

CORE COURSE III – CELL AND MOLECULAR BIOLOGY

Unit I

Diversity of cell size and shape – cell theory, structure of prokaryotic and eukaryotic cells – Isolation and growth of cells, Subcellular fractionation and criteria for functional integrity.

Unit II

Cellular organelles – plasma membrane, cell wall, their structural organization, transport of nutrients, ions and macromolecules across the membranes. Cellular energy transactions – Role of mitochondria and chloroplast, Cell cycle – molecular events and model systems, cellular responses to environmental signals in plants and animals – mechanisms of signal transductions. Cellular basis of differentiation and development – mitosis, gametogenesis and fertilization

Unit III

DNA replication, prokaryotic and eukaryotic DNA replication, enzymes and accessories proteins involved in DNA replication. DNA repair and recombination, Transcription – prokaryotic and eukaryotic transcription, RNA polymerase, general and specific transcription factors, regulatory elements and mechanisms of transcription regulations, transcriptional and post transcriptional changes – gene silencing modifications in RNA – 5' – CAP formation, transcription termination, 3' processing and polyadenylation, splicing, editing, nuclear export of mRNA, mRNA stability.

Unit IV

Translation – prokaryotic and eukaryotic translation, the translational machinery, mechanisms of initiation, elongation and termination, regulation of translation, co- and post transcriptional modification of proteins. Protein localization, synthesis of secretory and membrane proteins, import into nucleus, mitochondria, chloroplast and peroxisomes, receptor mediated endocytosis.

Unit V

Biology of cancer – oncogenes and tumour suppressor genes with suitable examples. Programmed cell death. Brief introduction to life cycle and molecular biology of some important pathogens of AIDS, hepatitis and kalaazar – antisense and ribozyme technology – homologous recombination – mapping of genome – genome sequencing

Reference Books:

1. Principles of Biochemistry, Geoffrey L. Zubay, William, W. Parson, Dennis E. Vance, 1995, Wim C. Brown communications
2. Molecular Cell Biology, James Darnet, Harvey Lodish, David Baltimore, 1986, Scientific American Books Ins.,
3. Cell and Molecular Biology, E.D.P. Derobertis, E.M.F. DeRobertis, 1988, 8th edition, International edition ISBN
4. Molecular Biology of the gene, James, D. Watson, Nancy H. Hopkins, Jeffrey W. Roberts, Joan Argetsinger Steitz, Alan M. Weiner, 1987, The Benjamin / Cummings Publishing Company, Inc.
5. Biochemistry, Jeremy M. Berg, John L. Tymoczko, Lubert Stryer, 2002, 5th edition, W.H. Freeman and Company.