

DEPARTMENT OF BIOINFORMATICS
SCHOOL OF BIOENGINEERING
SRM UNIVERSITY
LECTURE PLAN

Subject code: BI0503

Subject: ALGORITHMS FOR BIOINFORMATICS

Staff: Dr. K. Ganesan

Credits: 4

Semester: I

Hour	Contents	Learning Outcome
1.	Graph Algorithms in Sequencing,	<ul style="list-style-type: none"> • Introduction to algorithmic design techniques used in bioinformatics • Knowledge on various sequence alignment methods • Importance of various scoring matrices in the alignment • Application of Pattern matching algorithms in bioinformatics • Heuristics applied in bioinformatics • Clustering technologies
2.	SBH and Eulerian Paths	
3.		
4.		
5.		
6.	De-novo Peptide Sequencing	
7.		
8.	Longest Paths and Dynamic Programming	
9.		
10.	Sequence Alignment: Introduction	
11.	Edit distance	
12.	LCS	
13.	PAM and BLOSUM Scoring Matrices	
14.		
15.		
16.	Local Alignments: Smith Waterman Algorithm	
17.		
18.	Gap Penalties	
19.	Space Efficient Alignment Algorithms	
20.		
21.	Fast LCS using Table Lookup	
22.	Exact Pattern Matching: KMP Algorithm	
23.	Keyword Trees	
24.	Aho-Corasick Algorithm	
25.	Database Search: FASTA and BLAST	
26.		
27.		
28.	Clustering Basics	
29.	Hierarchical Clustering	

30.	Multiple Sequence Alignment: CLUSTAL	<ul style="list-style-type: none"> • Phylogenetic analysis • Machine learning approach applied in bioinformatics with reference to HMM • Decoding algorithm applied in HMM
31.	Center-based Clustering	
32.		
33.	Clustering via Cliques	
34.		
35.	Evolutionary Trees and Ultrametrics	
36.		
37.	Additive distance trees	
38.	Perfect Phylogeny Problem	
39.	Small Parsimony Problem	
40.		
41.	Nearest Neighbor Interchange	
42.	Hidden Markov Models: Basics	
43.		
44.	Forward and Backward (Viterbi) Algorithms	
45.		

Tutorial: 15

REFERENCE BOOKS

1. Gusfields D, *Algorithms on strings, trees and sequences- Computer Science and Computational Biology*, Cambridge University Press 1997.
2. Neil C. Jones and Pavel A. Pevzner, *An Introduction to Bioinformatics Algorithms*, MIT Press, First Indian Reprint 2005.
3. Steffen Schulze-Kremer, *Molecular Bioinformatics: Algorithms and Applications*, Walter de Gruyter, 1996.
4. Gary Benson Roderic page (Eds), *Algorithms in Bioinformatics*, Springer International Edition, First Indian Reprint 2004.
5. Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison. *Biological Sequence Analysis : Probabilistic Models of Proteins and Nucleic Acid*, Cambridge University Press, 1999.

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