Department of Liberal Education
Era University, Lucknow
Course Outline
Effective From: 2023-24

Name of the Program B.A. / B.Sc. (LIBERAL EDUCATION) Year/ Semester: 1st Year / 1st Semester					
Course Name	Introduction to Biochemistry: Molecules of Life & Cell Biology	**Course Code:**	**BCH101**	**Type:**	**Theory**
Credits	**05**			**Total Sessions Hours:**	**75 Hours**
Evaluation Spread	**Internal Continuous Assessment:**	**50 Marks**		**End Term Exam:**	**50 Marks**
Type of Course	○ Compulsory	◉ Core		○ Creative	○ Life Skill
Course Objectives	The student must understand the basis of chemistry and its principle underlying in the various functions needed for life. Introduction to bio molecules and their role would be done. .The objective of this course is to comprehend fundamental structure and functions of a cell as well as understand about the structure and transport across membrane in brief.				
Course Outcomes(CO): *After the successful course completion, learners will develop following attributes:*					
Course Outcome (CO)	**Attributes**				
CO1	1. Student would understand and identify the role & necessity of biochemistry in living beings and in mechanisms of life				
CO2	2. Students can correlate the basic chemistry of molecules with the biological system and its various roles.				
CO3	3. Students can delineate various cell organelles , their functions in human biology and can define transport across cell membrane.				
CO4	4. Students can identify various biomolecules (carbohydrates,proteins, amino acids, lipids, nucleic acids, vitamins and minerals) their classification & roles in a living system				
Pedagogy	Interactive, discussion-bases, student-centered, activity based.				
Internal Evaluation Mode	Mid-term Examination: 20 Marks Activity: 10 Marks Class test: 05 Marks Online Test/Objective Test: 05 Marks Assignments/Presentation: 05 Marks Attendance: 05 Marks				
Session	**Topic**			**Hours**	**Mapped**

Details			CO
Unit 1	**Role of biochemistry in day-today life:** • Definition, scope and significance of Biochemistry in Nutrition, Medicines, Aging, diseases and disorders; Cancer, AIDS; in life-style disorders (Obesity, Diabetes, Hypertension); • Biotechnology and biochemistry: Genetic Engineering; Nano-technology, Customized designer babies. • Introduction to chemistry in biology: An overview of elements, biomolecules in living organisms: atoms, molecules, ions, chemical reactions, bonds, substitution, addition, elimination, oxidation, reduction, cyclization and ring openings. • Concept of pH , acid and bases **Fundamental Cell Biology**: • Organization and structure of cells: Brief introduction of origin of life on earth, history of cells and cell theory, prokaryotic and eukaryotic cells, types of cells, ultrastructure of plant and animal cells • Plasma membrane: structure and function (fluid mosaic model), • Transport across membranes: Passive and Active transport- primary and secondary with a special reference to Na-K pump and Na+-Glucose pump • Subcellular components: Structure and functions of cell organelles- Mitochondria, Chloroplast, ER, Golgi complex, Ribosome, Centrioles and basal bodies; Lysosome, Endosome, Peroxisomes, Nucleus. • Cytoskeleton structure and functions: Microtubules, Microfilaments and Intermediate filaments membranes **Activity:** 1. Showing the movie Jurrasic Park and discussing various aspects and applications of Biochemistry 2. Submission of at least 5 questions pertaining to why and how some things work in biological system. Example: cuddling of milk	19	CO1, C02
Unit 2	**Basics of Cell Division**: • Mitosis and meiosis, different steps in cell cycle • Concept of cell death- apoptosis, necrosis and autophagy **Introduction to Bio-molecules**: • **Carbohydrates** : Definition and structural organization monosaccharides, disaccharides, oligosaccharides, polysaccharide • Polysaccharides – homo- and hetero polysaccharides, fibres Structural and storage polysaccharides • Ring structure of sugars, conformations of sugars, mutarotation, Sterioisomers (anomers, epimers) and enantiomers	19	CO2, CO3

	• Ketones and aldehydes; Reducing non-reducing sugars, and other characteristic features • Conjugates of Carbohydrates: structure of biologically important sugar derivatives • Carbohydrate digestion and absorption • Important biological roles of carbohydrates with examples • Carbohydrate related diseases: Diabetes. Galactosemia, Lactose intolerance **Activity:** 1.Touring of laboratory 2. Learning of Good Lab Practices and Safety Measures 3. Test for starch, reducible and non-reducible sugars in the samples.		
Unit 3	**Proteins**: • Introduction and Definition, Composition and Classification • Amino acids: Essential, Non essential; Acidic, Basic; Polar, Non-polar • Classification of proteins with examples: Primary Structure, Secondary Structure, Tertiary Structure, Quaternary Structure • Conjugates of Proteins • Digestion and absorption of protein, • Characteristics: Denaturation and protein folding • Biological roles of various types of protein, concept of antigen and antibodies, oxygen binding protein • Associated deficiency diseases: Kwashiorkar, Marasmus, Anemia, Edema, Impaired Immune Function, Retarded Growth In Children **Lipids :** • Definition , classification , nomenclature and functions: • Fatty acids , Triacyl glycerol and waxes • Storage lipids • Structural lipids in membranes • Steroids, cholesterol • Important properties of fats: hydrolysis, saponification, hydrogenation, rancidity • Biological roles: Composition of membrane & Fluid Mosaic Model micelles, and other roles • Digestion and absorption of Lipids • Related Diseases : Fatty liver disease, Gaucher disease and Tay-Sachs disease , Familial hypercholesterolemia, glycogen storage diseases **Activity:** 1. Getting acquainted with common glass-wares and plastic-wares of laboratories.	19	CO3, CO4

