Course Description	
COURSE NUMBER and NAME	PRG 330 Python Programming with Data
UNITS	3
LENGTH OF CLASS	8 Weeks
COURSE DESCRIPTION	This course introduces students to programming in Python with a focus on data manipulation, analysis, and visualization. It covers the basics of Python programming including syntax, data types, control structures, and functions, as well as advanced topics such as libraries for data manipulation (Pandas), data visualization (Matplotlib, Seaborn), and machine learning (scikit-learn). By the end of the course, students will be able to develop Python applications to handle data-related tasks efficiently.
REQUIRED TEXT	McKinney, Wes. (2017). Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython (2nd ed.). O'Reilly Media. Print ISBN: 978-1491957660
INSTRUCTIONAL METHOD	Online / On-Campus

Summary of Graded Work and Assessments

Course assignments afford students the opportunity to demonstrate the degree to which they have mastered CLOs. The table below lists the assignments in this course, their value, and the specific CLOs aligned with each one.

Assignments	Totals	Weight	CLOs
Engagement and Professionalism (Rubric) including live class activities.	55	5.5%	1, 2, 3, 4, 5
Week 1: Discussion Board	40	4%	1
Week 1: Basic Python Syntax and Constructs	75	7.5%	1
Week 2: Discussion Board	40	4%	2
Week 2:Data Manipulation with Pandas	75	7.5%	2

Assignments	Totals	Weight	CLOs
Week 3: Discussion Board	40	4%	3
Week 3: Data Visualization	75	7.5%	3
Week 4: Discussion Board	40	4%	4
Week 4: Machine Learning Basics	75	7.5%	4
Week 5: Discussion Board	40	4%	5
Week 5: Data Cleaning and Preprocessing	75	7.5%	5
Week 6: Discussion Board	40	4%	6
Week 6: Debugging and Testing	75	7.5%	6
Week 7: Discussion Board	40	4%	7
Week 7: Performance	75	7.5%	7
Week 8: Discussion Board	40	4%	8
Week 8: Comprehensive Data Project	100	10.0	1-9
Total Points/Percentage	**1000 Points**	**100%**	

Course Policies

For Westcliff's course policies, please see the Course Policies document.

Discussion Requirements

For all discussions, the primary response is due by Wednesday at 11:59 p.m. Pacific Time. The primary response must be at least 200 words in length and fully address the topic, demonstrating critical thinking and creativity. Each student must then also post a minimum of two responses to other students in the discussion by Saturday night at 11:59 p.m. Pacific Time. Each peer response must be at least 50 words in length and substantively engage with the other student's original post, continuing the discussion in a professional manner. If at any time information or material is brought in from an outside source or website, it must be properly cited following APA 7th edition guidelines, and a full reference must be provided.

Assignment Requirements

Each assignment deliverable is specifically defined in the assignment instructions, such as page length, citations and references, audio or video, presentations, tables, etc. For all written assignments, the required page length does not include the cover or references pages. Refer to the specific requirements as stated in each assignment, and reach out to your instructor for

additional information as needed. All graded submissions are due by Sunday at 11:59 p.m. Pacific Time.

All written work must adhere to APA 7th edition academic formatting requirements including core components such as the cover page, page numbers, headings, citations, 1" margins, paragraph indentations, left alignment, double spacing throughout, and the final references using hanging indents.

Participation Requirements

Students are required to attend each live class session either in person or virtually as stipulated in the course policies. Participation in the live class session is determined by actively engaging, answering or asking questions, providing comments, interacting in group activities, etc., as required by the instructor. Students who are unable to attend the live in-class or virtual sessions must follow the Virtual Class Session (VCS) submission requirements as stated in the Course Policies document.

Writing Center

The Westcliff University Writing Center is dedicated to providing quality support to students and faculty. From assignment review, to in-class workshops, to dissertation support, to publication help, the Writing Center is committed to empowering individuals to use the written language to articulate and disseminate knowledge.

