CE 391: PYTHON FOR DATA ANALYTICS
B.TECH 5TH SEMESTER (CIVIL)
PROGRAMME ELECTIVE - II

Credits and Hours:

Teaching Scheme	Theory	Practical	Total	Credit
Hours/week	3	2	5	4
Marks	100	50	150	

A. Objectives of the Course:

The main objectives of the course are:

- To provide comprehensive knowledge of python programming paradigms required for Data Science
- To get familiar with the main elements of Python programming
- To understand the basic concepts of Python
- To become Proficient in using the Most Common Python Data Science Packages like Numpy, Pandas & Matplotlib
- To understanding how to manipulate and analyze uncurated datasets
- To execute the basic statistical analysis methods

B. Outline of the Course:

Sr. No.	Title of the Unit	Minimum Number of Hours
1	NumPy	10
2	Pandas	12
3	Matplotlib	10
4	Statistics for data analytics	13

Total Hours (Theory): 45

Total Hours (Lab): 30

Total Hours: 75

C. **Detailed Syllabus:**

1	**NumPy**	**10 Hours**	**22%**
1.1	NumPy Introduction		
1.2	Create NumPy Arrays		
1.3	Data Type Object, type		
1.4	Numerical Operations on NumPy Arrays		
1.5	Changing the Dimensions of Arrays		
1.6	Python, NumPy and Probability		
1.7	Creation of Synthetical Test Data		
1.8	Boolean Masking of Arrays		
1.9	Matrix Arithmetic		
1.10	Reading and Writing and arrays		
2	**Pandas**	**12 Hours**	**27%**
2.1	Pandas Data Frames		
2.2	Replacing Values in Data Frames and Series		
2.3	Pandas Data Files		
2.4	Dealing with NaN		
2.5	Binning Data		
2.6	Pandas Tutorial Continuation: multi-level indexing		
2.7	Data Visualization with Pandas and Python		
2.8	Python, Pandas and Timeseries		
2.9	Estimating the number of Corona Cases with Python and Pandas		
3	**Matplotlib**	**10Hours**	**22%**
3.1	Pyplot API		
3.2	Simple Plot		
3.3	Figure Class		
3.4	Axes Class		
3.5	Multiplot		
3.6	Subplots () Function		
3.7	Formatting Axes		
3.8	Setting Ticks and Tick Labels		

3.9   Bar Plot

3.10   Histogram

3.11   Pie Chart

3.12   Scatter Plot

3.13   Three-dimensional Plotting

4	**Statistics for data analytics**	13Hours	29%

4.1   Mean, Median, Mode

4.2   Standard Deviation, Variance

4.3   Variable Distribution

4.4   Normalization

4.5   Statistical Modeling using Auto Regression and Auto

4.6   Correlation

D. Instructional Method and Pedagogy:

At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.

- Attendance is compulsory in lectures and laboratory.

- Internal exams will be conducted as per pedagogy as a part of internal theory evaluation.

- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.

- Surprise tests/Quizzes/Seminar will be conducted as per pedagogy as a part of internal theory evaluation.

- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.

- Experiments/Tutorials related to course content will be carried out in the laboratory.

E. Students Learning Outcome:

 On the completion of the course the students will be able to:

- Implement the most widely used Python packages like NumPy, Pandas & MatplotLib

- Build and code a Graphical User Interface (GUI) to run a program

- Analyze the significance of python program development environment by working on real world examples
- Implement numerical programming, data handling and visualization through NumPy, Pandas and MatplotLib modules.

F. **Recommended Study Material:**

Text Books:

1) William McKinney, " Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Ipython" O'Reilly Media, Inc.,

2) Nagar, Sandeep, "Introduction to Python for Engineers and Scientists - Open Source Solutions for Numerical Computation", Apress, 2018.

3) Jesus Rogel-Salazar, "Data Science and Analytics with Python", CRC Press, Taylor & Francis Group, LLC

Reference Books:

1) Magnus Lie Hetland, "Beginning Python from Novice to Professional", Third Edition, Apress, 2017

2) Mark Lutz "Learning Python", 4th Edition, O''REILLY, 2016

Web Materials:

1) https://nptel.ac.in/courses/106/106/106106212/

2) https://matplotlib.org/gallery/index.html

3) https://realpython.com/python-matplotlib-guide/

4) https://www.tutorialspoint.com/python/index.htm

LIST OF PRACTICALS

Practical No.	Name of Practical
1	Write Python programs to understand control structures.
2	Write Python programs to understand list and tuples.
3	Use conditional statements and loops in Python programs.
4	Write python programs to create functions and use functions in the program.
5	Import module and use it in Python programs.
6	Write python program to plot data using PyPlot.