	2. Learning about the various laboratory instruments and their uses 3. Practicing handling of micropipettes		
Unit 4	**Nucleic Acids:** • Definition and properties , genetic information carriers • Introduction to Deoxyribonucleic Acid (DNA) • Structure, composition and functions of DNA, Watson Crick modelof DNA, forms of DNA • Ribonucleic Acid (RNA): Structure, composition, types, function **Vitamins:** • Definition, chemical composition and properties • Essential, non- essential • Water soluble and non- soluble type. • RDA, Biological roles and characteristics • Related diseases **Minerals:** • Definition, chemical composition and properties • Classification • RDA, Biological roles and characteristics, special reference to Na, K, Ca, Fe • Related diseases **Activity:** 1. Learning how to make solutions in the lab 2. Discussing the answers to the question asked in unit I.	18	CO3, CO4

CO-PO and PSO Mapping

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CO1	3	2	3	2	2	2	3	1	3	3	3	2	2	2
CO2	2	2	3	1	2	3	3	1	2	3	2	3	2	1
CO3	2	2	2	2	1	3	2	1	2	3	3	2	2	1
CO4	3	3	3	2	2	3	2	2	3	3	3	2	2	2

Strongcontribution-3, Averagecontribution-2, Lowcontribution-1

Suggested Readings:

Text-Books	1. Lehninger Principles of Biochemistry, Nelson & Cox. Macmillan Learning Publisher. 7th Edition/ Latest edition. 2. Biochemistry, Satynarayana&Chakrapani, Latest Edition
Reference Books	1. Medical Biochemistry Preparatory Manual for Undergraduates, Dandekar SP, Mahdi AA, Elsevier Publication, Latest Edition 2. Textbook of Medical Biochemistry, Dinesh Puri, Latest Edition 3. Biochemistry for Physiotherapy Students, Prasad RM. RM Publications, Latest Edition

Para Text	Unit I • https://youtu.be/RPAZvs4hvGA • Genome Editing with CRISPR-Cas9: https://youtu.be/2pp17E4E-O8 • CRISPR: The science behind gene-edited 'designer babies':https://youtu.be/SuSP-tzogyY Unit II • http://192.168.7.13:808/medlab/playclasslecture?lectid=466&deptid=14 • http://192.168.7.13:808/medlab/playclasslecture?lectid=464&deptid=14 • https://youtu.be/zufaN_aetZI • https://youtu.be/URUJD5NEXC8 Unit III • https://youtu.be/5BBYBRWzsLA • http://192.168.7.13:808/medlab/playclasslecture?lectid=464&deptid=14 Unit IV • https://youtu.be/0lZRAShqft0 • RNA interference (RNAi) Animation || miRNA || siRNA || mRNA regulation: https://youtu.be/_Bl_l9SNvjA **Activity** • https://www.cartercenter.org/resources/pdfs/health/ephti/library/lecture_notes/med_lab_tech_students/medicallabtechnology.pdf • Solution by Dilution: Making a Solution: https://youtu.be/L2t5UhZizns • Making a Molar Solution: https://youtu.be/X7pvoQFuruA

Recapitulation & Examination Pattern

Internal Continuous Assessment:

Component	**Marks**	**Pattern**
Mid Semester	20	**Section A:** Contains **10** MCQs/Fill in the blanks/One Word Answer/ True-False type of questions. Each question carries **0.5Marks.** **Section B:** Contains **07** descriptive questions out of which **05** questions are to be attempted. Each question carries **03 Marks**.
Activity	10	Will be decided by subject teacher
Class Test	05	Contains **05 descriptive questions.** Each question carries **01** Mark.
Online Test/ Objective Test	05	Contains **10 multiple choice questions.** Each question carries **0.5**Marks.
Assignment/ Presentation	05	Assignment to be made on topics and instruction given by subject teacher
Attendance	05	As per policy
Total Marks	**50**	

Course created by: Dr. Ghazala Zaidi **Signature:**	**Approved by: Prof. Sudhir Mehrotra** **Signature:**