pyrimidine & Purine derivatives; modified nitrogenous bases; tautomerism in nitrogenous bases; Nucleosides: nomenclature & structure
- g) Nucleotides: nomenclature & structure (ribonucleotide & deoxyribonucleotides), functions of nucleotides
- h) Double helical model of DNA structure, Chargaff's Rule, Variants of double helical DNA (A, B, C and Z-DNA), denaturation and annealing of DNA.

**List of Practicals**

10. Preparation of solutions, buffers with specific concentration and pH.
11. Preparation of stock and working solution.
12. To perform qualitative tests to find the presence of carbohydrates in a sample.
13. To perform tests to differentiate between monosaccharide, disaccharide, and polysaccharide.
14. To perform tests to identify reducing and non-reducing sugars.
15. To perform qualitative tests to find the presence of proteins in a sample
  - d) Biuret test
  - e) Ninhydrin test
  - f) Lowry's test
16. To perform paper chromatography test to separate mixture of amino acids.
17. To perform qualitative & quantitative determination of nucleic acids.
18. To perform tests to find the presence of lipids in a sample.

**Part C-Learning Resources****Suggested readings:**

- n) Fundamentals of Biochemistry by J.L. Jain (S. Chand & Company Ltd.)
- o) The Foundations of Biochemistry by Lehninger
- p) Biochemistry – J.M.Berg, J.L.Tymoczko, L.Stryer, 5th ed
- q) Biochemistry-Reginald H. Garret, Charles M. Grisham 6th ed
- r) Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.
- s) Essentials Of Biochemistry, U. Satyanarayana, U. Chakrapani, (2021), Publisher- Elsevier

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