Subject Code : P8MB11

Core Course XI (CC) – Genetic Engineering

Unit – I: Introduction to Basics of genetic engineering

Gene as a unit of mutation and recombination. Mutagenesis, mutations and mutants – biochemical basis of mutations, spontaneous and induced mutations, isolation of mutants, mutagenesis, reversion, suppression, genetic analysis of mutants. Recombination methods – conjugation and transformation.

Unit – II: Tools of genetic engineering

Enzymes in Genetic Engineering - DNA Polymerase, Polynucleotide kinase, T4 DNA ligase, Nick translation system, Terminal deoxynucleotidyl transferase, Reverse transcriptase Restriction endonucleases Type I & II. Vectors – plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome.

Unit – III: Techniques of Genetic Engineering I

Strategy of recombinant DNA technology; Gene library - Genomic library, cDNA library – Cloning strategies - Use of linkers, adoptors, homopolymer tails - Nucleic acid hybridization - Colony hybridization, plaque hybridization; Blotting techniques - Southern, Northern, Western and dot blotting.

Unit – IV: Techniques of Genetic Engineering II

PCR – principles, techniques and applications. Gene isolation, cloning and expression, DNA sequencing, oligonucleotide synthesis, Southern and Northern hybridization, FISH, RAPD, PCR-RFLP, STRR, LTRR. DNA fingerprinting and their applications for diagnosis of disease, site-directed mutagenesis, Gene silencing, Gene transfer technologies.

Unit-V: Functional genomics and Applications of Genetic Engineering

DNA chips and microarray gene screen technology; site directed mutagenesis, transgenic animals and gene knockout techniques, cell culture based techniques Genetic diagnosis. Applications in medical field, biology, transgenic plants, transgenic animals, Recombinant vaccines development. Gene therapy; Molecular basis of genetic diseases, genetic counseling.

References:

Molecular biology and Microbial genetics (1994) David Frifielder, Stanely R. Maloy, 2nd edition Jones and Barlett Publishers.
Genetics by Peter J Russell (1997) 5th edition Benjamin-Cummings Publishing Company.
Molecular Biotechnology (2003) Bernard R. Glick and Jack J.Pasternak., 2nd edition by ASM press.
Gene Cloning and DNA analysis (2004) T.A.Brown 2nd edition. By ASM press.
Application of rDNA Technology (2003). Glick & Pasteneuk.
Principles of Gene Manipulation and Genomics (2006) Sandy Primrose. 7th Edition, Black Well Publishers.