



Shri Vile Parle Kelavani Mandal's
DWARKADAS J. SANGHVI COLLEGE OF ENGINEERING
(Autonomous College Affiliated to the University of Mumbai)
NAAC Accredited with "A" Grade (CGPA : 3.18)



Shri Vile Parle Kelavani Mandal's
Dwarkadas J. Sanghvi College of Engineering
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Scheme and detailed syllabus

DJS23

Honors Program in Data Analytics(Semester IV)

With effect from the Academic Year: 2025-2026



Scheme for Honors in Data Analytics Second Year B. Tech. CSE (IoT and Cybersecurity with Blockchain Technology) Semester IV (Autonomous)
 Academic Year 2025-2026

| Sr. No. | Course Code | Course | Teaching Scheme | | Credits | Duration (Hrs) | Semester End Examination (SEE) - A | | | | | Continuous Assessment (CA) - B | | | | | Aggregate (A+B) | Credits Earned | | | |
|-----------------|---------------|---|-----------------|-----------------|----------|----------------|------------------------------------|------------|-----------|--------------|---------------|--------------------------------|-------------------|-------------------|-----------------------------------|------------|-----------------|----------------|------------|-----------|-----------|
| | | | Theory (Hrs) | Practical (Hrs) | | | Theory | Oral | Pract | Oral & Pract | SEE Total (A) | Term Test 1 (TT1) | Term Test 2 (TT2) | Term Test 3 (TT3) | Term Test Total (TT1 + TT2 + TT3) | Term Work | CA Total (B) | | | | |
| Sem III | | | | | | | | | | | | | | | | | | | | | |
| 1 | DJS23BCH1201 | Fundamentals of Data Mining | 3 | — | — | 3 | 2 | 60 | — | — | — | 60 | 15 | 15 | 10 | 40 | — | 40 | 100 | 3 | 3 |
| Sem IV | | | | | | | | | | | | | | | | | | | | | |
| 2 | DJS23BHI1251 | Data Analytics and Visualization | 3 | — | — | 3 | 2 | 60 | — | — | — | 60 | 15 | 15 | 10 | 40 | — | 40 | 100 | 3 | 4 |
| | DJS23BHI1251L | Data Analytics and Visualization Laboratory | — | 2 | — | 1 | 2 | — | 25 | — | — | 25 | — | — | — | — | 25 | 25 | 50 | 1 | |
| Sem V | | | | | | | | | | | | | | | | | | | | | |
| 3 | DJS23BHI301 | Natural Language Processing and Text Analytics | 3 | — | — | 3 | 2 | 60 | — | — | — | 60 | 15 | 15 | 10 | 40 | — | 40 | 100 | 3 | 4 |
| | DJS23BHI301L | Natural Language Processing L and Text Analytics Laboratory | — | 2 | — | 1 | 2 | — | — | — | 25 | 25 | — | — | — | — | 25 | 25 | 50 | 1 | |
| Sem VI | | | | | | | | | | | | | | | | | | | | | |
| 4 | DJS23BHI351 | Time Series and Forecasting Analytics | 3 | — | — | 3 | 2 | 60 | — | — | — | 60 | 15 | 15 | 10 | 40 | — | 40 | 100 | 3 | 4 |
| | DJS23BHI351L | Time Series and Forecasting Analytics Laboratory | — | 2 | — | 1 | 2 | — | 25 | — | — | 25 | — | — | — | — | 25 | 25 | 50 | 1 | |
| Sem VIII | | | | | | | | | | | | | | | | | | | | | |
| 5 | DJS23BHI401 | Optimization for Decision Analytics | 3 | — | — | 3 | 2 | 60 | — | — | — | 60 | 15 | 15 | 10 | 40 | — | 40 | 100 | 3 | 3 |
| | | Total | 15 | 6 | 0 | 18 | 16 | 300 | 50 | 0 | 25 | 375 | 75 | 75 | 50 | 200 | 75 | 275 | 650 | 18 | 18 |

Prepared by

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Checked by

Vishesh

Head of the Department

Chhodkar

Vice Principal

Chhodkar

Principal



Continuous Assessment (A):

| Course | Assessment Tools | Marks | Time (hrs.) |
|-----------------------|--|---------|---------------|
| Theory | One Term test (based on 40 % syllabus) | 15 each | 1 |
| | Second Term test (next 40 % syllabus) / presentation / assignment / course project / group discussion / any other. | | |
| Audit course | Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool. | 10 | As applicable |
| Laboratory | Performance in the laboratory and documentation. | -- | |
| Tutorial | Performance in each tutorial & / assignment. | -- | |
| Laboratory & Tutorial | Performance in the laboratory and tutorial. | -- | |

