SEMESTER-I

Course title: Cell and Molecular Biology **Credit: 4**
Course code: SLOS BC /C001 **Lecture: 60**
External Evaluation: 75 **Internal Evaluation:25**

Course objectives:
The focus of Cell and Molecular Biology is the study of the fine structure and function of the cell. In this course we will emphasize on Eukaryotic cell biology and will cover topics such as membrane structure and composition, transport, and trafficking, the cytoskeleton and cell movement. We also cover important cellular processes including DNA replication, transcription and translation.

Student learning outcomes:
Upon completion of this course, the student will be able to:

- Describe the fundamental principles of cellular biology
- Have a conceptual understanding of the molecular basis of various cellular processes
- Know how cell function and structure are related
- Be able to think critically and interpret hypothetical experimental observations based on class concepts.

Unit-I
Introduction to Cell Biology, Membranes and Cell Architecture, Nucleus architecture, Membrane Transport, Membrane Trafficking, Vesicular Traffic, Secretion, and Endocytosis Glycosylation & COP - Mediated Vesicular Transport, Moving proteins into membranes and organelles.

Unit-II
Cellular Organization and Movement, Cytoskeleton-Microfilaments and Intermediate Filaments, Microtubules, Microtubule-Based Movement - Intracellular Transport, Motile Appendages, Cell-Cell Organization and the Extracellular Space, the Extracellular Matrix (ECM), Integrating Cells into Tissues.

Unit-III
DNA: Structure and function, Chromosome and chromatin, DNA replication and its regulation (prokaryotes and eukaryotes), DNA polymerases of Prokaryotes. Mechanism of replication in prokaryotes. Eukaryotic DNA polymerases. Mechanism of replication in eukaryotes. DNA damage and repair, DNA Mutation, Types of mutations, Genetic system of Mitochondria and plastids, Gene recombination Homologous and site-specific recombination.

Unit-IV
Transcription and its regulation (prokaryotes and eukaryotes), Prokaryotic RNA polymerase. Nature of prokaryotic promoters. Mechanism of prokaryotic transcription. Eukaryotic RNA polymerases. Nature of eukaryotic promoters, Mechanism of eukaryotic transcription. Inhibitors of transcription. Translation and its regulation (prokaryotes and eukaryotes), adapter role of RNA in protein synthesis; genetic code; wobble hypothesis; ribosomes, activation of amino acids; initiation, elongation, and termination of protein synthesis in prokaryotes and eukaryotes. Control of translation: role of guanine nucleotides; translational control of gene expression

Suggested reading:

1. Essential Cell Biology, 4th edition, Alberts, Bray, Hopkin, Johnson, Lewis, Raff, Roberts, and Walter.
2. Essentials of Stem Cell biology (2013) 3rd ed., Lanza RP and Anthony A, Elsevier Academic Press,
3. Molecular Cell Biology. Seventh Edition. Lodish et. al. Freeman Press. (ISBN-13: 978-1-4292-3413-9)

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