

**COURSE TITLE: CELL BIOLOGY AND BIOMOLECULES (THEORY) w.e.f June 2020**

**COURSE CODE: BOT-I.C-2**

**MARKS: 100 (75 Theory+ 25 Practicals)**

**CREDITS: 4 (3 Theory+ 1 Practical)**

**COURSE DURATION: 45 HOURS**

**COURSE OBJECTIVES:**

This course will provide a detailed discussion on a wide range of topics in Cell biology & Bio-molecules emphasizing experimental approaches and key experiments that have provided important insights. The course is aimed at conveying an understanding of how cellular structure and function arise as a result of the properties of cellular macromolecules. Emphasis will be on the dynamic nature of cellular organization, structure and function.

**COURSE OUTCOME:**

Upon successful completion of the course, students will be able:

CO 1: Recognise, classify cell, explain cell theory, evolution and biogenesis

CO 2: Define, describe, classify and explain cytoskeleton, cell organelle, biomolecules.

CO 3: Define, describe, compare, explain, illustrate cell wall and plasma membrane

CO 4: Predict and interpret the importance of cell

<b>Sr. No</b>	<b>TOPICS</b>	<b>Hours</b>
<b>Module I: Introduction to Cell, Ultra-structure and Function of Cell Wall and Plasma Membrane</b>		<b>15</b>
<b>1.1</b>	Discovery and basic properties of cells	
<b>1.2</b>	Prokaryotic and Eukaryotic cell; Cell theory	
<b>1.3</b>	Cell evolution and biogenesis	
<b>1.4</b>	Structure and functions of cytoskeleton;	
<b>1.5</b>	Structure and function of Microtubule, Intermediate filaments, Microfilaments	
<b>1.6</b>	Structure and function of cell wall; Chemical composition of cell wall; Extracellular matrix and cell interactions; Gap -Junctions & plasmodesmata	
<b>1.7</b>	Structure and function of plasma membrane; Active and Passive transport of solute (channels & pumps); Cell signaling- molecules and receptors, signaling network	

<b>Module II: Study of Cell Organelles</b>		<b>15</b>
<b>2.1</b>	Semiautonomy and gene control;	
<b>2.2</b>	Structure & functions of peroxisome, glyoxysome& lysosomes	
<b>2.3</b>	Nucleus and its Organization; Nuclear envelope, nuclear pore complex Nuclear matrix, Chromosomes and chromatin structure	
<b>2.4</b>	Structure and function of ribosome	
<b>2.5</b>	Endomembrane systems- Endoplasmic reticulum and Golgi complex	
<b>Module III: BIOCHEMISTRY OF CARBOHYDRATES, LIPIDS AMINO ACIDS AND PROTEINS</b>		<b>15</b>
<b>3.1</b>	Definition & importance of biomolecules; types of bonds in biomolecules; pH and buffers ; Water as a biological solvent	
<b>3.2</b>	Classification and biological functions of carbohydrates and lipids	
<b>3.3</b>	Classification and biological functions of amino acids and proteins	
		<b>Total</b>
		<b>45</b>

**COURSE TITLE: CELL BIOLOGY & BIOMOLECULES (PRACTICAL)****COURSE CODE: BOT-I.C-2****MARKS: 25****CREDITS: 1****PRACTICAL SESSIONS: 15**

Sr.No	MODULE IV: TOPICS	PRACTICAL SESSIONS
1.	Study of cell structure in <i>Hydrilla</i> and <i>Tradescantia</i> staminal hairs	1
2.	Examination of prokaryotic cell, eukaryotic cell and cell organelles by EM graphs	1
3.	Preparation of temporary slides to observe different types of cells	2
4.	Staining and Preparation of slides	6
	I. Cytochemical staining of Nucleus- Acetocarmine II. Cytochemical staining of polysaccharides- Periodic Acid Schiff's (PAS) III. Cytochemical staining of Mitochondria – Jannis Green IV. Cytochemical staining of Total proteins –Bromophenol blue V. Cytochemical staining of Histones – Fast Green	
5.	Determination of pH (of plant extracts) using pH meter	1
6.	Quantitative determination of carbohydrates (Anthrone reagent)	1
7.	Estimation of oil in fatty seeds using (Soxhlet apparatus)	2
8.	Estimation of proteins ( Lowry's Method)	1
	<b>Total</b>	<b>15</b>

**REFERENCES:**

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2. Donald Voet., Judith G. Voet and Charlotte W. Pratt. (2002). Fundamentals ofBiochemistry, 2<sup>nd</sup> edition, John Wiley and Sons (Asia) Pvt Ltd.
3. Gupta, P.K. (1999). A Text-book of Cell and Molecular Biology. Rastogi Publications, Meerut, India.
4. Robert A. Horton. (2006).Principles of Biochemistry.4<sup>th</sup> ed. Pearson Prentice Hall.
5. Jeremy M. Berg, John L. Tymoczko and LubertStryer.(2002). Biochemistry5<sup>th</sup> edition,

W.H.Freeman & Company, New York

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7. Paul Flinch (1999). Carbohydrates structure, Synthesis & Dynamics. Kluwer Academic Pub.The Netherlands.
8. U. Satyanarayana and U. Chakrapani. (2000).Biochemistry,4<sup>th</sup>edition., Elsevier Pub.Kolkata.
9. Verma P.S. and Agarwal V. K. (1998).Cell Biology, Genetics, Molecular Biology, Evolution and ecology. Edn.14
10. Randall J. WeselakeEmail authorStacy D. SingerGuanqun Chen. ( 2018, July 19). *Introduction to Plant Biomolecules and Cellular Metabolism*. Retrieved February 13, 2020, from Springer: [https://link.springer.com/chapter/10.1007/978-1-4939-8616-3\\_2](https://link.springer.com/chapter/10.1007/978-1-4939-8616-3_2)
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