

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	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A1	Introduction to Biotechnology	240/BIOTL/CC101	3	-	2	3	-	1	4	25	50	5	20	100

Semester 2

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A2	Biomolecules	240/BIOTL/CC201	3	-	2	3	-	1	4	25	50	5	20	100

Semester 3

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A3	General Microbiology	240/BIOTL/CC301	3	-	2	3	-	1	4	25	50	5	20	100

Semester 4

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A4	Molecular Biology		3	-	2	3	-	1	4	25	50	5	20	100

Internship is to be done during summer break after 4th Semester, Marks will be added in 5th Semester.

Semester 5

Course Code	Course Title	Course ID	L	T	P	L	T	P	Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A5	Immunology		3	-	2	3	-	1	4	25	50	5	20	100

Semester 6

Course Code	Course Title	Course ID	L	T	P	L	T	P	Total Credits	MARKS				
			(Hrs)			Credits				TI	TE	PI	PE	Total
Core Course(s)														
CC-A6	Basics of Recombinant DNA Technology		3	-	2	3	-	1	4	25	50	5	20	100

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Semester 7; 8 (Honours) and Semester 8 (Honours with Research): Detailed Scheme will be prepared in due course of time.

Multidisciplinary Programme- BIOTECHNOLOGY

Part A - Introduction			
Semester	I		
Name of the Course ID: 240/BIOTL/CC101	Introduction to Biotechnology		
Course Learning Outcomes (CLO):			
<p>On successful completion of the course the students will gain and be able to demonstrate following knowledge:</p> <ol style="list-style-type: none"> 1. Understand the concepts of biotechnology to get an insight of how biotechnology is related to other sciences and how BhartiyaGyanPrampura contributed in biotechnology. 2. Gain knowledge about the scope and applications of biotechnology. Learners will get an insight of scope and applications of biotechnology in agriculture, environment, food, pharma, dairy and other industries. The students will be able to demonstrate the knowledge of the applications of biotechnology for sustainable development and human welfare. 3. Gain knowledge about genetic manipulations; recombinant DNA technology and genetic engineering. The learner will get an insight of how quantity and quality can be improved in plants and animals by using biotechnology. 4. Gain knowledge about the role of biotechnology in Bioinformatics, Nanotechnology and other allied fields 5. Gain knowledge of structure, working, maintenance/calibration and safety measures during handling of biotech lab instruments and biochemicals. Also get insight of maintenance of aseptic conditions and proper disposal of biochemicals. 6. Gain knowledge about intellectual property rights, risk assessments, safety guidelines and ethical issues related to biotechnology. 			
Credits	Theory	Practical	Total
	3	1	4
Contact Hours	3	2	5
Max. Marks:100(50TE+ 25TI + 05 PI + 20PE)	Time: 3h (Theory), 2h (Practical)		
Part B- Contents of the Course			
Instructions for Paper-Setter			
<p>Nine questions will be set in all. Question No.1 comprising objective/short answer type questions from the entire syllabus, will be compulsory. The remaining eight questions will be set taking two questions from each section. The candidates will be required to attempt Q.No.1 & four others selecting one questions from each section. All questions carry equal marks.</p>			

<u>UNIT I</u>	CONTACT HOURS
<p>Biotechnology: Definition, different types and colors (white, red, green, blue) of biotechnology, biotechnology as an interdisciplinary pursuit, scope and future of biotechnology, Biotechnology research in India, Biotechnology in context of developing world, Role of BhartiyaGyanPramptra or Indian knowledge System (IKS) in biotechnology.</p> <p>Genetic engineering: Introduction of recombinant DNA technology and genetic engineering, basic concept of genetically modified organisms, history of genetic manipulations.</p> <p>Genomics and proteomics: brief account on gene and genomes, Proteins and proteome, DNA fingerprinting.</p> <p>Tissue culture:Brief about plant and animal tissue culture.</p> <p>Fermentation biotechnology:Brief about Fermentation technology and food processing.</p>	12
<p><u>UNIT II</u></p> <p>Application of biotechnology: Application of biotechnology in agriculture, dairy processing, food industry, pharmaceutical industry, forensic analysis, environment protection; waste treatment and bioremediation.</p>	12
<p><u>UNIT III</u></p> <p>Biotechnology for sustainable development and human welfare:</p>	11
<p>Brief about Biofuels, bioplastics, petroleum refining, bioleaching and biomining.</p> <p>Brief about hybridoma technology and monoclonal antibodies, In vitro fertilization, and embryo transfer technology.</p>	
<p><u>UNIT IV</u></p> <p>Role of biotechnology in allied fields; Bioinformatics, Nanotechnology, Biomedical microelectromechanical systems (Bio-Mems), Biosensor.</p> <p>IPR, biosafety and bioethics: a brief account on intellectual property and Intellectual property rights; patent, trademark, copyright, trade secret and geographical indication.</p> <p>Brief account of safety guidelines and risk assessment in biotechnology, Ethical issues related to Biotechnology.</p>	10

List of Practical: 30 hrs.

