

University of North Carolina at Greensboro		
Department of Computer Science		
CSC105: Data, Computing, and Quantitative Reasoning		
Syllabus and Schedule		
Date	Submission/Exam Dates	Lecture Content
Wednesday, May 8		<b>Class 1: Introduction to Python and Jupyter Notebooks</b> Introduction to Python programming language. Overview of Jupyter Notebooks. Basic operations in Python: arithmetic, variables, and data types. Writing and executing simple Python code in Jupyter Notebook.
Thursday, May 9		<b>Class 2: Python Libraries for Data Analysis</b> Introduction to libraries: pandas, numpy, and matplotlib. Installing libraries using pip or conda. Importing and exploring datasets using pandas. Basic data manipulation techniques: filtering, selecting, and sorting data.
Monday, May 13		<b>Class 3: Introduction to Simple Statistical Analysis</b> Overview of basic statistical concepts: mean, median, mode, variance, and standard deviation. Calculating descriptive statistics using pandas and NumPy. Understanding correlation: Pearson correlation coefficient. Hands-on project: Analyzing a dataset using simple statistical analysis techniques and visualizing the results.
Tuesday, May 14	<b>Due Assignment 1 (10%)</b>	<b>Class 4: Data Cleaning and Preparation</b> Understanding the structure of messy datasets. Identifying and handling missing data using pandas. Data cleaning techniques: removing duplicates, handling outliers. Data transformation: converting data types, encoding categorical variables.
Wednesday, May 15		<b>Class 5: Exploratory Data Analysis (EDA) Part 1</b> Introduction to Exploratory Data Analysis (EDA). Descriptive statistics: mean, median, mode, variance, and standard deviation. Visualizing data distributions using histograms and box plots. Analyzing relationships between variables with scatter plots.
Thursday, May 16		<b>Class 6: Exploratory Data Analysis (EDA) Part 2</b> Correlation analysis: Pearson correlation coefficient. Visualizing correlations using heatmaps. Exploring categorical variables: frequency tables and bar plots. Analyzing time series data: trends, seasonality, and autocorrelation.
Monday, May 20		<b>Class 7: Grouping and Aggregating Data</b> Grouping data using pandas: groupby function. Aggregating data: calculating summary statistics for groups. Multi-level indexing in pandas. Advanced grouping techniques: transformation and filtering.

Tuesday, May 21	Due Assignment 2 (10%)	<b>Class 8: Data Visualization with Matplotlib Part 1</b> Introduction to data visualization principles. Basic plotting techniques with Matplotlib: line plots, scatter plots, and bar plots. Customizing plot appearance: labels, titles, colors, and styles. Saving plots as image files.
Wednesday, May 22		<b>Class 9: Data Visualization with Matplotlib Part 2</b> Plotting categorical data: pie charts and stacked bar plots. Visualizing distributions: kernel density estimation (KDE) plots. Creating multi-panel plots using subplots. Adding annotations and text to plots.
Thursday, May 23		<b>Class 10: Intermediate Data Manipulation Techniques</b> Review of basic data manipulation techniques covered in previous classes. Handling missing data: using fillna() and interpolate() methods. Introduction to string operations: string manipulation using str methods in pandas. Applying functions to data: using apply(), applymap(), and map() methods. Introduction to data transformation with pandas: pivot, melt, and stack/unstack operations.
Monday, May 27	Due Assignment 3 (10%)	<b>Class 11: Case Study: Real-world Data Analysis</b> Applying the concepts learned to analyze a real-world dataset. Importing and cleaning the dataset. Conducting exploratory data analysis. Creating insightful visualizations to communicate findings.
Tuesday, May 28		<b>Class 12: Review and Midterm Assessment</b> Review of concepts covered in the first half of the course. Midterm assessment: quiz or assignment covering Python fundamentals, data manipulation, and visualization techniques.
Wednesday, May 29	Midterm Project (20%)	
Thursday, May 30		<b>Class 13: Introduction to Data Wrangling</b> Understanding the importance of data wrangling in the data analysis process. Basic data cleaning techniques: handling missing values, removing duplicates. Data transformation basics: converting data types, renaming columns. Hands-on project: Cleaning and preparing a small dataset with missing values and duplicates.
Monday, June 3		<b>Class 14: Exploring Data Integration</b> Introduction to data integration: combining datasets using concatenation and merging. Concatenating dataframes vertically and horizontally. Merging datasets using different join types: inner, outer, left, and right joins. Hands-on project: Combining multiple datasets to analyze a common theme or question.
Tuesday, June 4	Due Assignment 4 (10%)	<b>Class 15: Understanding Data Transformation</b> Introduction to data transformation techniques in pandas. Using the apply() function to apply transformations row-wise or column-wise. Applying custom functions to manipulate data. Hands-on project: Applying various transformations to a dataset to prepare it for analysis.
Wednesday, June 5		<b>Class 16: Exploring Advanced Visualization with Seaborn</b> Introduction to Seaborn library for statistical data visualization. Visualizing distributions with Seaborn: histograms, KDE plots. Plotting categorical data: box plots, violin plots, swarm plots. Hands-on project: Using Seaborn to create more advanced visualizations for data exploration.

Thursday, June 6		<b>Class 17: Introduction to NumPy</b> Overview of NumPy library for numerical computing in Python. Understanding NumPy arrays: creation, indexing, and slicing. Basic array operations: element-wise arithmetic, aggregation functions. Hands-on project: Performing basic numerical computations and operations using NumPy arrays.
Monday, June 10		<b>Class 18: Data Manipulation with NumPy</b> Using NumPy arrays for data manipulation: reshaping, stacking, and splitting arrays. Broadcasting: understanding how NumPy handles operations on arrays with different shapes. Working with random numbers and generating random data with NumPy. Hands-on project: Applying NumPy operations to manipulate and analyze datasets.
Tuesday, June 11	<b>Due Assignment 5 (10%)</b>	<b>Class 19: Review and Final Assessment</b> Review of concepts covered in the second half of the course. Final assessment: quiz or assignment covering data integration, wrangling, transformation techniques; advanced visualizations using Seaborn
Wednesday, June 12	<b>Final Project (30%)</b>	