



Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and Detailed Syllabus (DJS23)

Final Year B.Tech

in

Artificial Intelligence (AI) and Data Science

Honors Degree Program

in

Computational Biology

(Semester VII/VIII)

To be Prepared by: - Board of Studies in Artificial Intelligence (AI) and Data Science

To be Recommended by: - Academic Council of Dwarkadas J. Sanghvi College of Engineering

To be Approved by: - Governing Body of Dwarkadas J. Sanghvi College of Engineering

With effect from the Academic Year: 2026-2027



Scheme for Final Year Undergraduate Program in Artificial Intelligence (AI) and Data Science with honors in Computational Biology:

Semester VII (Autonomous) (Academic Year 2026-27)

Sr. no.	Course Code	Course	Teaching Scheme			Semester End Examination (SEE) - A					Continuous Assessment (CA) - B						Aggregate (A+B)	Credits Earned			
			Theory (Hrs)	Practical (Hrs)	Tutorial (Hrs)	Credits	Duration (Hrs)	Theory	Oral	Pract	Oral & Pract	SEE Total (A)	Term Test 1 (TT1)	Term Test 2 (TT2)	Term Test 3 (TT3)	Test Total (TT1 + TT2 + TT3)			CA Total Work (B)		
SEM III																					
1	DJS23SCH1301	Computational Cellular Biology	3	--	--	3	2	60	--	--	--	60	15	15	10	40	--	40	100	3	3
SEM IV																					
2	DJS23SCH1401	Computational Molecular Biology	3	--	--	3	2	60	--	--	--	60	15	15	10	40	--	40	100	3	3
SEM V																					
3	DJS23SCH1501	Algorithms for Computational Biology	3	--	--	3	2	60	--	--	--	60	15	15	10	40	--	40	100	3	4
	DJS23SLH1501	Algorithms for Computational Biology Laboratory	--	2	--	1	--	--	--	--	--	--	--	--	--	--	25	25	25	1	
SEM VI																					
4	DJS23SCH1601	Computational Models for Biology	3	--	--	3	2	60	--	--	--	60	15	15	10	40	--	40	100	3	4
	DJS23SLH1601	Computational Models for Biology Laboratory	--	2	--	1	--	--	--	--	--	--	--	--	--	--	25	25	25	1	
SEM VII/VIII																					
5	DJS23SCH1701	Bigdata in Bioinformatics	4	--	--	4	2	60	--	--	--	60	15	15	10	40	--	40	100	4	4
Total																					
			16	4	0	18	10	300	0	0	0	300	75	75	50	200	50	250	550	18	18

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Head of the Department

[Signature]

Principal

Continuous Assessment (A):

Course	Assessment Tools	Marks	Time (mins)
Theory	a. Term Test 1 (based on 40 % syllabus)	15	60
	b. Term Test 2 (on next 40 % syllabus)	15	60
	c. Assignment / course project / group discussion / presentation / quiz/ any other.	10	--
	Total marks (a + b + c)	40	--
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	As applicable
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial and / or assignment.	25	
Laboratory and Tutorial	Performance in the laboratory and tutorial.	50	

The final certification and acceptance of term work will be subject to satisfactory performance of laboratory work and upon fulfilling minimum passing criteria in the term work

Semester End Assessment (B):

Course	Assessment Tools	Marks	Time (hrs.)
Theory /	Written paper based on the entire syllabus.	60	2
*Computer based	* Computer-based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	As applicable
Practical	Performance of the practical assigned during the Examination and the output / results obtained.	25	2
Oral and Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the Examination and on the entire syllabus.	As per the scheme	2

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Program: B. Tech in Artificial Intelligence (AI) and Data Science Final Year B. Tech Semester: VII/VIII
Course: Bigdata in Bioinformatics (DJS23SCH1701)

Prerequisite: Database, Data Mining, Biological Science.

