Subject Code : RCCN2G5

CORE COURSE V - CELL & MOLECULAR BIOLOGY AND BIOTECHNOLOGY

A. CELL & MOLECULAR BIOLOGY

Unit-I

Methods of Cell Study

Micrometry – cell culture methods – cell fractionation technique – cytochemical staining methods – cytophotometry – immunocytochemistry and autoradiography.

Cell Membrane

Molecular organization – molecular models – cell permeability – cell surface differentiations and cell – cell communication – membrane receptors and signal transduction – secretion and endocytic pathways.

Cytoplasmic Membrane System

Functions of endoplasmic reticulum and Golgi complex – Protein sorting.

Cytoskeleton and Cell Motility

Microtubules, microfilaments and intermediate filaments – role in cell organization, division and motility.

Unit-II

Mitochondria and Energy Transduction

Molecular organization of mitochondria and their role in oxidative phosphorylation.

Nucleus and Chromosomes

Nuclear envelop – Nuclear pore – Nuclear proteins – Nucleosome – exons – introns – extrachromosomal DNA.

Nucleic Acids and Their Functions

DNA and RNA – Structure, types and functions – Replication of DNA – DNA repair mechanism.

Ribosomes

Morphology, ultrastructure, biochemistry and functions.

Unit-III

Cell Cycle

Phases of cell cycle – role of cyclin and other molecules – molecular organization and functional significance of mitotic apparatus.

Protein Synthesis

Mechanism of transcription – role of transcription factors – transcription regulators – Genetic code - Processing of mRNA – translation – post translational modifications and control mechanism.

Biology of Cancer Cells

Characteristics of Cancer Cells, types of tumours. Apoptosis and its relevance in cancer biology.

B. BIOTECHNOLOGY

Unit-IV

Genetic Engineering

DNA isolation – Restriction enzymes – Vectors – salient features and types – plasmids – phages – cosmids – ligation.

Gene transfer techniques – Selection and screening – plaque and colony hybridization – clone identification by immunological and blotting techniques.

DNA sequencing – Sanger and Maxim Gilbert Method, & PCR

DNA finger printing – Principle and Applications

RFLP

Unit-V

Applied Biotechnology

Application of recombinant DNA technology – Production of single cell protein (SCP), vaccines, growth hormone (GH), insulin and enzyme engineering.

Biotechnology in Agriculture

Biofertilizers – Biopesticides – Transgenic plants & their applications.

Biotechnology in Aquaculture

Ploidy induction – Production of Transgenic fish.

Biotechnology in Animal Husbandry

Transgenic farm animals and applications.

Recommended Text Books

CELL AND MOLECULAR BIOLOGY

1. De ROBERTIS, E.D.P. and De ROBERTIS, E.M.F. (1987), Cell and Molecular Biology, VIII Ed., Lea and Febiger, Philadelphia.
2. DAVID FREIFELDER (1998), Molecular Biology, II Ed., Narosa Publishing House, New Delhi.

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1. IGNACIMUTHU, S. (1998), Basic Biotechnology, Tata McGraw Hill Publishing Co., New Delhi.
2. KUMAR, H.D. (1998), Modern Concepts of Biotechnology, Vikas Publishing House Pvt. Ltd., New Delhi.

References

CELL AND MOLECULAR BIOLOGY

1. LEWIS, KELEINSMITH and VALERIS M. KISH (1988), Principles of Cell Biology, Harper and Row Publications, New York.
2. POWAR, C.B. (1983), Cell Biology, Himalaya Publishing House, Bombay.
3. WATSON et al., (1987), Molecular Biology of the Gene, The Benjamin Cummings Publishing Co., Inc., California.

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1. BROWN, C.M., CAMPBEL, I. and PRIEST, F.G. (1988), Introduction to Biotechnology, Blackwell Scientific Publications, UK.

2. PRIMROSE, S.B. (2000), Modern Biotechnology, Blackwell Scientific Publications, Oxford, London.

3. KESHAV TREHAN (1996), Biotechnology, New Age International Pvt. Ltd. Publishers, New Delhi.