Course Code:	CSL 437	Course Title:	Bioinformatics			
Category :	ELECTIVE	Credit Assigned :	L	T	P	C
			3	0	2	4
Pre-Requisite (if Any) :	NONE	Type of Course :	Computer Science and Engineering			

Course Outcomes:

1. Students would be able to implement basic string based computational methods and algorithms to understand the cell and biological systems.
2. Students will analyse and evaluate algorithms and programming techniques like dynamic programming, hashing, and suffix trees.
3. The course focuses on computational approaches to: genetic and physical mapping; genome sequencing, assembly, and annotation. Hence, students would be exposed to an entirely demanding area of computational biology.
4. This course will help students develop multidisciplinary approach to the systematic analysis and modelling of complex biological phenomena.
5. Students would be able to identify recent computational and systems biology problems, implement solutions, verify results and contribute to the society.

Course Contents:

1. Basics of biology
2. Sequences: Problem statement, Edit distance and substitution matrices, Global and local alignments, KMP Algorithm, suffix trees.
3. Compression algorithms: Burrow Wheeler Transform (BWT), Lampel Ziv WelchTransform (LZW).
4. Phylogenetic trees: Introduction to Evolution, Phylogeny - Molecular Evolution, Phylogeny Example, Sankoff and Finch Algorithms
5. Overview of Gene Control, Working of Genetic Switches, Introductory Systems Biology, The biochemical paradigm, genetic paradigm and the systems paradigm
6. Introduction to Data Analytics: Biological Databases,Types of data, Data Visualization, Prediction from biological data, Examples of K-means (here) and Hierarchical Clustering.
7. Modelling biological systems, Conditional Probability/ Bayes Theorem, Hidden Markov models.
8. Miscellaneous topics: Pathways and networks, Microarrays, Biomedical images, Genetic Algorithms and applications,

Text Books:

1. "An Introduction to Bioinformatics Algorithms" by Jones, Pevzner. MIT Press.
2. "Algorithms on Strings, Trees and Sequences" by Gusfield. Cambridge University Press.
3. “An Introduction to Systems Biology: Design Principles of Biological Circuits” by Alon. Chapman & Hall/CRC Press.