

M.G. Science Institute, Autonomous

Affiliated to Gujarat University, Ahmedabad

(Managed by The Ahmedabad Education Society)

Department of Biotechnology

Programme: Bachelor of Science (Hons.) in Biotechnology

SYLLABUS

(Effective from Academic Year 26-27)

Semester: VI	Title: Biostatistics and Bioinformatics	Credit: 4
Course Code: BTM362 (T)		4hr/week

After successful completion of this course, students will be able to:

CO1: Describe the scope and significance of bioinformatics, including types of biological databases and sequence formats (FASTA, GenBank).

CO2: Retrieve and submit DNA, RNA, and protein sequences using online databases and tools; explain applications of genomics, transcriptomics, and proteomics.

CO3: Perform pairwise and multiple sequence alignments and construct basic phylogenetic trees using tools like BLAST, CLUSTALW, and MEGA.

CO4: Demonstrate understanding of molecular docking and the basic principles of computer-aided drug discovery.

CO5: Apply statistical methods such as measures of central tendency, dispersion, t-test, chi-square, and ANOVA to analyze biological data.

CO6: Use SPSS and other software tools (e.g., ExPASy, RasMol) for biological data analysis and visualization.

CO/PO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8
CO-1	3	2	2	1		2	1	
CO-2	3	3	3		1			2
CO-3	2		2	1		2	2	
CO-4	1	3			1		3	
CO-5	3		2	3		2		
CO-6	2	2	1	2	3			1

Unit I: Introduction to Bioinformatics

Teaching hours 15

- Definition and scope of Bioinformatics
- Biological databases: and types of databases
- Basic introduction to DNA, RNA, and protein sequences submission and retrieval
- Introduction to Genomics, Transcriptomics, and Proteomics

Unit II: Sequence Alignment and Analysis Tools

Teaching hours 15

- Concept of Sequence alignment
- Pairwise sequence alignment (Global and Local alignment)
- Multiple sequence alignment (MSA)
- BLAST
- Phylogenetic tree construction (basic concepts)
- Computational tools: Introduction to tools like MEGA, ExPASy, and RasMol and their applications

Unit III: Biostatistics - 1

Teaching hours 15

- Scope and applications of Biostatistics
- Samples and population concept, Collection, Processing and Presentation of data
- Frequency distribution
- Measures of Central tendency- Mean, Mode, Median and percentile their applications, merits and demerits

Unit IV: Biostatistics - 2

Teaching hours 15

- Measures of dispersion- Range, Variance, Standard Deviation, Coefficient of Variance, their applications, merits and demerits
- Chi square test - introduction and application in biology
- Analysis of variance - introduction and application in biology
- Introduction to SPSS

References:

1. Bioinformatics: Principles and Applications – Ghosh, Z. & Mallick, B.
2. Introduction to Bioinformatics – Arthur M. Lesk (Oxford University Press)
3. Fundamentals of Bioinformatics – Krane, D. E., & Raymer, M. L.
4. Bioinformatics: Sequence and Genome Analysis – David W. Mount
5. Bioinformatics: Sequence, Structure and Databanks – Des Higgins & Willie Taylor
6. Biostatistics: A Foundation for Analysis in the Health Sciences – Wayne W. Daniel
7. Fundamentals of Biostatistics – Bernard Rosner
8. Introductory Biostatistics – Chap T. Le
9. Biostatistics: The Bare Essentials – Norman & Streiner
10. Statistical Methods in Biology – Bailey, N. T. J.
11. Practical Statistics for Medical Research – Douglas G. Altman