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

Continuous Assessment (B):

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

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|--|-----------|----------|---------------|---------------------------------------|---------------------------------|------------------|-----------------|---|-----|--|
| Program: B.Tech in Computer Science and Engineering(IoT and Cybersecurity with Block chain Technology) | | | | | S.Y.B.Tech | Semester: IV | | | | |
| Course: Data Analytics and Visualization | | | | | Course Code: DJS23BH1251 | | | | | |
| Course: Data Analytics and Visualization Laboratory | | | | | Course Code: DJS23BH1251L | | | | | |
| Teaching Scheme (Hours / week) | | | | Evaluation Scheme | | | | | | |
| | | | | Semester End Examination Marks (A) | Continuous Assessment Marks (B) | | | | | |
| Lectures | Practical | Tutorial | Total Credits | Theory | Term Test 1 | Term Test 2 | Assignment | Total | | |
| | | | | 60 | 15 | 15 | 10 | 40 | 100 | |
| | | | | Laboratory Examination | Term work | | | Total Term work | 50 | |
| 2 | 2 | -- | 3 | Oral | Practical | Oral & Practical | Laboratory Work | Tutorial / Mini project / presentation / Assignment | | |
| | | | | 25 | -- | -- | 15 | 10 | 25 | |

Prerequisite: Database management Systems.

Course Objectives: The Objective of the course is

1. Understand Data Fundamentals and Analytics Concepts
2. Explore the Analytics Lifecycle and Professional Roles
3. Apply Techniques for Data Preparation and Visualization
4. Perform Data Aggregation and Group Operations

Course Outcomes: On successful completion of this course, student should be able to:

1. Identify different types of data, scales, and explain their significance in analytics.
2. Illustrate the types of analytics, the analytics lifecycle, and key professional roles.
3. Demonstrate techniques to load, read, and manage data from various file formats.
4. Perform data cleaning, transformation, and feature engineering for analysis.
5. Construct visualizations using Python and Tableau and interpret insights effectively.
6. Analyze datasets using aggregation, grouping, and split-apply-combine methods to derive insights.

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AB

| Unit | Description | Duration |
|--------------|---|----------|
| 1 | <p>Understanding Data and Its Role in Analytics: Types of Data: Quantitative Data, Qualitative Data, Structured Data, Unstructured Data, Semi-Structured Data, Univariate, Bivariate and Multivariate data.</p> <p>Scales of Measurement: Nominal Scale, ordinal, interval or ratio.</p> <p>Data Analytics: Definition of data analytics, Difference between data, information, and knowledge, Importance of data in modern organizations, Real-world applications (e.g., marketing, finance, healthcare).</p> | 5 |
| 2 | <p>The Analytics Lifecycle and Key Roles:</p> <p>Types of Data Analytics: Descriptive Analytics, Diagnostic Analytics, Predictive Analytics, Prescriptive Analytics.</p> <p>Data Analytics Lifecycle: Problem Definition, Data Collection, Data Exploration and Analysis, Data Visualization, Interpretation and Reporting, Decision-Making.</p> <p>Roles in Data Analytics: Data Analyst, Data Scientist, Data Engineer, Business Analyst, Machine Learning Engineer.</p> | 9 |
| 3 | <p>Introduction to Data Wrangling: Introduction to Data Wrangling, Combining and Merging Data Sets, Combining Data with Overlap, Reshaping and Pivoting, Core Data Transformations (Structural)</p> | 6 |
| 4 | <p>Data Cleaning and Preparation: Handling Missing Data, Data Transformation, Handling outliers, Scaling & normalization, Encoding categorical variables (One-hot, Label encoding), Feature Engineering, Extension Data Types, String manipulation.</p> | 6 |
| 5 | <p>Plotting and Visualization: A Brief matplotlib API Primer, Figures and Subplots, Colors, Markers, and Line Styles, Ticks, Labels, and Legends, Annotations and Drawing on a Subplot, Saving Plots to File, matplotlib Configuration, Plotting with pandas and seaborn, Line Plots, Bar Plots, Grouped and Stacked Bars, Histograms and Density Plots, Scatter or Point Plots, Facet Grids and Categorical Data, Dot Plots and Heatmaps, Q-Q Plots. Programming with Tableau Connecting and Loading Data in Tableau; Tableau Data types; Basic graphs and charts; Sheet, Dashboard and Story.</p> <p>Interactive Visualization: Dynamically explore data, zooming, filtering, and hovering to reveal insights. Geospatial Visualization</p> | 10 |
| 6 | <p>Data Aggregation and Group Operations: Approach to Performing Group Operations, iterating over Groups Selecting a Column or Subset of Columns, Grouping with Dictionaries and Series, Grouping with Functions, Grouping by Index Levels, Data Aggregation, Column-Wise and Multiple Function Application, Returning Aggregated Data Without Row Indexes, apply: General split-apply-combine.</p> | 6 |
| Total | | 42 |