Course Objective: The Objective of the course is

To inculcate in-depth knowledge of processing and analyzing biological data

Course Outcomes: Students will be able to

1. Explain a basic understanding of challenges in handling huge biological data
2. Apply tools for biological data analysis
3. Perform the basics of integrating multi-omics data and the use of NoSQL databases for querying and storing & retrieval of biological data.
4. Use distributed computing architectures and cloud computing platforms for biological data analysis
5. Perform visualisation on genomic epidemic data

Bigdata in Bioinformatics (DJS23SCH1701)		
Unit No	Description	Duration
1	Big Data in Biological Data Overview of big data in the context of biological data analysis. Challenges and opportunities of handling large-scale biological datasets. Introduction to big data technologies and platforms for biological data analysis. Case studies and examples of big data applications in genomics, transcriptomics, and other biological domains.	09
2	Tools Used for Big Data Analysis Introduction to commonly used tools and software packages for big data analysis in bioinformatics. Hands-on sessions on data preprocessing, analysis, and visualization using popular tools such as Hadoop, Spark, and Python libraries. Case studies demonstrating the use of big data tools in genomic data analysis, transcriptomic data analysis, and functional annotation.	09
3	Integrating Omics Data Techniques and methods for integrating multi-omics data from genomics, transcriptomics, proteomics, and metabolomics. Dimensionality reduction techniques for visualizing and analyzing multi-omics data. Network-based analysis methods for constructing gene regulatory networks and protein-protein interaction networks. Case studies demonstrating the integration of omics data to study complex biological phenomena and diseases.	10
4	NoSQL Databases in Biological Data Introduction to NoSQL databases and their applications in storing and querying biological data. Comparison of different types of NoSQL databases (e.g., document-oriented, graph-based, key-value stores) and their suitability for biological data. Hands-on sessions on setting up and using NoSQL databases such as MongoDB, Cassandra, and Neo4j for storing and querying biological datasets. Case studies demonstrating the use of NoSQL databases in genomic data storage, metadata management, and data integration.	09

5	Distributed and Cloud-Based Environments for Biology Overview of distributed computing architectures and cloud computing platforms for biological data analysis. Hands-on sessions on deploying bioinformatics pipelines on cloud computing platforms such as AWS, Google Cloud, and Microsoft Azure. Best practices for optimizing performance, scalability, and cost-effectiveness of bioinformatics workflows in distributed and cloud-based environments. Case studies demonstrating the use of distributed computing and cloud-based platforms for large-scale genomic data analysis and collaborative research.	09
6	Visualizing Genomic Epidemiology Data Techniques for visualizing genomic data in epidemiological studies, including single nucleotide polymorphisms (SNPs), genetic variants, and phylogenetic trees. Case studies demonstrating the use of genome browsers and phylogenetic tree visualization tools to analyze the spread and evolution of infectious diseases, such as HIV, influenza, and SARS-CoV-2. Visualization methods for transcriptomic and proteomic data in epidemiological research, including expression heatmaps, pathway analysis, and protein interaction networks.	10
Total		56

Textbooks:

1. X. Li and J. Qiu, Eds., *Cloud Computing for Data-Intensive Applications*. New York, NY, USA: Springer New York, 2016
2. J. Ramsden, *Bioinformatics: An Introduction*, 4th ed. Cham, Switzerland: Springer Nature Switzerland AG, 2023.
3. B. Abu-Jamous, R. Fa, and A. K. Nandi, *Integrative Cluster Analysis in Bioinformatics*. Hoboken, NJ, USA: John Wiley & Sons, 2015.
4. A. Fowler, *NoSQL For Dummies*. Hoboken, NJ, USA: John Wiley & Sons, 2015.

Reference Books:

1. N. Sharma, K. Cengiz, and P. Chatterjee, Eds., *Intelligent Data Analytics for Bioinformatics and Biomedical Systems*. Hoboken, NJ, USA: John Wiley & Sons, 2024.
2. S. K. Dhal, S. K. Pani, S. Prasad, and S. K. Mohapatra, Eds., *Big Data Analytics and Machine Intelligence in Biomedical and Health Informatics: Concepts, Methodologies, Tools and Applications*. Hoboken, NJ, USA: John Wiley & Sons, 2022.
3. V. Buffalo, *Bioinformatics Data Skills*. Sebastopol, CA, USA: O'Reilly Media, 2015.

Weblinks:

1. Big Data in Biological Data Analysis: Challenges and Opportunities
<https://www.nature.com/articles/498255a>
2. Tools for Big Data Analysis in Bioinformatics https://www.splunk.com/en_us/blog/learn/data-analysis-tools.html
3. Integrating Multi-Omics Data in Translational Medicine”
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9747357/>

Online Resources:

1. Computational Genomics" https://onlinecourses.nptel.ac.in/noc24_bt03/preview"
2. Bioinformatics: Algorithms and Applications" https://onlinecourses.nptel.ac.in/noc25_bt06/preview"



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