Course Learning Outcomes (CLOs)

Learning outcomes are statements that describe significant and essential scholarship that students achieve and can reliably demonstrate by the end of the course. Learning outcomes identify what the learner will know and be able to do by the end of a course – the essential and enduring knowledge, abilities (skills), and attitudes (values, dispositions) that constitute the integrated learning needed for successful completion of this course. The learning outcomes for this course summarize what students can expect to learn, and how this course is tied directly to the educational outcomes of the degree.

Course Learning Outcomes (CLOs)	Program Learning Outcomes
1. Understand and apply basic Python syntax and programming constructs	6
2. Develop Python applications for data manipulation.	4
3. Create data visualization.	4
4. Implement machine learning algorithms.	6

Course Learning Outcomes (CLOs)	**Program Learning Outcomes**
5. Perform data cleaning and preprocessing for analysis	4
6. Debug and test python application effectively.	6
7. Analyze the performance and efficiency of Python data applications	3
8. Implement best practices in Python programming for data security and maintainability.	3
9. Develop end-to-end data projects integrating multiple libraries and frameworks.	6

Detailed Course Outline

The following outline provides important assignment details for this course, unit by unit. Students are responsible for all of the assignments given. Please refer to the Detailed Description of Each Grading Criteria in the syllabus for specific information about each assignment.

Week 1

Assignments to complete this week:

- Reading:
    - Chapter 1: "Introducing Python" (Pages 1-30)
    - Chapter 2: "Python Basics" (Pages 31-60)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Basic Python Syntax and Constructs

Week 1 Live Class Activity -

This live class activity will be with the entire peer group. In your class activity you will be provided an employee's dataset (EMPLOYEES DATASET). Using this data set you will conduct the following:

- Install Acaconda
- Create and navigate Jupyter Notebooks
- Investigate basic notebook operations including the following:
    - Creating cells
    - Utilizing markdown basics
    - Implementing code execution
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric)– CLO 1

Consider the ideas examined this week and outlined in your assigned readings. Discuss the importance of learning the basic syntax and constructs of Python. How do these fundamentals contribute to more advanced programming concepts? Support your ideas with course readings. Share your ideas with your peers and respond to others in the discussion.

Assignment (Rubric) – CLO 1

For this assignment students will be using Jupyter Notebook. Using Jupyter Notebook, students will write a program that outputs "Hello, World!" to the console. Use comments to explain each part of your code. Please take a screenshot of your console, and save as PDF or Word.doc. Submit to GAP.

Week 2

Assignments to complete this week:

- Reading:
  - Chapter 3: "Data Structures" (Pages 61-90)
  - Chapter 4: "Data Manipulation with Pandas" (Pages 91-120)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Data Manipulation with Pandas

Week 2 Live Class Activity-

This live class activity will be with the entire peer group. In your class activity you will be provided Global EV Data 2024t (GLOBAL EV DATASET). Using this data you will conduct the following:

- Access the provided dataset
- Install Jupyter
- Write simple Python scripts in Jupyter
- Complete exercises on variables, data types, and control structures
- Conduct data manipulation with Pandas
- Conduct basic data analysis tasks
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric)– CLO 2

Consider the ideas examined this week and outlined in your assigned readings. Explain how data manipulation techniques in Pandas can streamline data analysis processes. Provide examples of common operations and their applications. Share your ideas with your peers and respond to others in this discussion.

Assignment (Rubric)– CLO 2

For this assignment students will be using Python. Create a Python program that reads data from a CSV file into a Pandas DataFrame, performs basic data manipulation operations (such as filtering, grouping, and aggregating), and outputs the results. Use comments to explain each part of the process. Please take a screenshot of your work and save as a PDF or Word.doc. Submit to GAP.

