Course Code	BIOXXX
Course Name	Practical Bioinformatics
Credits	4
Course Offered to	PG
Course Description	This objective of this course is to provide introduction to modern biology, data-oriented questions, and training in application of computational techniques for data analysis. Apart from providing conceptual understanding of important topics in bioinformatics, the focus is on hands-on training in implementation of techniques. Through combination of lectures, exercises, assignments and presentations, the student is expected to achieve practical understanding of bioinformatics techniques.

Pre-requisites

Pre-requisites(Mandatory)	Pre-requisites(Desired)	Pre-requisites(Other)
None	Knowledge of data structures and algorithms	
	Basic understanding of python and/or R programming	

Course Objectives

CO1	CO2	CO3	CO4
The student shall understand the nature of biological systems and data generated from them.	The student shall understand various bioinformatics techniques and knowledge of their suitable application.	The student shall have the ability to implement major bioinformatics techniques, tools used for analysis of biological data, and to interpret the results.	The student shall have the ability to suitably enhance existing methods and tools so as to suit the needs of a problem.

Weekly Lecture Plan

Week number	Lecture Topic	CO met	Assignments
1	Introduction to biological systems and experimental techniques used for generating biological data	CO1	3+2 hours (Exercises)
2	Introduction to biological sequences and alignment techniques	CO1, CO2	3+2 hours (Exercises)
3	Needleman and Wunsch algorithm	CO2, CO3	3+2 hours (Exercises+Assignment-1)
4	Application of alignment algorithms: BLAST Suite	CO2, CO3, CO4	3+2 hours (Exercises)
5	Application of alignment algorithms: BLASTN, BLASTP	CO2, CO3, CO4	3+2 hours (Exercises+Assignment-2)
6	Bioinformatics tools for the laboratory: Restriction mapping, Finding open reading frames	CO1, CO2, CO3, CO4	3+2 hours (Exercises)
7	Bioinformatics tools for the laboratory: PCR and primer design, Measuring DNA and protein composition	CO1, CO2, CO3, CO4	3+2 hours (Exercises+Assignment-3)
8	Introduction to protein structures: Protein structure organization	CO1	3+2 hours (Exercises)
9	Ramachandran plot, structure-function relation, and protein folding	CO1, CO2, CO3	3+2 hours (Exercises)
10	Protein folding: Homology modeling	CO1, CO2, CO3	3+2 hours (Exercises+Assignment-4)
11	Protein folding: Threading and ab initio modeling	CO2, CO3	3+2 hours (Exercises)
12	Systems modeling of biological data: Network biology, Microarray data analysis	CO2, CO3, CO4	3+2 hours (Exercises+Assignment-5)
13	Systems modeling of biological data: Omics models (genome/ transcriptomes/ protein interaction networks)	CO2, CO3, CO4	3+2 hours (Presentations)

Assessment Plan

Type of Evaluation	% Contribution in Grade
Mid-Sem	20
Assignments	40
End-Sem	30
Presentation	10

Resource Material

Type	Title
Textbook	Practical Bioinformatics by Michael Agostino (Garland Science).
Textbook	Understanding Bioinformatics by Marketa Zvelebil and Jeremy Baum (Garland Science).
Textbook	Introduction to Protein Structure by Cark Branden and John Tooze (Garland Science).
Textbook	The Structure of Complex Networks: Theory and Applications by Ernesto Estrada (Oxford University Press)