

**Course Code: ZOO 339**

**Course Title: Advanced Cell Biology**

**Number of Credits: 3 + 1**

**Effective from AY: 2020 -21**

<b>Prerequisite for the Course:</b>	Basic understanding of different components and functions of the cell.	
<b>Objectives:</b>	3. To develop advanced concepts of structural and functional properties of cell and its components. 4. To understand dynamic functions associated with cell membrane and organelles.	
<b>Content</b>	<p><b>Module 1</b> Cell membrane: Plasmamembrane Dynamics involved in Membrain fluidity (Paracrystalline state, Liquid-disordered state and Liquid-ordered state), Transbilayer movements, lateral movements, Membrane Rafts, Caveolins, cell-cell interaction, membrane fusions.</p> <p>Importance of Freeze-fracture microscopy and Fluorophore Photobleaching experiments to decipher membrane structure and dynamism.</p> <p>Nuclear transport: Passive Transport and selective energy dependant transport, Karyopherins (Importins and exportins), NLS and NES</p> <p><b>Module 2</b> Endomembrane system: Main Vesicular transport pathways (inward transport: Endocytotic pathway and Outward Transport: Secretory pathway) of endomembrane systems and transport proteins involved.</p> <p>Structural and functional Polarization of Golgi apparatus, Two models for cis to trans-Golgi progression (Cisternal Maturation Model and Vesicular transport model, three pathways of protein sorting at trans Golgi network: Signal mediated diversion to Lysosomes, Signal mediated diversion to regulated secretion, constitutive secretory pathways. LAMP and LIMP of Lysosomes and their significance.</p> <p>Synthesis, Structure and Functions of Ribosome and its subunits in Prokaryotes and Eukaryotes. Concept of LUCA in relation to Ribosomes.</p> <p><b>Module 3</b> Comparison of constitution of Cytoplasm, Cytosol and Nucleoplasm. Comparison of Organelle composition of Protein secreting and Steroid secreting Cells. Comparison of Cytoskeletal elements of Prokaryotes and Eukaryotes.</p> <p>Programmed and non-programmed Cell death and its types, Autophagy, Pyroptosis, Necroptosis, Parthoantos, Ferroptosis, Apoptosis and Necrosis. Extrinsic <i>versus</i> Intrinsic pathway of</p>	<p>07 hrs.</p> <p>02 Hrs</p> <p>03 Hrs</p> <p>04 Hrs</p> <p>06 hrs</p> <p>02 Hrs</p> <p>03 Hrs</p> <p>04Hrs</p>

	<p>Apoptosis in Mammals.</p> <p>Cell signaling: General Principles, Specific responses to cell signaling (Survive, Grow+divide, Differentiate, Die) with example each, Feedback loops of signaling networks, adaptation to sensitivity to signaling. Overview of Receptors, Signaling transducers and second messengers.</p> <p><b>Module 4 Practicals:</b></p> <p>1. Isolation of plasmamembrane from blood cells or from hepatocytes.</p> <p>2. Cytoskeletal element staining using buccal epithelial cells.</p> <p>3. Temporospacial patterns of apoptosis in chick embryos during the morphogenetic period of development.</p>	<p>05 Hrs</p> <p>12 x 2 Hrs</p>
<b>Pedagogy:</b>	Lectures/ tutorials/Group discussions/PBL/self-study	
<b>Learning Outcome:</b>	<p>3. Understand the functions of the cell at the molecular level.</p> <p>4. Gain insight into the most significant functional cellular machinery to expand understanding of biological disturbances.</p>	
<b>References /Reading</b>	<p>13. Alberts B, Johnson A, Lewis J, et al. Molecular Biology of the Cell, Taylor &amp; Francis Group, New York, USA.</p> <p>14. Lodish H, Berk A, Lawrence S, et al., Molecular Cell Biology, Freeman WH &amp; Co. New York.</p> <p>15. Watson JD, Beyker, Bell JD, et al., Molecular Biology of the Gene, Pearson Education, Delhi.</p> <p>16. Bray BAD, Lewis J, Raff M, Roberts K and Watson JD, Molecular Biology of the Cell, Garland Publishing Co. Ltd. New York.</p> <p>17. De Robertis EDP and De Robertis EMF, Cell and Molecular Biology Saunders College, Philadelphia Dowben RM, Cell Biology, Harper and Row Publ. London.</p> <p>18. Nelson, D. L. and Cox, M. M. Lehninger Principles of Biochemistry. Seventh Edition (2017). Freeman WH and Co, USA</p>	