# 20CS41E3 - PYTHON PROGRAMMING - II

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| Course Category: | Professional Elective | Credits: | 3 |
| Course Type: | Theory | Lecture-Tutorial-Practical: | 3-0-0 |
| Prerequisite: | Basic mathematical knowledge and basic programming skills. | Sessional Evaluation:  Univ. Exam Evaluation:  Total Marks: | 40  60  100 |
| Objectives: | * To learn the fundamentals of NumPy, Pandas, Matplotlib, Scikit-Learn, Scipy * To develop various simple applications using NumPy, Pandas, Matplotlib. * To define Data analysis using python modules. * To explore features of Data Science and Machine Learning Concepts with Python Modules. | | |

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| Course Outcomes | Upon successful completion of the course, the students will be able to: | |
| CO1 | Understand the NumPy Arrays with different operations. |
| CO2 | Acquire the knowledge how to apply Matrices in the data analysis. |
| CO3 | Understand the importance of Pandas for Data Analysis. |
| CO4 | Acquire knowledge in the concepts of Data Visualization. |
| CO5 | Understand and Apply the Machine Learning concepts using Scikit-learn |
| CO6 | Use Scipy functions in Machine Learning and Data Science |
| Course Content | UNIT-I  **NumPy I: THE ABSOLUTE BASICS FOR BEGINNERS**  Installing NumPy, Import NumPy, Difference between Python lists and NumPy Array, what is an Array, How to Create Basic Arrays, Adding Removing and Sorting Elements, How do You Know the Size and Shape of an Array, Can you Reshape An Array, 1D to 2D Arrays (How do you add new Axis to an Array), Indexing and Slicing, How to Create an array with an Existing Data, Basic Array Operations, More Useful Array Operations,  UNIT-II  **NumPy II:** Creating Matrices, Generating Random Numbers, How to get Unique Items and Counts, Transporting and Reshaping Matrices, Reverse an Array, Reshaping and Flattering Multi-Dimensional Arrays, How to Accessing the Docstring for more information, Working with Mathematical Formulas, How to save and load NumPy Objects.  UNIT-III  **Pandas: User Guide:** Object Creation, Viewing Data, Selection, Missing Data, Operations, Merge, Grouping, Reshaping, Time Series, Categorical, Getting Data In/ Out  **Introduction to Data Structures:** Series, Data Frame.  UNIT-IV  **Matplotlib:** Features of Matplotlib, anatomy and customization of a Matplotlib Plot.  **Plotting and Plot Customization:** Creating a plot and figure, Axes, Subplots, Changing Figure sizes.  **Customizing Plots:** Plot Titles, Labels and Legends, Text, Ticks, Layouts.  Changing Colour of Elements, Visualization Examples.  UNIT-V  **Scikit-Learn:** Introduction to Machine Learning with Scikit-Learn: Machine Learning: The Problem Setting, Loading an Example Datasets, Learning and Predicting, Model Persistence, Conventions.  **A Tutorial on Statistical-Learning for Scientific Data Processing:** Statistical Learning, Supervised Learning, Model Selection  UNIT-VI  **Scipy:** Basic Functions, Special Functions, Compressed Sparse Graph Routines, Spatial Data Structures and Algorithms, **Statistics**: Building Specific Distributions. | |
| Text Books &  Reference  Books | **TEXT BOOKS:**   1. Hands on Data Analysis with NumPy and Python, Curtis Miller.   **REFERENCE BOOKS:**   1. Learning the Pandas Library, Matt Harrison. 2. Machine Learning Using Python, Manaranjan Pradhan, U. Dinesh Kumar , Wiley Publications. 3. NumPy User Guide 1.20.0, Written by the NumPy Community 4. Pandas: Powerful Python Data Analysis Tool kit Release 1.3.0, Wes McKinney and the Pandas Development Team. 5. Data Visualization in Python, Daniel Nelson. 6. Scikit-Learn User Guide, Release 0.18.2 , Scikit-Learn Developers. 7. Scipy Reference Guide, Release 0.13.0, Written by the Scipy Community | |
| E-Resources | 1. <https://www.w3schools.com> 2. <https://www.geeksforgeeks.org> 3. <https://numpy.org> 4. Learn Pandas Tutorials (kaggle.com) 5. <https://matplotlib.org> 6. <https://kaggle.com/learn/pandas> 7. <https://scipy-lectures.org> 8. <https://scikit-learn.org> | |

**CO-PO Mapping:** 3-High Mapping, 2-Moderate Mapping, 1-Low Mapping

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|  | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** |  |  |  | 1 |  |  | 2 |  |  |  |  |  |
| **CO2** | 2 |  |  |  |  | 2 |  |  |  |  |  |  |
| **CO3** |  |  | 3 |  |  |  |  |  |  |  |  |  |
| **CO4** |  |  | 3 |  |  | 2 |  |  | 2 |  |  |  |
| **CO5** |  | 2 |  |  | 2 |  |  |  |  |  |  |  |
| **CO6** |  | 2 |  | 3 |  |  |  |  |  |  |  |  |