Subject Code : P8GTE6

ELECTIVE COURSE IV-1: GENOMICS AND PROTEOMICS

UNIT- I

Genome Structure: Genome sizes- microbial and organelle genomes - Centromeres and telomeres, tandem repeats- dispersed repeats (transposons).
Genome Physical Mapping and Sequencing: Fragmenting the genome, the need for markers - marker sequences (RFLPs, AFLPs, SNPs, etc) - hybridization mapping -mapping without cloning - Basic Sanger sequencing - automated sequencing- sequencing
simple genomes - Sequencing large genomes - finalizing sequences – resequencing. Genome project and bioinformatics - www databases for genomes -Phylogenetic Genome mapping - DNA sequence database analysis - Random-shearing- GenBank - Web-based ORF finding, sequence alignment and 3-D matrix tools – Genotator - DNA modeling- EST sequencing strategies, whole genome assembly-Characterization of transcriptome.

UNIT -II

Microarray: DNA Micro array, Protein Micro array Transcriptomics, Applications and advantages of Micro arrays- DNA chips and SAGE technology- Organization of genome projects- human, plant, animal and microbial genome.
Plant Genome and Genomics- An overview, measuring gene activity during plant development; programmed morphogenesis and genome expression profiles; Expressed sequence tags (EST's)- Tools of plant genome analysis- Chloroplast DNA-. Comparative study of plant genomes- rice, *Arabidopsis thaliana.*

UNIT - III

Human Genome Project: Genesis – the Alta summit - Tracking the Genes – Forward Genetics approach, Reverse genetics approach, Human Chromosomes. Important genes associated with each chromosomes - Mendelian and sexlinked traits in human inheritance. Genetic diseases due to defects in autosomal and sex linked genes.Identification of genes Causing genetic diseases, Pedigree analysis, PFLP studies , STR linkage mapping; DNA Profiling/DNA fingerprinting: DNA Markers in disease diagnosis and finger printing: RFLPs, VNTRs, Microsatellites, SNPs, Current Technology for DNA Finger printing;Databases of human genome; Gene cards, Gene larynx and others, Applications of functional genomics: Role of genomics in drug design and in gene discovery, in designing personalized therapies.

UNIT- IV

Proteomics: DNA polymorphisms as expressed in proteomes. Large scale proteomic tools-Identifying proteins in complex mixtures: Protein profiling, quantitative 2DGE, multidimensional chromatography, quantitative mass

spectrometry, and analytical protein chips- Computational pattern, recognition of proteomes – protein networks and pathways.
Protein domains and folds, using sequences and structures to predict gene function, high throughout structural analysis of protein, structural proteomics- Protein structure prediction by homology modeling- fold recognition- ab initio methods for structure prediction;Methods for comparison of 3D structures of protein; Protein structure databanks- protein databank, Cambridge small molecular crystal structure databank, internal and external coordinate system.

Unit V

Metabolomics: Significance, methodologies, technical problems, data handling, data Interpretation. Computational protein-protein interactions. RasMol – Swiss PDB viewer. **Phamacogenomics and New Drug Design**. Need for developing new drugs: Procedure followed in drug design; Molecular modification of lead compounds; Prodrug and soft drugs; Physico-chemical parameters in drug design; QSAR; Active site determination of enzymes; Design of enzyme inhibitors.- expression arrays to study drug response; SNP genotyping methods and technology.- Model organisms in pharmacogenetic studies: use of yeast, *C. elegans*, zebrafish and mice in pharmacogenetic studies.

REFERENCES:

1. Necia Grant Cooper; (Ed.) 1994.The Human Genome Project; Deciphering the blueprint of heredity University Science books, CA, USA.
2. Gary zweiger, 2003. Transducing the Genome; Information, Anarchy and Revolution in Biomedical Sciences.. Tata McGraw-Hill Publishers, New Delhi.
3. Howard L McLeod1 and William E Evans. 2001. PHARMACOGENOMICS: Unlocking the Human Genome for Better Drug Therapy. *Annu. Rev. Pharmacol. Toxicol.*41:101–121.
4. Evans W.E. and Relling, M.V. 1999. Pharmacogenomics: translating functional genomics into rational therapeutics. *Science* 286:487
5. Satoskar, R.S., Bhandarkar, S.D and Annapure, S.S. 1999. Pharmacology and Pharmacotherapeutics, Popular Prakashan, Mumbai.
6. Branden, C and J.Troze, 1999. Introduction to Protein Structure. Second Edition.Garland Publishing, New Delhi.
7. Baxevanis, A.D and Ouellette, B.F.F. Eds. 2001. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins. Wiley Interscience. New York.
8. Higgins, D and Taylor, W (Eds). 2000. Bioinformatics: Sequence, Structure and Databnks.Oxford University Press, Oxford.