
[DSWP-3059] DATA SCIENCE WITH PYTHON
FALL, 2026, JSGP

SECTION:	Elective	OFFICE HOURS:	By appointment
INSTRUCTOR:	Dr. S. Shariq Husain	CLASS TIME & LOCATION:	
E-MAIL:	syeds.husain@jgu.edu.in		As announced

COURSE DESCRIPTION

This course provides the foundations for the understanding of a wide range of data available across different domains. It dispenses a knowledge base that allows students to analyze and visualize different types of social, economic, financial, pollutant and socioeconomic data, understand relational patterns and insights from data for evidence-informed recommendations to facilitate policies. The course would be a blend of basic mathematical methods and tools, introduction to python programming and data driven analyses (numpy, matplotlib, pandas library) with real world data. "Data Science with Python " aims to furnish the basic knowledge and train necessary skills in handling various structured/ unstructured data, cleaning and processing, its analyses, visualization and understanding of ongoing dynamics by capturing meaningful patterns. It will be complemented with vivid examples involving multiple factors, complex systemic perspective to current research. This will complement the traditional way of looking into the subject and the tools and techniques can be implemented to health, environment, financial and other socioeconomic data to gain deeper insights. The course also sets the foreground to various emerging disciplines as computational social science, complex systems, network science computational epidemiology/linguistics etc.

LEARNING OBJECTIVE:

The students will learn to develop an interdisciplinary approach for data science. The session will incorporate computational techniques to analyze and visualize different types of social and economic data, capture meaningful patterns and undergoing dynamics through different means and thereby facilitating policy recommendation using data science approach.

COURSE-LEVEL LEARNING OUTCOME

The following is a list of course-level learning outcomes.

- * understanding of core concepts and techniques
- * understanding of programming skill and handling of various mathematical, logical and matrix operations
- * ability to analyse and interpret empirical results

REQUIRED BACKGROUND AND PREREQUISITE KNOWLEDGE

The required concepts and skills will be taken care of as the class would be a mix of theory, programming skill and data science approaches.

REFERENCE BOOKS:

The following books might be useful for extending the understanding of the topics covered in class:

- Gries, P., Campbell, J., & Montojo, J. (2017). Practical programming: an introduction to computer science using Python 3.6. Pragmatic Bookshelf.
- Barrow, M. (2009). Statistics for economics, accounting and business studies. Pearson Education.
- Caldarelli, G., & Chessa, A. (2016). Data science and complex networks: real cases studies with Python. Oxford University Press.
- Boschetti, A., & Massaron, L. (2015). Python data science essentials. Packt Publishing Ltd.

ASSESSMENT:

Evaluation is comprised of two components: internal (70%) and external (30%) assessments.

ASSESSMENT 1: 20%

ASSESSMENT 3 OR END TERM EXAM: 30%

ASSESSMENT 2[A+B]: 50%

ASSIGNMENTS:

Assignment(s)/Quiz/Test or Viva will be conducted to assess the grasp and map the progress of the knowledge dissemination with direct, indirect and inverted question(s) having a variety of nature(objective, explanatory and application based) that must be submitted as per the deadlines and guidelines provided. For some of it collaboration can be taken into consideration while working on these assignments but must in all cases turn to originality and quality of work. **NOTES AND CONSTRAINTS**

- ☞ Concepts are being built through the materials and discussion each passing day, hence active participation is expected.
- ☞ Sometimes for proper knowledge dissemination, the process of developing the concept(s) and connection(s) may appear slow, hence patience is expected.

ATTENDANCE POLICY:

As per University policy.

ACADEMIC INTEGRITY

Academic Honesty, Cheating, AI and Plagiarism: As per University policy.

TENTATIVE COURSE CONTENT

Week	Topics
1	Introduction: Overview & Theory, Motivation: Tragedy of Commons
2	Shell, Ipython, Jupyter, Anaconda
3	Variable Types, Data, numerical manipulations
4	Data, Built in Operators, String Operations and Manipulations, Loops and Introducing Matrices, Introduction to numpy, Basics and Computation
5	Assignments/Assessment
6	Advanced topics in numpy, vectorized computation, arrays, use of functions
7	Introducing matplotlib
8	Visualisation, Advances in matplotlib
9	Assignments/Assessment
10	Introduction to pandas, Operating with data using pandas
11	Advances in pandas, combining datasets, handling missing data
12	Data wrangling and manipulations
13	Data analysis and mathematical operations, statistical observations, visualisations
14	Spatial data analysis, Web Scraping, Combination of concepts and implementing on real data, working with financial time series and usage of seaborn, data file with multiple variables
15	Assessment

NOTE: The above scheme is tentative and subject to change and modifications due to the requirements of the class. Also, the indicated timeline may be moved backward or forward depending on class pace and progress.