



MANIPAL UNIVERSITY JAIPUR

School of Basic Sciences

Department of Biosciences

Course Hand-out

Cell and Molecular Biology | BT 2101 | 4 Credits | 3 | 0 | 4

Session: Aug 18 – Nov 18 | Faculty: Dr. Mousumi Debnath | Class: Core course

A. Introduction: This course is offered by Dept. of Biosciences as a core course in M.Sc. Biotechnology Programme targeting students who wish to pursue their career in the field of Cell sciences, Molecular Biology, Genomics, Proteomics, Transcriptomics, etc. The course imparts in depth knowledge of the cell structure, functions and signalling pathways involved in growth and development. Also the course connects the cellular functioning with the “omics” technology and the molecular genetics, enabling the students to explore and identify novel research leads for the greatest benefit of mankind and critically examine the data and interpretations presented by researchers.

B. Course Outcomes: At the end of the course, students will be able to:

- [BT 2101.1]. Understand the composition, structure and function of organelles and other cellular components in the context of the cells they constitute and their biological activities
- [BT 2101.2]. Classify the cellular and subcellular specialisations, and characteristics of higher tissue assemblies and their contribution to the overall functioning of the organism, and how malfunctions at the subcellular level lead to diseases such as cancer.
- [BT 2101.3]. Discuss the phases of cell cycle, and its regulation, importance of cell cycle regulation for normal functioning of the body, abnormalities associated with improper cell cycle regulation
- [BT 2101.4]. Identify the methods and factors involved in cell death, consequences of abnormal functioning of Programmed Cell Death pathways, malfunctions associated and their prognosis
- [BT 2101.5]. Understand the mechanism of central dogma including DNA replication, transcription, translation and gene expression in prokaryotes and enhance the employability.

C. SYLLABUS

Cell structure: Comparison between plant and animal cells; Plasma membrane; **Electrical properties of membrane, Modification of plasma membrane and intracellular junctions;** Organization of plant cell wall. **Cell signalling:** communication between cells and their environment. Introduction to **cytoplasmic organelles and cytoskeleton:** Protoplasm; Mitochondria; Chloroplast; ER; Golgi complex; Lysosome, endosome, Ribosome; Centriole; Nucleus. Chromosomes, chromatin and nucleosome: **Chromosome structure in bacteria and eukaryotes**, centromere, telomere, Hetero- and euchromatin, Nucleosome model and radial-loop scaffold model. **Overview of Cell cycle:** Stages of cell cycle, cell cycle control, Mitotic and meiotic cell division; Distinction between mitosis in plant and animal. **Cell Death: Apoptosis and Necrosis. Nucleic acids structure:** DNA as genetic material, Watson-Crick model, A, B and Z forms of DNA; RNA types, distinctions between RNA and DNA. **The Central Dogma:** Overview of synthesis of DNA, RNA and protein. **The genetic code:** Genetic code and its properties. **Gene cloning:** restriction endonuclease and cloning vector, screening of cloned DNA.

D. TEXT BOOKS

1. *Alberts, B., Jahusan., A., Levis, J., Raff, M., Roberts, K. and Walter, P. Molecular Biology of Cell, Garland Science, USA, 2002.*
2. *Lodish, H. and Baltimore, D. Molecular Cell Biology, WH Freeman and Company, USA, 2012.*
3. *Chaitanya, K.V. Cell and Molecular Biology: A Lab Manual, PHI Publisher, India, 2013.*
4. *Puttaraju. H.P. Molecular Biology & Biochemistry: A Lab Manual with Colour Plates (Manual Series-I). New India Publishing Agency, New Delhi, 2008.*

E. REFERENCE BOOKS

1. *Lewin, B. Genes XII, Jones and Bartlett Publishers, USA, 2014.*
2. *Karp, G. Cell and Molecular Biology – Concepts and Experiments, John Wiley & Sons, Inc. USA, 2009.*
3. *Brown, T.A. Genomes, Garland Science, New York, 2006.*

