Course Code: EE-815

Title: Computational Molecular Biology

Credit hours: (3-0)

1. **Objectives** This course introduces the basic computational methods used to understand the cell on a molecular level. It covers subjects such as the sequence alignment algorithms: dynamic programming, hashing, suffix trees, and Gibbs sampling. Furthermore, it focuses on computational approaches to: genetic and physical mapping; genome sequencing, assembly, and annotation; RNA expression and secondary structure; protein structure and folding; and molecular interactions and dynamics.

2. **Text Books**. No specific text book will be followed. Few reference books have been mentioned at para 5 below.

3. **Course Outline**

Topics	Periods
Introduction to Genomics, Bioinformatics & Molecular Biology	10
Human Genome Project	2
Genome and Sequence Databases	2
Protein Sequence and Motif Databases	2
Sequence Alignment	2
Sequence Similarity Search	2
Multiple Sequence Alignment	2
Distance based Phylogenies	2
Building Protein Motifs and Models	2
Ab initio Protein Structure Prediction	2
Clustering Coordinately Regulated Genes	2
Discovering Gene Regulatory Signals	2
Gene Regulatory Modules and Networks	2
MicroRNA Regulatory Networks	2
Simple Nucleotide Polymorphisms (SNPs)	2
Genome Variations	2
Genome-Wide Association Studies	2
Metabolic Pathways and Analyses	4
Total	**46**

4. **Course Outcomes**. By the end of course students will have a clear understanding of computational methods used in molecular biology. It will provide them with enough background to understand state of the art research being done in the area and have a platform to pursue their own research in the area.

5. **Recommended Reading**

- Biochemistry by Berg, Tymoczko and Stryer

Genes IX. by Benjamin Lewin