**DATA VISUALIZATION**

**PVP20**

**MICRO SYLLABUS**

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| **Course Code** | 20CS6621 | **Year** | **III** | **Semester** | II |
| **Course Category** | Honors | **Branch** | **CSE** | **Course Type** | Theory |
| **Credits** | 4 | **L-T-P** | **3-0-2** | **Prerequisites** | - |
| **Continuous**  **Internal Evaluation :** | 30 | **Semester End Evaluation:** | **70** | **Total Marks:** | 100 |

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| **Course Outcomes** | | |
| Upon successful completion of the course, the student will be able to | | |
| **CO1** | Understand fundamental concepts of Data visualization | **L2** |
| **CO2** | Apply different techniques and views for effective visualization of data | **L3** |
| **CO3** | Analyze the given data and use appropriate technique for better  Visualization | **L4** |
| **CO4** | Apply different visualization techniques for effective understanding of data | **L3** |

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| **Contribution of Course Outcomes towards achievement of Program Outcomes & Strength of correlations (3:Substantial, 2: Moderate, 1:Slight)** | | | | | | | | | | | | | | |
|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 3 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| **CO2** | 3 |  |  |  |  |  |  |  |  |  |  |  |  | 2 |
| **CO3** |  | 3 |  |  |  |  |  |  | 3 | 3 |  |  |  | 2 |
| **CO4** | 3 |  |  |  |  |  |  |  |  |  |  |  |  | 2 |

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| **Syllabus** | | **Mapped CO** |
| **Unit**  **No.** | **Contents** |
| **I** | **Foundations for an Applied Science of data visualization:** Visualization Stages,  The Study of Arbitrary Conventional Symbols: Gibson’s Affordance theory,  A Model of Perceptual Processing:  Stage 1: Parallel Processing to Extract Low-Level Properties of the Visual Scene, Stage 2: Pattern Perception, Stage 3: Sequential Goal-Directed Processing  Types of Data:  Entities, Relationships, Attributes of entities or Relationships, data dimensions, Operations considered as data. | **CO1** |
| **II** | **The Visualization Pipeline:**  Conceptual Perspective: Importing Data, Data Filtering and Enrichment, Mapping Data, Rendering Data  Implementation Perspective: Dataflow design, Dataflow implementation, Algorithm Classification  **Scalar Visualization:** Color Mapping,  Designing Effective Color maps: Goals, Color legends, Rainbow color map and other color map designs-Gray scale, Two hue, Heat map, Diverging and Zebra color map,  Contouring: Contour properties, Height Plots: Enridged plots | **CO1,CO2,CO3** |
| **III** | **Vector Visualization:**  Vector Glyphs: Line glyphs, Cone and arrow glyphs, Vector glyphs in 2D  Vector Color Coding: Color coding on 2D surfaces, Displacement Plots  Texture-Based Vector Visualization: Line integral convolution  **Domain- Modeling Techniques:** Cutting: Extracting a Brick, Slicing in Structured Datasets, Implicit Function Cutting, Generalized Cutting  Selection: Selecting cells, Thresholding, segmentation, and contouring, Grid Construction from Scattered Points: Triangulation Methods- Delaunay triangulations, Voronoi diagrams | **CO1,CO2,CO3** |
| **IV** | **Image Visualization:** Image Data Representation : 2D images and higher dimension images, Image Processing and Visualization,  Shape representation and analysis-Basic segmentation, Advanced segmentation: Normalized cuts, Mean shift, Image foresting transform connected components | **CO1,CO2,CO3** |
| **V** | **Information Visualization:**  What Is Infovis,  Table Visualization: Printing the contents, Mapping values, Sampling issues.  Visualization of Relations: Tree Visualization,  Multivariate Data Visualization: Parallel Coordinate Plots, Dimensionality Reduction  Text Visualization: Content-Based Visualization, Visualizing Program Code | **CO1,CO2,CO4** |

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| **Learning Resources** |
| **Text Books** |
| 1. Information Visualization Perception for Design, Colin Ware , 3rd edition, Morgan Kaufman 2012. 2. Data Visualization: Principles and Practice, Alexandru C. Telea, A. K. Peters Ltd, 2008 3. Core Python Programming , R. Nageswara Rao, Second Edition, Dreamtech Press |
| **References** |
| 1. Data Points: Visualization that means something, Nathan Yau,Wiley, 2013. 2. The visual display of quantitative information, Edward R. Tufte, Second Edition, 2001, Graphics Press 3. Interactive Data Visualization for the Web, Scott Murray, 2013 , O’Reilly. |
| **e-Resources & other digital material** |
| 1. <https://help.tableau.com/current/pro/desktop/en-us/default.htm>l 2. <https://www.ibm.com/cloud/learn/data-visualization> 3. <https://www.oreilly.com/library/view/interactive-data-visualization/9781491921296/> 4. <http://web.cse.ohiostate.edu/~shen.94/5544/> 5. <https://www.coursera.org/learn/datavisualization> |

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| **ourse Outcomes** | | |
| Upon successful completion of the course, the student will be able to | | |
| **CO1** | Apply tools to visualize the data | **L2** |
| **CO2** | Conduct experiments as an individual, or team member by using matplotlib and Tableau | **L3** |
| **CO3** | Develop an effective report based on various programs implemented. | **L3** |
| **CO4** | Apply technical knowledge for a given problem and express with an effective oral communication. | **L3** |
| **CO5** | Analyze outputs generated through Visualization | **L4** |

Experiments:

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| **Syllabus** | | |
| **Exp.**  **No.** | **Contents** | **Mapped CO** |
| **I** | Generate a simple graph by using python matplotlib | **CO1,CO2,CO3, CO4,CO5** |
| **II** | Implement different types of plots available in python matplotlib | **CO1,CO2,CO3, CO4,CO5** |
| **III** | Develop multiple plots using subplot( ) function in matplotlib | **CO1,CO2,CO3, CO4,CO5** |
| **IV** | Demonstrate how to connect to various data sources in Tableau | **CO1,CO2,CO3,**  **CO4,CO5** |
| **V** | Develop customized views by using Ask Data component in Tableau | **CO1,CO2,CO3, CO4,CO5** |
| **VI** | Build data views from scratch using Tableau | **CO1,CO2,CO3,**  **CO4,CO5** |

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| **Learning Resources** | |
| **Text Books** | |
| **1** | Data Visualization in Python, Daniel Nelson , StackAbuse |
| **2** | Data Visualization in Python with Pandas and Matplotlib, David Landup , StackAbuse |
| **3** | Information Dashboard Design by Stephen Few ,Second Edition, Analytics Press |
| **References** | |
| **1** | The Data Loom by Stephen Few, Analytics Press |
| **e-Resources & other digital material** | |
| **1** | https://matplotlib.org/2.0.2/ |
| **2** | <https://help.tableau.com/current/pro/desktop/en-us/default.htm>l |