DISCIPLINE SPECIFIC CORE COURSE – 2: Cell Biology: Organelles and

CREDIT DI STRIBUTION, E LIGIBILITY AND PRE-REQUISITES O F TH E COURSE

Course t itle & Code	Credits	Credit di stribution o f t he course			Eligibility criteria	Pre-requisite of t he course (if any)
		Lecture	Tutorial	Practical/ Practice		
Cell Biology: Organelles and Biomolecules	DSC-2	**2**	0	**2**	10+2 from any recognized Board with Biology & Candidates must appear in CUET in the following subject combination: **Physics+Chemistry+ Biology/ Biotechnology**	**Nil**

Learning Objectives

The Learning Objectives of this course are as follows:

- Cell as a structural and functional unit of life.
- Types of biomolecules (proteins, carbohydrates, lipids and nucleic acids) and their roles in cell structure and function.
- Structures of different organelles and their role in fundamental metabolic processes of a cell.

Learning outcomes

The Learning Outcomes of this course are as follows:

By studying this course students will gain basic knowledge on

- The relationships between the properties of macromolecules, their cellularactivities and biological functions.
- Physico-chemical composition of organelles and their functional organization.
- Basic principles and concepts of evolution that contribute to plant diversity.

SYLLABUS OF DSC-2

Unit 1: Biomolecules **Hours: 10**

Types of chemical bonds and their biological significance. Structure and biological roles of carbohydrates, lipids, proteins and nucleic acids. ATP: structure and its role as an energy currency molecule.

Unit 2: The Cell **Hours: 04**

Cell as a unit of structure and function; Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).

Unit 3: Cell Wall and Plasma Membrane **Hours: 06**

Chemistry, structure and function of Plant Cell Wall. Singer and Nicolson's fluid mosaic model of cell membrane.

Unit 4: Cell Organelles: Structure and function of the following Organelles

Hours: 11

Nucleus: Structure and function (nuclear envelope, nuclear pore complex, nuclear lamina); types of chromatins; nucleolus.
Chloroplast and Mitochondria: Structural organization; Function; Semi- autonomous nature of mitochondria and chloroplast.
Endomembrane system: Endoplasmic Reticulum – Structure and function of RER and SER, protein folding, processing in ER, export of proteins and lipids; Golgi Apparatus Organization, protein glycosylation, protein sorting and export from Golgi Apparatus. Introduction to post- translational modifications.
Peroxisome and Lysosomes: Structure and function.

Cytoskeleton: Role and structure of microtubules, microfilaments, intermediary filament and motor proteins.

Unit 5: Cell division **Hours: 08**

Eukaryotic cell cycle, mitosis and meiosis; regulation of cell cycle.

Practical component (60 Hours):

1. Study of cell and its organelles with the help of electron micrographs and other digital resources. (02)
2. Study of plant cell structure with the help of epidermal peel mount of *Allium*/*Rhoeo*/*Crinum*. (01)
3. Microchemical tests for carbohydrates (reducing, non-reducing sugars and starch), lipids and proteins. (02)
4. Separation of chloroplast pigments by paper chromatography/ Thin Layer Chromatography. (01)
5. Separation of amino acids by paper chromatography. (01)
6. Study the effect of organic solvent and temperature on membrane permeability. 02
7. Demonstration of the phenomenon of protoplasmic streaming in *Hydrilla* leaf. (01)
8. Demonstration of the phenomenon of plasmolysis and deplasmolysis. (01)
9. Demonstration of separation of biomolecules by dialysis. (01)

Essential/recommended Readings:

- Hardin, J. and Lodolce, J.P. (2022). Becker's World of the cell, 10th edition, Pearson
- Berg, J.M., Tymoczko, J.L., Stryer, L. (2011). *Biochemistry*. New York, NY: W. H. Freeman and Company.
- Campbell, N. A. (2020). Biology: A Global Approach, 12th Edition, Pearson
- Campbell, P.N., Smith, A.D. (2011). *Biochemistry Illustrated*, 4th edition.London, UK: Churchill Livingstone.

Suggested readings:

1. Cooper, G.M., Hausman, R.E. (2019). The Cell: A Molecular Approach, 7th edition. Sinauer/OUP.
2. Iwasa, J, Marshall , W. (2020). Karps's Cell Biology, 9th edition, New Jersey, U.S.A.: John Wiley & Sons.
3. Majumdar, R., Sisodia, R. (2019). Laboratory Manual of Cell Biology, with reference to Plant Cells. New Delhi, Delhi: Prestige Publication.
4. Nelson, D.L., Cox, M.M. (2021). Lehninger Principles of Biochemistry, 8th edition. New York, NY: W.H. Freeman and Company.
5. Reven, F.H., Evert, R.F., Eichhorn, S.E. (1992). Biology of Plants. New York, NY: W.H.Freeman and Company.
6. Tymoczko, J.L., Berg, J.M., Stryer, L. (2012). Biochemistry: A short course, 2nd edition. New York, NY: W.H.Freeman and Company.

Note: Examination scheme and modes shall be as prescribed by the Examination Branch, University of Delhi, from time to time.

DISCIPLINE SPECIFIC CORE COURSE – 3: Basic Laboratory and Field Skills in

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Basic Laboratory and Field Skills in Plant Biology	**DSC-3**	**2**	**0**	**2**	10+2 from any recognized Board with Biology & Candidates must appear in CUET in the following subject combination: **Physics+ Chemistry+ Biology/ Biotechnology**	**Nil**