Name of the Programme: M. Sc. Zoology

Course Code: ZOO-529 **Title of the Course:** Animal Cell Biology (Theory)

Number of Credits: 03

Effective from AY: 2023-24

Pre-requisites for the Course:	Basic understanding of different components and functions of the cell. Parallel enrolment for the courses ZOO-530, Animal cell biology Practical	
Course Objectives:	1. To evaluate the dynamics of Plasma membrane and its importance. 2. To summarize the experiments used for proving the dynamic nature of the Plasma membrane. 3. To explain the structure and function of the endomembrane system. 4. To appraise cell death and cell signaling.	
Content:	**Module 1** Cell membrane: Plasma membrane dynamics involved in membrane fluidity (Paracrystalline state, liquid-disordered state and liquid-ordered state), trans bilayer movements, lateral movements, membrane rafts, caveolins, cell-cell interaction, membrane fusions. Importance of freeze-fracture microscopy and fluorophore photobleaching experiments to decipher membrane structure and dynamism. Nuclear transport: passive transport and selective energy dependent transport, Karyopherins (importins and exportins), NLS and NES **Module 2** Structural component of Endomembrane system, main vesicular transport pathways (inward transport: Endocytotic pathway and outward transport: Secretory pathway) of endomembrane systems and transport proteins involved. 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. Lysosomes, signal-mediated diversion to regulated secretion,	7 hours 4 hours 4 hours 4 hours 6 hours

	constitutive secretory pathways. LAMP and LIMP of lysosomes and their significance.	2 hours
	Synthesis, structure, and functions of the ribosome and its subunits in Prokaryotes and Eukaryotes. Concept of LUCA in relation to ribosomes. (Additional: mention of Mitochondrial Eve and Y-chromosome Adam concept).	2 hours
	Comparison of organelle composition of protein-secreting and steroid-secreting cells.	1 hour
	Module 3 Comparison of the constitution of Cytoplasm, Cytosol and Nucleoplasm. Comparison of Cytoskeletal elements of Prokaryotes and Eukaryotes.	3 hours
	Programmed and non-programmed cell death and its types, Autophagy, Pyroptosis, Necroptosis, Parthonatos, Ferroptosis, Apoptosis, and Necrosis. Extrinsic versus Intrinsic pathway of Apoptosis in Mammals.	6 hours
	Cell signaling: General principles, specific responses to cell signaling (survive, grow+divide, differentiate, death) with example each, feedback loops of signaling networks, adaptation to sensitivity to signaling. Overview of receptors, signaling transducers and second messengers.	6 hours
Pedagogy:	Mini Projects, Group activities, Demonstrations	
References/ Readings:	1. B. Alberts, A. Johnson, J. Lewis, M. Raff, K. Roberts, and P. Walter, (2014) Molecular Biology of the Cell. Taylor & Francis, New York, USA, 2014. 2. H. Lodish, A. Berk,C. A. Kaiser, M. Krieger, A. Bretscher, H. Ploegh, A. Amon, and M. P. Scott, *Molecular Cell Biology*. W. H. Freeman, New York, 2016. 3. J. D. Watson, T. A. Baker, and S. P.Bell, Molecular Biology of the Gene. Benjamin-Cummings Publishing Company, 2014. 4. E. D. P. De Robertis, and E. M. F. De Robertis, Cell and Molecular Biology Saunders College, Philadelphia Dowben RM, Cell Biology, Harper and Row Publ. London, 2021. 5. D. L. Nelson, and M. M. Cox, Lehninger Principles of Biochemistry. Seventh Edition (2017). Freeman WH and Co, USA, 2008.	

Course Outcomes:	The learner will 1. Manipulate the construction of the Plasma membrane with respect to the changing environment. 2. Interpret the results of experiments that are conducted to demonstrate Plasma membrane dynamics. 3. Defend the various cell death events encountered in the tissues during the normal and pathological conditions. 4. Infer the complexities of cell signaling associated with nuclear transport, endomembrane trafficking.

(Back to top)