1. To study the different methods of sterilization and maintenance of aseptic conditions of biotech labs.
2. Study of structure, working and maintenance of lab instruments: Autoclave, Hot air oven, pH meter, Laminar airflow and centrifuge.
3. To study working, maintenance, calibration and precautions during handling of pH-meter, weighing balance, microscopes and other miscellaneous biotech lab instruments.
4. Preparation of normal, molar, percent solutions.
5. Preparation of buffer solutions and determination of their pH.
6. Precautions in handling of biochemicals and study of their proper disposal after use.

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

1. Biotechnology: expanding horizons- B. D. Singh
2. Elements of Biotechnology- PK Gupta
3. Biotechnology for beginners– ReinhardRenneberg Academic Press
4. BBB: Basics of Biology and Biotechnology- NM Jain
5. Introduction to Biotechnology-NM Jain
6. Biotechnology 5th edition- Johan E. Smith

MULTIDISCIPLINARY PROGRAMME- BIOTECHNOLOGY

Part A - Introduction

Semester

II

Name of the Course ID: 240/BIOTL/CC201

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

Contact Hours

3

2

5

Max. Marks:100

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

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

Part B- Contents of the Course

Instructions for Paper-Setter

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.

<p>UNIT I Amino acids & Proteins: Structure & Function</p> <ul style="list-style-type: none"> e) Amino Acid: Structure, specific rotation, electrochemical properties, classification based on R-group, nutritional requirement, and metabolic fate f) Representation of peptide bond; Chemical bonds involved in protein structure g) Protein configuration: Primary structure, Secondary structure (α- helix and β-pleated sheet), Tertiary structure (myoglobin) and Quaternary structure (Hemoglobin) h) Classification of Proteins: Based on shape, composition, biological function. Denaturation and renaturation of proteins 	<p>CONTACT HOURS</p> <p>12</p>
<p>UNIT II Carbohydrates: Structure and Function</p> <ul style="list-style-type: none"> e) Nomenclature and Definition; Classification: Monosaccharides, Oligosaccharides and Polysaccharides f) Monosaccharides: Isomerism; Mutarotation; Structure-Linear form and Ring form, pyranose and furanose structure; anomer; epimers g) Oligosaccharides: reducing and non-reducing sugar; disaccharides (sucrose, lactose, maltose, cellobiose, isomaltose, trehalose); artificial sweeteners h) Polysaccharides: Homopolysaccharides (Starch, Glycogen, Cellulose, Pectin & Chitin), Heteropolysaccharides (Hyaluronic acid & Chondroitin) 	<p>12</p>
<p>UNIT III Lipids: Structure and functions</p> <ul style="list-style-type: none"> d) Importance and definition of lipids; basic structural components; Fatty Acid-saturated and unsaturated fatty acids (nomenclature& structure); Biological roles of lipids e) Simple lipids (Fats & Oils); Compound (Phospholipids & Glycolipids) f) Derived Lipids (Steroids: cholesterol – its structure and biological properties; Terpenes; Carotenoids) 	<p>11</p>

<p>UNIT IV Nucleic acids: Structure and functions</p> <p>e) Introduction; Types of nucleic acids; Structural components of nucleic acids</p> <p>f) Nitrogenous bases: Structure of Pyrimidine & Purine derivatives; modified nitrogenous bases; tautomerism in nitrogenous bases; Nucleosides: nomenclature & structure</p> <p>g) Nucleotides: nomenclature & structure (ribonucleotide & deoxyribonucleotides), functions of nucleotides</p> <p>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.</p>	<p>10</p>
<p><u>List of Practicals</u></p> <p>10. Preparation of solutions, buffers with specific concentration and pH.</p> <p>11. Preparation of stock and working solution.</p> <p>12. To perform qualitative tests to find the presence of carbohydrates in a sample.</p> <p>13. To perform tests to differentiate between monosaccharide, disaccharide, and polysaccharide.</p> <p>14. To perform tests to identify reducing and non-reducing sugars.</p> <p>15. To perform qualitative tests to find the presence of proteins in a sample</p> <p style="padding-left: 20px;">d) Biuret test</p> <p style="padding-left: 20px;">e) Ninhydrin test</p> <p style="padding-left: 20px;">f) Lowry's test</p> <p>16. To perform paper chromatography test to separate mixture of amino acids.</p> <p>17. To perform qualitative & quantitative determination of nucleic acids.</p> <p>18. To perform tests to find the presence of lipids in a sample.</p>	
<p>Part C-Learning Resources</p> <p>Suggested readings:</p> <p>n) Fundamentals of Biochemistry by J.L. Jain (S. Chand & Company Ltd.)</p> <p>o) The Foundations of Biochemistry by Lehninger</p> <p>p) Biochemistry – J.M.Berg, J.L.Tymoczko, L.Stryer, 5th ed</p> <p>q) Biochemistry-Reginald H. Garret, Charles M. Grisham 6th ed</p> <p>r) Berg, J. M., Tymoczko, J. L. and Stryer, L. (2006). Biochemistry. VI Edition. W.H Freeman and Co.</p> <p>s) Essentials Of Biochemistry, U. Satyanarayana, U. Chakrapani, (2021), Publisher- Elsevier</p>	