

COURSE CODE: ENS-452
COURSE NAME: Bioinformatics
CREDIT HOURS: Theory = 02 Practical = 01 Total = 03
CONTACT HOURS: Theory = 32 Practical = 48 Total = 80
PREREQUISITE: None
MODE OF TEACHING: Instruction: 2 hours of Lecture per week (67%)
 Lab Demonstration: 3 hours of Lab work per week (33%)

Course Description:

This course is designed to provide the students with bioinformatics knowledge and training that will help them to decipher the biological processes. The expansive nature of biological data can only be translated effectively into knowledge by the use of information technology, as has recently been demonstrated by solving some of the mysteries of gene sequence analysis and decoding the human genome. The students should have thorough knowledge about the data storage and retrieval systems, the types and sources of databases used in biotechnology and virology and how to retrieve data from bioinformatics databases.

TOPICS COVERED:

Week#	Topics
1	Introduction to Bioinformatics, Definition of Bioinformatics and Related Fields
2	Earliest Bioinformatics Efforts, Objective and Scope of Bioinformatics
3	Introduction to Databases, Major Biological Databases
4	Sequence Alignment, Pairwise Sequence Alignment, Database Similarity Searching
5	Multiple Sequence Alignment, Protein Motifs and Domain prediction
6	Gene and Promoter Prediction, Gene Prediction tools
7	Promoter and Regulatory Element Prediction Tools
8	Molecular Phylogenetics, Phylogenetic Tree Construction Methods and

	Programs, Phylogenetic Tree Evaluation
9	Midterm Exam – MSE
10	Structural Bioinformatics, Protein Structure Visualization
11	Comparison and Classification
12	Protein Structure Prediction Tools
13	RNA Structure Prediction Methods and Tools
14	Genomics and Proteomics
15	Tools for Genome Analysis, Genome Mapping
16	Assembly and Comparison, Functional Genomics
17	Introduction to Proteomics, Tools for Proteome Analysis
18	End Semester Exam

Lab Work:

Week#	Topics
1	Orientation
2	WEB Cutter
3	BLAST
4	CLUSTAL W
5	T-Coffee
6	Peptide Cutter
7	Translate
8	Reverse Translate
9	BLAST Database and Genome Annotation
10	Midterm Exam – MSE
11	Constructing a Phylogenetic Tree
12	An Introduction to the Vector/Primer designing program
13	Protein Structure Prediction
14	Visualization of Bimolecular Structures
15	Protein Homology Modeling

16	Protein Docking
17	Presentations
118	End Semester Exam

Text and Material:

1. Introduction to Bioinformatics: A Theoretical and Practical Approach by Stephen A. Krawetz, David D. Womble.
2. Introduction to Bioinformatics by Anna Tramontano.
3. Essential Bioinformatics by Jin Xiong. Cambridge University Press.
4. Introduction to Bioinformatics by Arthur M. Lesk. Oxford University Press, 5th edition (2019).
5. Sequence and Genome Analysis by DW. Mount, Cold Spring Harbor.

ASSESSMENT SYSTEM:

Theoretical/Instruction	100%
Assignments	10%
Quizzes	15%
Mid Semester Exam	25%
End Semester Exam	50%

Practical Work	100%
Lab Work	70%
Lab Exam/Projects	30%