

**Year: B. Tech III (Semester VI)**

**Subject Name:** Data Visualization and Presentation

**Subject Code:** BTAI13601

**Type of course:** Professional Core Course

**Prerequisite (if any):** Web Development

**Rationale:** This course introduces students to the technology fundamentals for data visualization, various tools used for data visualization.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |   |   | Theory Marks |     |     | Practical Marks |     | Total |
|-----------------|---|---|---|--------------|-----|-----|-----------------|-----|-------|
| L               | T | P | C | TEE          | CA1 | CA2 | TEP             | CA3 |       |
| 2               | 0 | 2 | 3 | 60           | 25  | 15  | 30              | 20  | 150   |

CA1: Continuous Assessment (assignments / projects / open book tests / closed book tests) CA2: Sincerity in attending classes / class tests / timely submissions of assignments / self-learning attitude / solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work / Quality of work submitted / Active participation in lab sessions / viva on practical skills learned in course.

**Contents:**

| Sr. No. | Contents   | Total Hrs |
|---------|--|-----------|
| 1.      | <b>Introduction of data visualization :</b><br>Visualization Tools , Graphical representation of data, Visualizing Data, Design readable and clear data graphics, optimization of data story   | 04        |
| 2.      | <b>Technology Fundamentals :</b><br>Web, HTML, DOM, Developer Tools, Rendering and the Box Model, CSS, JavaScript - Other Variable Types, JSON, Operators, Control Structures, Functions, JavaScript Gotchas, SVG - The SVG Element, Styling SVG Elements                              | 04        |
| 3.      | <b>Web Data Visualization :</b><br>Introducing D3, Setup D3 environment – downloading D3, Referencing D3, setting up the web server  | 02        |
| 4.      | <b>Visualizing data Programmatically:</b><br>Creating HTML5 CANVAS Charts (HTML5 Canvas basics, Linear interpolations, A Simple Column Chart, Animations), Starting with Google charts (Google Charts API Basics, A Basic bar chart, A basic Pie chart, Working with Chart Animations) | 04        |
| 5.      | <b>Advanced Data Visualization:</b><br>Making charts interactive and Animated- Data joins, updates and exits, interactive buttons, Updating charts, Adding transactions, using keys, Adding a Play Button - wrapping the   | 06        |

|           |   |           |
|-----------|---|-----------|
|           | update phase in a function, Adding a Play button to the page, Making the Play button go, Allow the user to interrupt the play, sequence   |           |
| <b>6.</b> | <b>Information Dashboard Design:</b><br>Introduction, Dashboard design issues and assessment of needs, Considerations for designing dashboard-visual perception, Achieving eloquence, Advantages of Graphics, Library of Graphs, Designing Bullet Graphs, Designing Sparklines, Dashboard Display Media, Critical Design Practices, Putting it all together - Unveiling the dashboard | <b>06</b> |
| <b>7.</b> | <b>Other Data Visualisation Tools</b><br>Excel, R, Tableau, Python  | <b>04</b> |

**Suggested Specification table with Marks (Theory): (For B. Tech only)**

| Distribution of Theory Marks |         |         |         |         |         |
|------------------------------|---------|---------|---------|---------|---------|
| R Level                      | U Level | A Level | N Level | E Level | C Level |
| 15                           | 20      | 20      | 5       | -       | -       |

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (Revised Bloom's Taxonomy)

**Reference Books:**

| Sr. No. | Title of book /article  | Author(s)  | Publisher and details like ISBN |
|---------|---|--|---------------------------------|
| 1       | Data Visualization Made Simple: Insights into Becoming Visual | Kristen Sosulski   | Routledge                       |
| 2       | Interactive Data Visualization for the Web                    | Scott Murray   | O'Reilly Media, Inc.            |
| 3       | JavaScript and jQuery for Data Analysis and Visualization     | Jon Raasch, Graham Murray, Vadim Ogievetsky, Joseph Lowery | John Wiley & Sons, Inc.         |

**Note: Students should refer to the latest editions of books**

**Course Outcomes (CO):**

| <b>Sr. No.</b> | <b>CO statements</b>   | <b>Marks % weightage</b> |
|----------------|--|--------------------------|
| CO-1           | Explain design principles of data visualization and categories of data visualization.  | 10%                      |
| CO-2           | Explain various developer tools for data visualization.  | 20%                      |
| CO-3           | Apply appropriate techniques using D3 for web data visualization.  | 15%                      |
| CO-4           | Apply visualization tools / techniques for various data analysis tasks.  | 35%                      |
| CO-5           | Given the application context for given data set, design the information Dashboard to access information based on user criteria. | 20%                      |

**List of Open learning website:**

- HTML5 (Canvas and SVG tags)
- D3.js (<https://d3js.org/>), Canvas.js
- Google API

**List of Experiments:**

1. Setup Environment for D3.
2. Develop the following Program Using HTML5 CANVAS and SVG TAG
  - a. Develop the Different basic Graphical Shapes using HTML5 CANVAS
  - b. Develop the Different Advanced Graphical Shapes using HTML5 CANVAS
  - c. Develop the Different basic Graphical Shapes using HTML5 SVG
  - d. Develop the Different Advanced Graphical Shapes using HTML5 SVG
3. Develop Following Program Using HTML5 and JavaScript
  - a. Develop the simple bar chart using HTML5 CANVAS
  - b. Read the data .txt file and draw Data Table
  - c. Read the data .txt file and draw Simple Bar Chart
  - d. Read the data .csv file and draw Data Table
  - e. Read the data .csv file and draw Column Bar Chart
  - f. Read the data XML file and draw Data Table
  - g. Read the data XML file and draw Simple Chart
  - h. Read JSON Data and draw Data Table
  - i. Read JSON Data and draw Simple Chart
4. Develop Following Program Using HTML5 and D3.js and Canvas.js



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- a. Showing the data as a column chart (simple)
  - b. Showing the data as a stacked column chart
  - c. Showing the Data as a column chart for four age group
  - d. Showing the data as a Line chart (single, fewer and multiple lines)
  - e. Showing the data as a Pie Chart (single and multiple pie)
  - f. Showing the data as a Bar Chart (Simple and multiple)
5. Develop Following Program Using HTML5 and Google Chats API and Map API
- a. Using Google Charts API Basics draw charts like a Bar chart
  - b. Using Google Charts API Basics draw charts like a Line chart
  - c. Using Google Charts API Basics draw PieChart.
  - d. Using Google Charts API Basics draw Donut Chart.
  - e. Using Google Charts API Basics draw Candle Chart.
  - f. Using Google Charts API Basics draw other types of Chart.
  - g. Using Google API read JSON file and create Google Map.
6. Explore visualization tools Excel, R, Tableau and Python.
7. Build interconnected Dashboard.