

Programme	B.Sc. (Hons) Agriculture (Major: Soil Science)	Course Code	IBB-301	Credit Hours	3(3-0)
Course Title	PRINCIPLE OF BIOCHEMISTRY AND CELL BIOLOGY				
Course Introduction					
<p>Aim of this course is to let the students know about the basic biochemical principles of living systems in a logical and coherent fashion. The course aims to develop an understanding of role of different biomolecules in the living systems and introducing students with basic of cell biology helping them understand biochemistry in the context of cell.</p>					
1. Learning Outcomes					
<p>By the end of this course, students will be able to:</p> <ol style="list-style-type: none"> 2. Describe the fundamental principles of biochemistry and the nature of organic matter. 3. Explain the properties of water and their significance in aqueous solutions. 4. Apply thermodynamic principles to biological systems. 5. Understand the role of thermodynamics in prebiotic molecular evolution and the origin of life. 6. Explain the structure, function, and genetic material of mitochondria and chloroplasts. 7. Discuss the human mitochondrial genome and its genetic implications. 8. Explain the composition and structural diversity of the cytoskeleton and its role in cell motility and shape. 9. Describe the composition, structural diversity, and functions of the extracellular matrix. 					
Course Content (Theory)				Assignments/Readings	
Week 1	<p>Unit 1</p> <p>1.1. Introduction to Biochemistry and Organic Matter</p> <p>1.1.1. Introduction to the science of biochemistry</p> <p>1.1.2. Nature of organic matter</p> <p>1.1.3. Importance of biochemistry in agriculture</p>			<p>Reading: Chapter 1 of "Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer</p>	

<p>Week 2</p>	<p>Unit 2</p> <p>2.1. Properties of Water and Aqueous Solutions</p> <p>2.1.1. Properties of water</p> <p>2.1.2. Aqueous solutions</p>	
<p>Week 3</p>	<p>Unit 3</p> <p>3.1. Thermodynamic Principles</p> <p>3.1.1. Basic thermodynamic principles</p> <p>3.1.2. Applications in biological systems</p>	
<p>Week 4</p>	<p>Unit 4</p> <p>4.1. Prebiotic Molecular Evolution and Origin of Life</p> <p>4.1.1. Theories of prebiotic molecular evolution</p> <p>4.1.2. Hypotheses on the origin of life</p>	<p>Writing: Summarize the key concepts of biochemistry and the nature of organic matter in 500 words.</p>
<p>Week 5</p>	<p>Unit 5</p> <p>5.1. Structure and Function of Cell Organelles</p> <p>5.1.1. Prokaryotic cell organelles</p> <p>5.1.2. Eukaryotic cell organelles</p>	
<p>Week 6</p>	<p>Unit 6</p> <p>6.1. Biological Membranes</p> <p>6.1.2. Organization and fluidity of membrane components</p> <p>6.1.3. Function of biological membranes</p>	
<p>Week 7</p>	<p>Unit 7</p> <p>7.1. Intracellular Compartments and Protein Sorting</p> <p>7.1.1. Organization of intracellular compartments</p>	<p>Write a brief essay on the importance of water's unique properties in biological systems and in agricultural sector</p>

	7.1.2. Mechanisms of protein sorting	
Week 8	Unit 8 8.1. Junctions Between Cells 8.1.2. Types and functions of cellular junctions 8.1.3. Role in tissue organization	
Week 9	Unit 9 9.1. Intracellular Vesicular Traffic 9.1.1. Mechanisms of vesicular traffic 9.1.2. Significance in cellular functions	
Week 10	Unit 10 10.1. Mitochondria, Chloroplasts, and Their Genomes 10.1.1. Structure and function of mitochondria and chloroplasts 10.1.2. Overview of their genomes	Reading: Chapter on vesicular transport from "The Cell: A Molecular Approach" by Geoffrey M. Cooper
Week 11	Unit 11 11.1. Human Mitochondrial Genome 11.1.1. Structure and function of the human mitochondrial genome 11.1.2. Genetic implications	
Week 12	Unit 12 12.1. Energy Conversion in Mitochondria 12.1.2. Genetically controlled energy delivering processes 12.1.3. ATP synthesis and energy conversion	Analyze the implications of mitochondrial DNA in human genetics and diseases

Week 13	<p>Unit 13</p> <p>13.1. Cytoskeleton, Motility, and Shape</p> <p>13.1.1. Composition and structural diversity of the cytoskeleton</p> <p>13.1.2. Role in cell motility and shape</p>	
Week 14	<p>Unit 14</p> <p>14.1. Extracellular Matrix</p> <p>14.1.1. Composition and functions of the extracellular matrix</p> <p>14.1.2. Structural diversity and interactions</p>	<p>Writing: Discuss the composition and functions of the extracellular matrix in different tissues.</p>
Week 15	<p>Unit 15</p> <p>15.1. Cell Division</p> <p>15.1.2. Mitosis and maturation division</p> <p>15.1.3. Crossing over and formation of gametes</p>	
Week 16	<p>Unit 16</p> <p>16.1. Differentiation, Development, Cell Cycle, and Apoptosis</p> <p>16.1.2. Processes of cell differentiation and development</p> <p>16.1.3. Regulation of the cell cycle</p> <p>16.1.4. Mechanisms of apoptosis</p>	<p>Write a comprehensive review on the regulation of the cell cycle and the mechanisms of apoptosis.</p>
Textbooks and Reading Material		
<ul style="list-style-type: none"> • Voet, Donald, Judith G. Voet, and Charlotte W. Pratt. Principles of biochemistry. Vol. 4. New York: Wiley, 2008. • Alberts, Bruce, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts, and James D. Watson. Molecular biology of the cell. Vol. 3. New York: Garland, 1994. • Purves, William K. Life: the science of biology. Macmillan, 2001. • Biology, N.A. Campbell, 9th Edition, 2010, benjamin/Cummings Publisher Co. Inc. 		

- The Philosophy and Biochemistry of Prokaryotes, David white, 4th Edition, (2011), Oxford University Press.

Teaching Learning Strategies

- Multimedia
- White Board
- Group discussion
- Quiz/Assignments
- Demonstration/Activity

Assignments: Types and Number with Calendar

1. **Reading:** Chapter 1 of "Biochemistry" by Jeremy M. Berg, John L. Tymoczko, and Lubert Stryer.
2. **Writing:** Discuss the composition and functions of the extracellular matrix in different tissues.
3. Write a comprehensive review on the regulation of the cell cycle and the mechanisms of apoptosis.
4. Analyze the implications of mitochondrial DNA in human genetics and diseases.
5. **Reading:** Chapter on vesicular transport from "The Cell: A Molecular Approach" by Geoffrey M. Cooper.
6. **Writing:** Summarize the key concepts of biochemistry and the nature of organic matter in 500 words.
7. Write a brief essay on the importance of water's unique properties in biological systems and in agricultural sector.

Assessment

Sr. No.	Elements	Weightage	Details
•	Midterm Assessment	35%	Written Assessment at the mid-point of the semester.
•	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.
•	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.