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List of Laboratory Experiments:

| Sr. No. | Suggested Experiments |
|---------|--|
| 1 | Array Creation, Manipulation and Initialization with NumPy |
| 2 | Handling structured data using Pandas. |
| 3 | Reading Data with Delimited Formats (TSV, Semicolon, Pipe etc.) |
| 4 | Reading & Writing Binary Files Using Pickle |
| 5 | NumPy Binary Data Handling (.npy / .npz) |
| 3 | Handling Missing Data and Data Transformation. |
| 4 | String Manipulation, Categorical Data |
| 5 | Hierarchical Indexing, Combining and Merging Datasets |
| 6 | Reshaping and Pivoting Data |
| 7 | Plotting with matplotlib |
| 8 | Plotting with pandas and seaborn |
| 9 | Data Analysis of Dataset. |
| 10 | Simulating Random Walk. |
| 11 | Basic graphs and charts; Sheet, Dashboard with Tableau |
| 12 | Mini Project (A group of 4 to 5 students is required to develop an application using blockchain technology and submit report). |

Any other experiment based on syllabus may be included, which would help the learner to understand topic/concept.

Books Recommended:

Text books:

1. Fabio Nelli , Python Data Analytics With Pandas, NumPy, and Matplotlib, Third Edition, Springer, 2022.
2. Abhinaba Banerjee, Ultimate Python Libraries for Data Analysis and Visualization, Leverage Pandas, NumPy, Matplotlib, Seaborn, Julius AI and No-Code Tools for Data Acquisition, Visualization, and Statistical Analysis, 2024.
3. Wes McKinney, Python for Data Analysis Data Wrangling with pandas, NumPy, and Jupyter, O'Reilly Media, Inc, 2022.
4. Claus O. Wilke, Fundamentals of Data Visualization, O'Reilly Media, Inc., 2019.

Reference Books:

1. Sayan Mukhopadhyay , Pratip Samanta, Advanced Data Analytics Using Python With Architectural Patterns, Text and Image Classification, and Optimization Techniques, Springer, 2023
2. Dr. Bhaves Devra, Dr. Dilip Kumar Sharma, Dr. Shajahan Basheer, Mr. Prolay Ghosh, Data Analytics with Python, Book Rivers, 2022
3. Jake VanderPlas, Python Data Science Handbook, O'Reilly Media, Inc, 2022

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Web resources:

1. Pandas Library: <https://pandas.pydata.org/>
2. NumPy Library: <https://numpy.org/>
3. Matplotlib Library: <https://matplotlib.org/stable/tutorials/pyplot.html>
4. Data Visualization: <https://clauswilke.com/dataviz/>
5. Tableau Documentation: https://help.tableau.com/current/offline/en-us/tableau_blueprint.pdf
6. Seaborn Library: <https://seaborn.pydata.org/>

Online Courses:

1. Python for Data Science, By Prof. Ragunathan Rengasamy, IIT Madras
https://onlinecourses.nptel.ac.in/noc22_cs32/preview
2. Programming in Python, By Dr. Rizwan Rehman, Dibrugarh University
https://onlinecourses.swayam2.ac.in/cec22_cs20/preview
3. Python for Data Science, Prof. Ragunathan Rengasamy, IIT Madras
<https://archive.nptel.ac.in/courses/106/106/106106212/>

Evaluation Scheme:**Semester End Examination (A):****Theory:**

1. Question paper based on the entire syllabus total comprising of 60 marks.
2. Total duration allotted for writing the paper is 2 hrs.

Laboratory:

Oral examination will be based on the entire syllabus including the practical performed during laboratory sessions.

Continuous Assessment (B):**Theory:**

1. Term Test 1 (based on 40 % syllabus) of 15 marks for the duration of 45 min.
2. Term Test 2 (on next 40 % syllabus) of 15 marks for the duration of 45 min.
3. Assignment / course project / group discussion /presentation / quiz/ any other for 10 marks.

Laboratory: (Term work)

1. Term Work shall consist of at least 6 practical based on the above list.
2. The distribution of marks for term work shall be as follows:
 - i. Laboratory work (Performance of Experiments, Write-up): 15 Marks.
 - ii. Mini Project: (10 marks)

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.



Prepared by



Checked by



Head of the Department



Vice Principal



Principal