



Approved/Modified in 49th BoA meeting (28.03.2023)

Course Name: Bioinformatics

Course Number: BE304

Credit: 3-0-2-4

Prerequisites: Understanding Biotechnology and its applications (IC136)

Intended for: B. Tech M.Tech Integrated Dual Degree Bioengineering students

Distribution: Core for Integrated Dual Degree Bioengineering students, elective for other B.Tech students

Semester:

Course Outline:

Objective: The course is aimed at providing a basic understanding to the students about bioinformatics methods and their in-depth applications for solving biological problems. The course will include practical sessions for the students to help them master some of the bioinformatics techniques from hands-on experience. The course may also involve a project/term-paper development towards important biological problems within the purview of the course.

Introduction to Bioinformatics: What is Bioinformatics? What are the applications of Bioinformatics? (1 hour)

Introduction to Basic Programming: Introduction to basic scripting and programming routinely used for bioinformatics analysis. (10 hour)

Sequence and Molecular File formats: Introduction to different file formats used for biological data. Sequence and molecular file conversion tools. (1 hour)

Databases in Bioinformatics: Introduction to different biological databases, their classification schemes, and biological database retrieval systems. (2 hour)

Sequence Alignments: Introduction to concept of alignment, Scoring matrices, Alignment algorithms for pairs of sequences including Dot Matrix plot, Dynamic programming and Heuristic algorithms such as BLAST, Multiple sequence alignment (Clustal), Global and local alignment algorithms. (12 hour)

Motif Identification: Introduction to motif identification in DNA and proteins including consensus and probabilistic approaches. (2 hour)

Lab Course content:

1. Perl programming (3 labs)
2. Databases for Bioinformatics and format conversion. (2 labs)
3. Sequence similarity (Local alignment, including BLAST) (2 labs).
4. Sequence similarity (Global alignment, Clustal) (2 labs).
5. Motif Identification (1 lab)

Text Book:

1. Bioinformatics: Methods and Applications Genomics, Proteomics, and Drug Discovery S.C. Rastogi, N. Mendiratta, P. Rastogi (3rd Edition) PHI Learning Private Limited New Delhi (2011)



2. Bioinformatics Principles and Applications. Z. Ghosh and B. Mallick Oxford University Press. (2015), ISBN 10: 0195692306; ISBN 13: 9780195692303.

Other References:

1. Introduction to Bioinformatics. Arthur M. Lesk (3rd Edition) Oxford University Press.
2. Biological Sequence Analysis-Probabilistic Models of Proteins and Nucleic Acids, by Richard Durbin, Sean R. Eddy, Anders Krogh, Graeme Mitchison. Cambridge University Press.
3. An Introduction to Bioinformatics Algorithms, by Neil C. Jones and Pavel A. Pevzner, MIT Press.

Articles:

Latest research articles will be advised related to the topic being taught.

Similarity content declaration with existing courses: None

Sl. No.	Course Code	Similarity Content	Approx. % of content
01.	BY512	Sequence similarity methods basics, Perl programming, Databases	20%

Justification of new course proposal if cumulative similarity content is >30%: