SRM UNIVERSITY
FACULTY OF ENGINEERING & TECHNOLOGY
DEPARTMENT OF BIOINFORMATICS

GI2001 - STRUCTURAL AND FUNCTIONAL GENOMICS

Semester: I **Course: Structural and Functional Genomics**
Sub Code: GI2001 **Staff Handling: Dr.S.Shobana**

Lecture Hour	Topic	Learning outcome
1 2 3 4 5 6 7 8 9	UNIT I - GENOME ANATOMIES • Introduction about Genomes, Transcriptomes and Proteomes • Importance of The Human Genome • The Human Genome Project • Genome Anatomies • An Overview • The Anatomy of the Eukaryotic and Prokaryotic Genome • The Repetitive DNA Content of Genomes. How genes work • Gene-protein relations, Genetic fine structure • Mutational sites • Complementation	**To acquire the knowledge about genome anatomies**
10 11 12 13 14 15 16 17 18	UNIT II - GENOME MAPPING AND COMPARISION Mapping Genomes • Genetic and Physical Maps • Sequencing Genomes • Methodology for DNA Sequencing, Assembly of a Contiguous DNA Sequence • Understanding a Genome Sequence • Locating the Genes in a Genome Sequence • Determining the Functions of Individual Genes, • Global Studies of Genome Activity, • Comparative genomics	**To understand the techniques of genomics to study gene expression.**
19	UNIT III - GENOME EXPRESSION AND REGULATION • How Genomes Function, Accessing the Genome, Inside the Nucleus,	**To apply the techniques to study gene expression**

20 **21** **22** **23** **24** **25** **26** **27**	• Chromatin Modifications and Genome Expression • Assembly of the Transcription Initiation Complex, The Importance of DNA-binding Protein-DNA-Protein Interactions During Transcription. • Initiation-Regulation of Transcription, • Synthesis and Processing of the Proteome • The Role of tRNA in Protein Synthesis, The Role of the Ribosome in Protein Synthesis • Post-translational Processing of Proteins, Protein Degradation. • RNA polymerase II, Cofactors, Chromatin, HATS and HDACS, Core promoterelements in Transcription, Transcriptional Activators, Repressors, Cytokine regulated transcription, Nuclear receptors, HOX genes, NF-κB. • Methods for gene expression analysis; DNA array for global expression profile; • Types of DNA arrays, Array databases; Applications of DNA microarray	
28,29 **30,31** **32-36**	UNIT IV - THE HUMAN GENOME AND MOLECULAR PHYLOGENY • How Genomes Evolve, Acquisition of New Genes, Non-coding DNA and Genome Evolution. • The Human Genome: the Last 5 Million Years- Molecular Phylogenetics Origins, • Applications of Molecular Phylogenetics	**To impart knowledge about human genome and phylogeny.**

37 38 39 40 41 42 43 44 45	UNIT V - RNA WORLD AND ITS STRUCTURE • Riboswitches and the RNA World, Riboswitches: Structures and Mechanisms, • Ribozymes, Noncoding RNPs of Viral Origin, • Spliceosome Structure and Function, • Folding and Finding RNA Secondary Structure, Predicting and Modeling RNA Architecture, In Vivo RNAi, miRNA biogenesis, • miRNA in human disease-cancer, • cardiovascular, metabolic disorders, epigenetics- miRNA as therapeutic targets. • Principles, Technical Considerations in the Use of iRNA- Design and Synthesis of Small Interfering RNAs, • Applications of iRNA to Establishing Gene Function- Signal Transduction, • Therapeutic Applications of iRNA, in Biology and Medicine.	**To acquire knowledge about RNA and its application.**

TEXTBOOKS

1. Primrose S.B. and Twyman R.M, "Principles of Gene Manipulation and Genomics", Blackwell Publishing Company, Oxford, UK, Seventh Edition, 2006.
2. Sahai S. "Genomics and Proteomics", Functional and Computational Aspects, Kluwer Academic Publishers, New York, 2002.

REFERENCES

1. Baxevanis A.D. and B.F. Francis Ouellellette, "Bioinformatics A Practical"Guide to the Analysis of Genes and Proteins, John Wiley & Sons, UK, Third Edition, 2005.
2. Jonathan Pevsner, "Bioinformatics and Functional Genomics", John Wiley &Sons, Second Edition, 2009.

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