| CSI3005 | Advanced Data Visualization Techniques | L | T | P | J | C |
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| **Pre-requisite** | **Nil** | **Syllabus version** | | | | |
| | | 1.0 | | | | |

**Course Objectives:**

1. To understand the various types of data, apply and evaluate the principles of data visualization
2. Acquire skills to apply visualization techniques to a problem and its associated dataset
3. To apply structured approach to create effective visualizations
4. To learn how to bring valuable insight from the massive dataset using visualization
5. To learn how to build visualization dashboard to support decision making
6. To create interactive visualization for better insight using various visualization tools

**Course Outcome:**

After successfully completing the course the student should be able to

1. Identify the different data types, visualization types to bring out the insight.
2. Relate the visualization towards the problem based on the dataset to analyze and bring out valuable insight on large dataset.
3. Design visualization dashboard to support the decision making on large scale data.
4. Demonstrate the analysis of large dataset using various visualization techniques and tools.

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| **Student Learning Outcomes (SLO):** | 4, 7, 12 |

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| **Module:1** | **Introduction to Data Visualization and Visualization techniques** | **6 hours** |

Overview of data visualization - Data Abstraction - Task Abstraction - Analysis: Four Levels for Validation. Visualization Techniques -Scalar and point techniques – colour maps – Contouring – Height Plots - Vector visualization techniques – Vector properties – Vector Glyphs – Vector Color Coding

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| **Module:2** | **Visual Analytics** | **5 hours** |

Visual Variables- Networks and Trees –Tables - Map Color and Other Channels- Manipulate View

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| **Module:3** | **Visualization Tools** | **6 hours** |

Fundamentals of R- Visualization using R library -Introduction to various data visualization tools- tableau

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| **Module:4** | **Geo spatial visualization** | **6 hours** |

Geo spatial data and visualization techniques : Chloropleth map, Hexagonal Binning, Dot map, Cluster map, cartogram map

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| **Module:5** | **Diverse Types Of Visual Analysis** | **6 hours** |

Time- Series data visualization – Text data visualization – Matrix visualization techniques - Heat Map- Multivariate data visualization and case studies

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| **Module:6** | **Visualization of Streaming Data** | **7 hours** |

Introduction to Data Streaming, processing and presenting of streaming data, streaming visualization techniques, streaming analysis.

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| **Module:7** | **Visualization Dashboard Creations** | **7 hours** |

Dashboard creation using visualization tools for the use cases: Finance-marketing-insurance-healthcare etc.,

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| **Module:8** | **Recent Trends** | **2 hours** |
| | **Total Lecture hours** | **45 hours** |

**Text Books**

1. Tamara Munzer, Visualization Analysis and Design, CRC Press 2014.
2. Aragues, Anthony. Visualizing Streaming Data: Interactive Analysis Beyond Static Limits. O'Reilly Media, Inc., 2018

**Reference Books**

1. Chun-hauh Chen, W.K.Hardle, A.Unwin, Hand book of Data Visualization, Springer publication, 2016.
2. Christian Toninski, Heidrun Schumann, Interactive Visual Data Analysis, CRC press publication,2020
3. Alexandru C. Telea, Data Visualization: Principles and Practice, AK Peters, 2014.

Mode of Evaluation: CAT / Assignment / Quiz / FAT / Seminar

**List of Experiments:**

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| 1 | Acquiring and plotting data. | 2 hours |
| 2 | Statistical Analysis – such as Multivariate Analysis, PCA, LDA, Correlation regression and analysis of variance | 4 hours |
| 3 | Financial analysis using Clustering, Histogram and HeatMap | 4 hours |
| 4 | Time-series analysis – stock market | 4 hours |
| 5 | Visualization of various massive dataset - Finance – Healthcare - Census - Geospatial | 4 hours |
| 6 | Visualization on Streaming dataset (Stock market dataset, weather forecasting) | 4 hours |
| 7 | Market-Basket Data analysis-visualization | 4 hours |
| 8 | Text visualization using web analytics | 4 hours |
| | **Total Lecture hours** | **30 hours** |

Mode of evaluation: Project/Activity

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| Recommended by Board of Studies | 11-02-2021 | | |
| Approved by Academic Council | No. 61 | Date | 18-02-2021 |