

**AC – 20/05/2025**  
**Item No. – 6.18 (N) (2b) Sem. IV**

**As Per NEP 2020**

## **University of Mumbai**



| <b>Syllabus for<br/>Basket of OE</b>        |                     |
|---------------------------------------------|---------------------|
| <b>Faculty of Science</b>                   |                     |
| <b>Board of Studies in Computer Science</b> |                     |
| <b>UG Second Year Programme</b>             |                     |
| <b>Semester</b>                             | <b>IV</b>           |
| <b>Title of Paper</b>                       | <b>Credits 2/ 4</b> |
| <b>I) Data Analytics</b>                    | <b>2</b>            |
| <b>From the Academic Year</b>               | <b>2025 – 2026</b>  |

## Name of the Course: Data Analytics

| Sr. No. | Heading                 | Particulars                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| 1       | Description the course: | <p><b>Introduction:</b></p> <p>In today's world, data is everywhere — from customer feedback to sports scores and social media trends. This course introduces students to the art of interpreting data through hands-on lab sessions using familiar tools like Excel, Google Sheets, Python, and Power BI, making data analytics both engaging and practical.</p> <p><b>Relevance:</b></p> <p>Data analytics is becoming a fundamental skill in every field — from arts and commerce to social sciences and biology. This course equips students with foundational data literacy, enabling them to understand patterns, trends, and insights from raw data.</p> <p><b>Usefulness:</b></p> <p>This course is highly useful for students across disciplines as it imparts foundational skills in handling, analyzing, and interpreting data—skills that are essential in both academic and professional settings. Whether students are preparing reports, research projects, or making informed decisions, the ability to manage data efficiently enhances their overall competence.</p> <p><b>Application:</b></p> <p>The practical, lab-based approach ensures immediate application of skills. From cleaning messy datasets to creating interactive dashboards, students gain hands-on experience with tools like Excel, Python (Pandas, Matplotlib), and Power BI. These applications are especially relevant in domains such as business analysis, social research, market surveys, and administrative tasks.</p> <p><b>Interest:</b></p> <p>Real-world, relatable datasets like sales figures, weather reports, and public feedback are used to teach concepts, which makes the course interesting and engaging. The visual and interactive nature of tools like Power BI and Excel charts helps maintain student interest while reinforcing learning through visualization and storytelling.</p> |

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|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p><b>Connection with Other Courses:</b></p> <p>This course complements subjects like Research Methodology, Business Statistics, Economics, Marketing, and Management Information Systems. It reinforces quantitative reasoning and analytical thinking, acting as a bridge between theoretical coursework and real-world problem-solving.</p> <p><b>Demand in the Industry:</b></p> <p>There is a rising demand across all sectors—education, healthcare, government, finance, and marketing—for individuals who can understand and analyze data. Data literacy is becoming a required competency, and even non-technical roles increasingly expect professionals to interpret and communicate data insights.</p> <p><b>Job Prospects:</b></p> <p>Completing this course enhances employability by equipping students with entry-level data analytics skills applicable in roles such as research assistants, data entry and analysis interns, marketing analysts, administrative associates, and operations coordinators. It also provides a stepping stone for pursuing advanced certifications or specialization in data analytics, business intelligence, or data-driven roles in various industries.</p> |
| 2 | <b>Vertical:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Open Elective                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 3 | <b>Type:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 4 | <b>Credits:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 2 credits (1 credit = 30 Hours of Practical work in a semester)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 5 | <b>Hours Allotted:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 60 hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 6 | <b>Marks Allotted:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 50 Marks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| 7 | <p><b>Course Objectives (CO):</b></p> <p><b>CO 1.</b> Understand basic concepts and importance of data analytics.</p> <p><b>CO 2.</b> Collect, clean, and explore real-world datasets using Excel and Python.</p> <p><b>CO 3.</b> Perform descriptive statistics and visualize trends effectively.</p> <p><b>CO 4.</b> Use basic tools like Excel, Google Sheets, Power BI, and Python libraries for practical data analysis.</p> <p><b>CO 5.</b> Apply analytics to simple business and social use cases</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 8 | <p><b>Course Outcomes (OC):</b></p> <p>After successful completion of this course, students would be able to -</p> <p><b>OC 1.</b> Work with datasets using spreadsheet tools and Python.</p> <p><b>OC 2.</b> Apply data cleaning and transformation techniques.</p>                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |

