

**FACULTY OF COMPUTER SCIENCE**  
**Master of Computer Application (Sem-III)**  
 In Effect from Academic Year 2025-26

|                              |                                                                                                           |
|------------------------------|-----------------------------------------------------------------------------------------------------------|
| <b>Branch Name:</b>          | MCA                                                                                                       |
| <b>Program Code:</b>         | CS201                                                                                                     |
| <b>Course Code</b>           | 4CS2010305T                                                                                               |
| <b>Course Title</b>          | Data Visualization & Business Intelligence                                                                |
| <b>Pre-requisite Course:</b> | Basic knowledge of Python programming, DBMS (SQL), statistics, and fundamental concepts of data analysis. |

**Course Objective:**

1. To learn various machine learning algorithms & their area of applications.
2. To learn the process of formulating & solving real world problems using machine learning.
3. To learn the implementation of various decision making problems using machine learning.

**Teaching and Examination Scheme:**

| Teaching Scheme (Hours per week) |          |           |        | Evaluation Scheme (Marks) |                       |                       |                       |       |
|----------------------------------|----------|-----------|--------|---------------------------|-----------------------|-----------------------|-----------------------|-------|
| Lecture                          | Tutorial | Practical | Credit | Theory                    |                       | Practical             |                       | Total |
|                                  |          |           |        | University Assessment     | Continuous Assessment | University Assessment | Continuous Assessment |       |
| 3                                | -        | -         | 3      | 60                        | 40                    | -                     | -                     | 100   |

**Course Contents:**

| Unit No | Topics                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Total Hours | Weightage (%) |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|---------------|
| 1       | <b>Foundations of Data Visualization &amp; Data Preparation</b> <ul style="list-style-type: none"> <li>● Introduction to Data Visualization in Data Science and BI</li> <li>● Role of Visualization in Decision Support Systems</li> <li>● Data Types and Structures (Structured, Semi-structured, Unstructured)</li> <li>● Data Preprocessing Techniques               <ul style="list-style-type: none"> <li>○ Data Cleaning, Transformation, Normalization</li> </ul> </li> <li>● Principles of Visual Perception and Cognition</li> <li>● Visualization Design Guidelines</li> <li>● Basic and Statistical Plots               <ul style="list-style-type: none"> <li>○ Bar, Line, Histogram, Box Plot, Scatter Plot</li> </ul> </li> <li>● Introduction to Python for Visualization               <ul style="list-style-type: none"> <li>○ NumPy, Pandas (Data Handling)</li> </ul> </li> </ul> | 09          | 25            |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |    |
|---|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| 2 | <b>Advanced Visualization &amp; Visual Analytics</b> <ul style="list-style-type: none"> <li>Advanced Visualization Techniques <ul style="list-style-type: none"> <li>Multivariate Analysis, Correlation Visualization</li> </ul> </li> <li>Time Series Visualization</li> <li>Geospatial Data Visualization (Maps, Choropleth Maps)</li> <li>Interactive Visualization Techniques</li> <li>Storytelling and Narrative Visualization</li> <li>Python Libraries for Advanced Visualization <ul style="list-style-type: none"> <li>Matplotlib, Seaborn, Plotly, Bokeh</li> </ul> </li> <li>Visual Analytics and Exploratory Data Analysis (EDA)</li> <li>Handling Large-Scale Data Visualization</li> </ul> | 10 | 25 |
| 3 | <b>Business Intelligence Systems &amp; Data Warehousing</b> <ul style="list-style-type: none"> <li>Introduction to Business Intelligence Systems</li> <li>BI Architecture and Framework</li> <li>Data Warehousing Concepts <ul style="list-style-type: none"> <li>Schema Design (Star, Snowflake)</li> <li>ETL Process and Tools</li> </ul> </li> <li>OLAP Operations (Drill-down, Roll-up, Slice, Dice)</li> <li>Data Mining vs Business Intelligence</li> <li>Key Business Metrics and KPIs</li> <li>BI Tools and Platforms <ul style="list-style-type: none"> <li>Power BI, Tableau</li> </ul> </li> <li>Integration of BI with Big Data Technologies</li> </ul>                                      | 09 | 25 |
| 4 | <b>Dashboard Development &amp; BI Applications</b> <ul style="list-style-type: none"> <li>Principles of Dashboard Design</li> <li>Development of Interactive Dashboards</li> <li>Data Reporting and Visualization for Business Decisions</li> <li>Predictive Analytics in BI</li> <li>Real-Time Business Intelligence Systems</li> <li>Case Studies in Various Domains <ul style="list-style-type: none"> <li>Finance, Healthcare, E-commerce, Social Media Analytics</li> </ul> </li> <li>Ethical Considerations in BI and Data Visualization</li> <li>Emerging Trends <ul style="list-style-type: none"> <li>AI-driven BI, Augmented Analytics, Self-Service BI</li> </ul> </li> </ul>                 | 10 | 25 |

**Text Books:**

1. Data Visualization: A Practical Introduction – *Kieran Healy*
2. Storytelling with Data – *Cole Nussbaumer Knaflic*
3. Fundamentals of Business Intelligence – *Wilfried Grossmann*

**Reference Books:**

1. The Visual Display of Quantitative Information – *Edward Tufte*
2. Python for Data Analysis – *Wes McKinney*
3. Business Intelligence Guidebook – *Rick Sherman*

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**Course Learning Outcomes (CLO):** On completion of this course, the students will be able to:

| CLO  | Description                                                            | Bloom's Taxonomy Level  |
|------|------------------------------------------------------------------------|-------------------------|
| CLO1 | Apply visualization techniques to explore and analyze complex datasets | 3.Apply<br>4.Analyze    |
| CLO2 | Design interactive and meaningful dashboards using BI tools            | 3.Apply<br>6. Create    |
| CLO3 | Implement data warehousing and BI concepts for business applications   | 3.Apply<br>4.Analyze    |
| CLO4 | Interpret data insights for strategic decision-making                  | 4.Analyze<br>5.Evaluate |
| CLO5 | Develop end-to-end BI solutions using modern tools                     | 3.Apply<br>6. Create    |

**Mapping of CLOs with POs & PSOs**

| Course Learning Outcomes | Program Outcomes (POs) |     |     |     |     |     |     |     |     |      |      |      | Program Specific Outcomes(PSOs) |      |
|--------------------------|------------------------|-----|-----|-----|-----|-----|-----|-----|-----|------|------|------|---------------------------------|------|
|                          | PO1                    | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1                            | PSO2 |
| <b>CLO1</b>              | H                      | M   | M   | M   | H   | L   | M   | L   | L   | L    | L    | L    | H                               | M    |
| <b>CLO2</b>              | H                      | H   | H   | H   | H   | L   | M   | M   | M   | L    | M    | M    | H                               | M    |
| <b>CLO3</b>              | H                      | H   | H   | H   | H   | L   | M   | M   | L   | L    | M    | M    | H                               | M    |
| <b>CLO4</b>              | M                      | H   | M   | M   | M   | H   | H   | M   | H   | M    | M    | M    | M                               | H    |
| <b>CLO5</b>              | H                      | H   | H   | H   | H   | H   | H   | H   | M   | M    | H    | H    | H                               | H    |

**H:High, M:Medium, L:Low**