

Four-year Undergraduate Programme
Subject: Botany
Semester: Second
Major 2
Course Name: *Cell Biology and Biomolecules*
Course Level: 100-199, and subsequent level as per NEP structure

THEORY [Total marks: 60] Credit: 03; Total No. of classes: 45			
Unit no.	Unit content	No. of classes	Marks
Unit 1	Introduction to cell: Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory); Cytoskeleton, Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle.	8	12
Unit 2	Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport.	6	12
Unit 3	Cell organelles: Nucleus: Structure-nuclear envelope, Organization of chromatin, Nucleolus, Ribosome, Chloroplast, Mitochondria, Peroxisomes, Endoplasmic Reticulum, Golgi Apparatus, and Lysosomes.	9	8
Unit 4	Carbohydrates and Lipids: Carbohydrates: Nomenclature and classification. Lipids: Definition and major classes of storage and structural lipids; Structure, properties and functions of Essential fatty acids.	9	8
Unit 5	Amino acids and Proteins: Structure and classification of amino acids; Levels of protein structure (primary, secondary, tertiary, and quaternary); Protein denaturation and biological roles of proteins.	8	10
Unit 6	Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA.	5	10
PRACTICAL [Credit: 01]			

1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins. 2. Study of plant cell structure with the help of epidermal peel mount of Onion/ <i>Rhoeo</i>/ <i>Crinum</i>. 3. Demonstration of the phenomenon of protoplasmic streaming in <i>Hydrilla</i> and <i>Vallisneria</i> leaf. 4. Counting the cells per unit volume with the help of haemocytometer. (Yeast/ pollen grains). 5. Cytochemical staining of: DNA- Feulgen and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique. 6. Study different stages of mitosis and meiosis.	30	40
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Reading list:

1. Berg JM, Tymoczko JL and Stryer L (2011) Biochemistry, W.H. Freeman and Company.
2. Campbell MK (2012) Biochemistry, 7th Edition. Published by Cengage Learning
3. Campbell PN, Smith AD (2011) Biochemistry Illustrated, 4th Edition, Published by Churchill Livingstone.
4. Cooper GM, Hausman RE (2009) The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
5. Hardin J, Becker G, Skliensmith LJ (2012) Becker's World of the Cell, Pearson Education Inc. U.S.A. 8th Edition.
6. Karp G (2010) Cell Biology, John Wiley & Sons, U.S.A. 6th Edition.
7. Nelson DL, Cox MM (2008) Lehninger Principles of Biochemistry, 5th Edition, W.H. Freeman and Company.
8. Tymoczko JL, Berg JM and Stryer L (2012) Biochemistry: A short course, 2nd Edition, W.H. Freeman.

Graduate Attributes

Course Objective:

This paper will explain biomolecules, the basic building blocks of living organisms, with a focus on their structural organization, molecule properties, biological roles, and functions. The emphasis will be on the relationship between the structure and function of various biomolecules at the chemical level with a biological perspective, as well as a hands-on approach and laboratory techniques.

Course outcomes:

On successful completion of the course, students will be:

1. Able to obtain knowledge of structure, classification, and physicochemical properties of biomolecules and enzymes.
2. Detailed knowledge of the structure, properties, and functions of a cell and its components.
3. Acquainted with practical knowledge of properties of cell and cell membranes, DNA staining techniques, and microscopy of the plant cell.

4. Able to identify various biomolecules in the laboratory by qualitative tests of biomolecules.

Theory Credit: 03

Practical Credit: 01

No. of Required Classes: 75 (Theory: 45; Practical: 30)

No. of Contact Classes: 75 (Theory: 45; Practical: 30)

No. of Non-Contact Classes: Nil

Particulars of Course Designer (Name, Institution, email id):

CCS, Department of Botany
Gauhati University, Guwahati-14