BTC DSC 352T
GENOMICS AND PROTEOMICS

Contact Hours: 45
Full Marks = 100 [ESE (70) CCA (30)]

Course Objective: *The Genomics and Proteomics course is designed to provide students with a deep understanding of genomics, focusing on chromosome structure, nucleotide sequences, and gene expression analysis. It also covers proteomics, including the study of protein structure, properties, and various analytical techniques. The course aims to familiarize students with DNA sequencing methods and genome sequencing techniques, allowing them to comprehend genome sequence assembly processes. Additionally, it aims to educate students on protein analysis methods, including size determination, covalent structure determination, and proteomic analysis using 2D-PAGE and mass spectrometry-based techniques.*

UNIT 1 *(9 Lectures)*

Introduction to genomics: chromosome structure; eukaryotic nuclear genome; nucleotide sequence composition; satellite DNA; centromere DNA; telomere DNA; human genome project. **Gene expression studies:** microarray and SAGE.

UNIT 2 *(10 Lectures)*

DNA sequencing methods: Maxam and Gilbert method; Sangers method; pyrosequencing. **Genome sequencing methods:** Shotgun and Hierarchical (clone contig) methods. **Genome sequence assembly:** De novo assembly and assembly by reference mapping.

UNIT 3 *(9 Lectures)*

Protein: levels of protein structure; physical and chemical properties of proteins; physical interactions that determine the property of proteins (short-range interactions, electrostatic forces, van der waal interactions, hydrogen bonds and hydrophobic interactions).

UNIT 4 *(8 Lectures)*

Determination of protein size: sedimentation analysis; gel filteration; SDS-PAGE; Native PAGE. **Determination of covalent structures:** Edman degradation.

UNIT 5 *(9 Lectures)*

Proteomic analysis: 2D-PAGE (Sample preparation, solubilization, reduction and resolution); Mass spectrometry-based methods for protein identification; application of proteomics in disease research and drug discovery.

Course Outcome: *By the end of this course, students will have a comprehensive knowledge of genomics and proteomics. They will be able to understand chromosome structures, gene expression studies, and DNA sequencing methods. Students will also gain proficiency in proteomic analysis techniques, including 2D-PAGE and mass spectrometry-based methods for protein identification. This course will equip students with the skills required to contribute to genomics and proteomics research and applications in various fields, including biotechnology and bioinformatics.*

SUGGESTED READING

1. Genes IX by Benjamin Lewin, Johns and Bartlett Publisher, 2006.
2. Modern Biotechnology, 2nd Edition, S.B. Primrose, Blackwell Publishing, 1987.
3. Molecular Biotechnology: Principles and Applications of Recombinant DNA, 4th Edition, B.R. Glick, J.J. Pasternak and C.L. Patten, 2010.
5. Molecular Cloning: A Laboratory Manual (3rd Edition) Sambrook and Russell Vol. I to III, 1989.
6. Principles of Gene Manipulation 6th Edition, S.B.Primrose, R.M.Twyman and R.W. Old. Blackwell Science, 2001.