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|    | <p><b>OC 3.</b> Generate meaningful visualizations and summaries from data.</p> <p><b>OC 4.</b> Use tools like Power BI for creating dashboards.</p> <p><b>OC 5.</b> Derive actionable insights from data in real-life scenarios.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| 9  | <p><b>Modules:</b></p> <p><b>Module 1: Data Understanding &amp; Exploration</b></p> <p><b>Getting Started with Excel / Google Sheets:</b> Entering, formatting, and sorting data, Using basic functions: AVERAGE, COUNT, IF, VLOOKUP</p> <p><b>Data Cleaning Techniques:</b> Identifying and handling missing values, removing duplicates, dealing with outliers</p> <p><b>Descriptive Statistics in Excel:</b> Mean, median, mode, variance, Interpreting statistical summaries</p> <p><b>Data Visualization:</b> Creating and customizing bar, pie, and line charts, Using pivot tables for summary analytics</p> <p><b>Introduction to Python for Data Analytics:</b> Google Colab/Jupyter Notebook setup, Using Pandas to read CSVs and explore data, Basic plotting with Matplotlib or Seaborn</p> <p><b>Module 2: Practical Data Analytics &amp; Applications</b></p> <p><b>Trend Analysis using Excel/Python:</b> Drawing trendlines in Excel, Real-life datasets: Sales, Weather, etc., Basic Regression (only conceptually – no crying over math)</p> <p><b>Customer Grouping / Clustering Concepts:</b> Using filters &amp; conditional formatting to simulate clustering, Finding patterns: segment customers by behavior, geography, etc., Use pivot tables to analyze grouped data</p> <p><b>Working with Public Datasets:</b> Downloading open datasets (Kaggle, data.gov, etc.), Cleaning using Pandas, Visualization using Seaborn / Matplotlib</p> <p><b>Power BI for Data Visualization:</b> Introduction to Power BI Interface, Importing Excel or CSV files, Creating Interactive Dashboards, Filters, slicers, and drill-downs (without a degree in rocket science), Publishing &amp; sharing reports (because what's analysis if no one sees it?)</p> <p><b>Mini Case Studies – Data-Driven Decisions:</b> Choose a dataset (product sales, customer reviews, etc.) &amp; Clean + visualize + present insights using Excel/Python/Power BI</p> |
| 10 | <p><b>Text Books</b></p> <ol style="list-style-type: none"> <li>McKinney, W. (2018). Python for data analysis: Data wrangling with Pandas, NumPy, and IPython (2nd ed.). O'Reilly Media.</li> <li>Alexander, M., Kusleika, R., &amp; Walkenbach, J. (2021). <i>Excel 2021 Bible</i>. Wiley.</li> <li>Powell, B. (2018). <i>Mastering Microsoft Power BI: Expert techniques for effective data analytics and business intelligence</i>. Packt Publishing.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |

| <b>11</b> | <b>Reference Books</b><br>1. Maheshwari, A. (2017). <i>Data analytics made accessible</i> (3rd ed.). Amazon Digital Services.<br>2. Grolemund, G., & Wickham, H. (2017). <i>R for data science: Import, tidy, transform, visualize, and model data</i> . O'Reilly Media.<br>3. Provost, F., & Fawcett, T. (2013). <i>Data science for business: What you need to know about data mining and data-analytic thinking</i> . O'Reilly Media.                                                                                                                                    |                                                                                                                                                                                                                                                  |          |                             |       |      |          |    |      |          |    |      |      |    |
|-----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|-----------------------------|-------|------|----------|----|------|----------|----|------|------|----|
| <b>12</b> | <b>Internal Continuous Assessment: 40%</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>Semester End Examination: 60%</b>                                                                                                                                                                                                             |          |                             |       |      |          |    |      |          |    |      |      |    |
| <b>13</b> | Practical Assignments / Experiments / Hands-On Tests / Presentations / Demonstrations / Online Class Test / Case Studies: <b>15 marks</b><br>Journal: <b>5 marks</b><br><hr/> <b>Total: 20 Marks</b>                                                                                                                                                                                                                                                                                                                                                                        | <b>A Semester End Practical Examination of 2 hours duration for 30 marks</b> as per the paper pattern given below.<br><br><b>Certified Journal is compulsory</b> for appearing at the time of Practical Exam<br><br><hr/> <b>Total: 30 Marks</b> |          |                             |       |      |          |    |      |          |    |      |      |    |
| <b>14</b> | <b>Format of Question Paper:</b><br><br><div style="display: flex; justify-content: space-between;"> <b>Total Marks: 30</b> <b>Duration: 2 Hours</b> </div> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 33%;">Question</th><th style="width: 33%;">Practical Question Based On</th><th style="width: 33%;">Marks</th></tr> </thead> <tbody> <tr> <td>Q. 1</td><td>Module 1</td><td>12</td></tr> <tr> <td>Q. 2</td><td>Module 2</td><td>12</td></tr> <tr> <td>Q. 3</td><td>Viva</td><td>06</td></tr> </tbody> </table> |                                                                                                                                                                                                                                                  | Question | Practical Question Based On | Marks | Q. 1 | Module 1 | 12 | Q. 2 | Module 2 | 12 | Q. 3 | Viva | 06 |
| Question  | Practical Question Based On                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Marks                                                                                                                                                                                                                                            |          |                             |       |      |          |    |      |          |    |      |      |    |
| Q. 1      | Module 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 12                                                                                                                                                                                                                                               |          |                             |       |      |          |    |      |          |    |      |      |    |
| Q. 2      | Module 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 12                                                                                                                                                                                                                                               |          |                             |       |      |          |    |      |          |    |      |      |    |
| Q. 3      | Viva                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 06                                                                                                                                                                                                                                               |          |                             |       |      |          |    |      |          |    |      |      |    |

Sd/-

**Sign of the BOS Chairman**  
**Dr. Jyotshna Dongardive**  
Ad-hoc BOS (Computer Science)

Sd/-

**Sign of the Offg. Associate Dean**  
**Dr. Madhav R. Rajwade**  
Faculty of Science & Technology

Sd/-

**Sign of Offg. Dean**  
**Prof. Shivram S. Garje**  
Faculty of Science & Technology