

COURSE CODE	COURSE TITLE	L	T	P	C
1152IT136	Bioinformatics	3	0	0	3

Course Category:

~~Foundation (0) / Program Core (1) / Program Elective (2) / Allied Elective (3) / University Elective (4) / Value Education Elective (5) / Independent Learning (6) / Industry – Higher Learning Institute Interaction (7).~~

a. Preamble: It aims to provide technology-oriented students with the knowledge and ability to develop creative solutions, and better understand the effects of future developments of mobile applications and its technology.

b. Prerequisite Courses:

Data Mining

c. Related Courses:

Data Warehousing and Data Mining
Pattern Recognition

d. Course Educational Objectives :

The student should be made to:

- Understand the theoretical basis behind bioinformatics.
- Search databases accessible on the WWW for literature relating to molecular biology and biotechnology.
- Analyse protein sequences, identify proteins, and retrieve protein structures from databases. View and interpret these structures. Understand homology modelling and computational drug design
- Manipulate DNA and protein sequences using stand-alone PC programs and programs available on the WWW.
- Query biological data, interpret and model biological information and apply this to the solution of biological problems in any arena involving molecular data.

e. Course Outcomes :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Develop models for biological data.	K2
CO2	Apply pattern matching techniques to bioinformatics data – protein data genomic data.	K3
CO3	Demonstrate individual learning and scientific work by being an independent and self-directed learner; working effectively, responsibly, ethically, and safely in an individual or team context	K3
CO4	Demonstrate an advanced understanding of biological sciences by articulating the methods of science, You will have an understanding of recent developments in a specialised area of biotechnology	K2
CO5	Apply micro array technology for genomic expression study	K3

f. Correlation of COs with POs :

Cos	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M		L		L							
CO2	M		L		M							
CO3	M		M		M							
CO4	M				M							
CO5	M				M							

- H- High; M-Medium; L-Low

g. Course Content :

UNIT I INTRODUCTION

9

Need for Bioinformatics technologies – Overview of Bioinformatics technologies Structural bioinformatics – Data format and processing – Secondary resources and applications – Role of Structural bioinformatics - Biological Data Integration System.

UNIT II DATA WAREHOUSING AND DATA MINING IN BIOINFORMATICS

9

Bioinformatics data – Data warehousing architecture – data quality – Biomedical data analysis – DNA

data analysis – Protein data analysis – Machine learning – Neural network architecture and applications in bioinformatics.

UNIT III MODELING FOR BIOINFORMATICS **9**

Hidden Markov modeling for biological data analysis – Sequence identification –Sequence classification – multiple alignment generation – Comparative modeling –Protein modeling – genomic modeling – Probabilistic modeling – Bayesian networks – Boolean networks - Molecular modeling – Computer programs for molecular modeling.

UNIT IV PATTERN MATCHING AND VISUALIZATION **9**

Gene regulation – motif recognition – motif detection – strategies for motif detection – Visualization – Fractal analysis – DNA walk models – one dimension – two dimension – higher dimension – Game representation of Biological sequences – DNA, Protein, Amino acid sequences.

UNIT V MICROARRAY ANALYSIS **9**

Microarray technology for genome expression study – image analysis for data extraction – preprocessing – segmentation – gridding – spot extraction – normalization, filtering – cluster analysis – gene network analysis – Compared Evaluation of Scientific Data Management Systems – Cost Matrix – Evaluation model - Benchmark – Tradeoffs.

h. Learning Resources

i.TEXT BOOK:

1. Yi-Ping Phoebe Chen (Ed), “BioInformatics Technologies”, First Indian Reprint, Springer Verlag, 2007.

ii.REFERENCES:

1. Bryan Bergeron, “Bio Informatics Computing”, Second Edition, Pearson Education, 2003.
2. Arthur M Lesk, “Introduction to Bioinformatics”, Second Edition, Oxford University Press, 2005.

iii. Online Resources

1. <http://bioinfo.mbb.yale.edu/mbb452a/intro/>
2. http://en.wikipedia.org/wiki/Integrative_bioinformatics
3. http://www.bioinformatics.org/wiki/Protein_structure_prediction
4. <http://mathematica.stackexchange.com/questions/73685/how-to-visualize-pattern-matching-process>
5. http://en.wikipedia.org/wiki/DNA_microarray