

BIOINFORMATICS

Paper Code: ETIT-412
Paper: Bio Informatics

L	T/P	C
3	0	3

INSTRUCTIONS TO PAPER SETTERS:

MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to facilitate the student with the basics of Bioinformatics using Machine Learning.

UNIT- I

Introduction: Biological data in digital symbol sequences, genomes, proteins and proteomes, biological sequences, molecular function and structure. Biological Databases: Sequence databases, mapping databases, information retrieval, genomic databases.

Machine Learning Foundations: The probabilistic framework and examples.

[T1], [T2][No. of hrs. 10]

UNIT- II

Machine Learning Algorithms: Introduction, dynamic programming, gradient descent, EM/GEM algorithms, Markov-Chain Monte Carlo methods, simulated annealing, evolutionary and genetic algorithms, learning algorithms.

Neural Network: Theory and Applications. Hidden Markov Models: Theory and applications

[T1][No. of hrs. 12]

UNIT- III

Probabilistic graphical models in bioinformatics: Markov Models and DNA symmetries, gene finders, hybrid models and neural network parameterization of graphical models, single model case, bidirectional recurrent neural networks for protein secondary structure prediction.

Probabilistic models of evolution: phylogenetic trees.

[T1] [No. of hrs. 11]

UNIT-IV

Stochastic grammars and linguistics: Introduction, formal grammars, Chomsky hierarchy, applications of grammars, learning algorithms, applications of SCFGs. Microarrays and gene expression: Introduction, Probabilistic modelling of array data, clustering, gene regulation.

[T1][No. of hrs. 10]

Text Books:

[T1] P.Baldi , S.Brunak ,”Bioinformatics : The machine learning approach” 2nd Edition, MIT Press.

[T2] A.D.Baxevanis, B.F.F.Quellette “Bioinformatics: A Practical guide to the analysis of genes and proteins” 3rd Edition, Wiley-Interscience.

References Books:

[R1] TK Attwood & DJ Parry-Smith,” Introduction to Bioinformatics”, Pearson Education

[R2] Edward Keedwell and Ajit Narayanan, “Intelligent Bioinformatics” John Wiley & Sons, Ltd.

[R3] A Tramontano, “Introduction to Bioinformatics”, Chapman & Hall/CRC.

[R4] D.Roy, “Bioinformatics” , Narosa Publishing House

[R5] David Mount, “Bioinformatics: sequence and genome analysis”, Cold spring harbour Lab