Week 3

Assignments to complete this week:

- Reading:
  - Chapter 5: "Introduction to Matplotlib" (Pages 121-150)
  - Chapter 6: "Advanced Visualization with Seaborn" (Pages 151-180)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Data Visualization

Week 3 Live Class Activity-

This live class activity will be with the entire peer group. In your class activity you will be provided 3 top 120 best-selling mobile datasets (MOBILE DATASET). Using this data you will conduct the following:

- Access the provided dataset
- Install Seaborn
- Create visualizations with Seaborn
- Customize visualizations with Seaborn
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric)– CLO 3

Consider the ideas examined this week and outlined in your assigned reading. Discuss the role of data visualization in data analysis. How do Matplotlib and Seaborn facilitate the creation of effective visualizations? Provide examples Share your ideas with your peers and respond to others in this discussion.

Assignment – (Rubric)- CLO 3

Develop a Python program that uses Matplotlib and Seaborn to create various types of data visualizations. Visualizations may include, but are not limited to line plots, bar charts, and heatmaps from a given dataset. Use comments to explain each part of the process. Please take a screenshot of your work and save as a PDF or Word.doc. Submit to GAP.

Week 4

Assignments to complete this week:

- Reading:
  - Chapter 7: "Machine Learning Basics" (Pages 181-210)
  - Chapter 8: "Supervised Learning" (Pages 211-240)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Machine Learning Basics

Week 4 Live Class Activity -

This live class activity will be with the entire peer group. In your class activity you will be provided with a tiktok dataset (TICTOK DATASET). Using this data you will conduct the following:

- Access the provided dataset
- Implement a Simple Linear Regression
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric)– CLO 4

Consider the ideas examined this week and outlined in your assigned reading.Discuss the basics of machine learning and its significance in data analysis. What are the key differences between supervised and unsupervised learning? Provide examples Share your ideas with your peers and respond to others in this discussion.

Assignment – (Rubric) - CLO 4

Implement a basic machine learning model using scikit-learn. Use a dataset to train the model and evaluate its performance. Document the process and results. Use comments to explain each part of the process. Please take a screenshot of your work and save as a PDF or Word.doc. Submit to GAP.

Week 5

Assignments to complete this week:

- Reading:
  - Chapter 9: "Data Cleaning Techniques" (Pages 241-270)
  - Chapter 10: "Preprocessing Data" (Pages 271-300)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Data Cleaning and Preprocessing

Week 5 Live Class Activity -

This live class activity will be with the entire peer group. In your class activity you will be provided 3 top 120 best-selling mobile data sets (AIRBNB DATASET). Using this data you will conduct the following:

- Access the provided dataset
- Apply data cleaning techniques
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric)– CLO 5

Consider the ideas examined this week and outlined in your assigned reading.Describe the importance of data cleaning and preprocessing in data analysis. What are some common techniques used in Python for these tasks? Provide examples Share your ideas with your peers and respond to others in this discussion.

Assignment – (Rubric) - CLO 5

Write a Python program that performs data cleaning and preprocessing on a raw dataset. Include operations such as handling missing values, encoding categorical variables, and normalizing numerical features. Use comments to explain each part of the process. Please take a screenshot of your work and save as a PDF or Word.doc. Submit to GAP.

Week 6

Assignments to complete this week:

- Reading:
  - Chapter 11: "Debugging Python Code" (Pages 301-330)
  - Chapter 12: "Testing Python Applications" (Pages 331-360)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Debugging and Testing

Week 6 Live Class Activity -

This live class activity will be with the entire peer group. In your class activity you will be provided the House Price Prediction Machine Learning dataset (HOUSE PRICE PREDICTION DATASET). Using this data you will conduct the following:

- Access the provided dataset
- Conduct debugging in Jupyter Notebook
- Conduct testing in Jupyter Notebook
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric)– CLO 6

Consider the ideas examined this week and outlined in your assigned reading. Discuss the importance of debugging and testing in software development. How can effective debugging and testing improve the reliability of Python applications? Provide examples Share your ideas with your peers and respond to others in this discussion.

Assignment – (Rubric) - CLO 6

Develop a Python program that reads from a text file and writes to another text file. Include exception handling to manage potential file errors. Additionally, write unit tests to ensure the functionality of your program. Use comments to explain each part of the process. Please take a screenshot of your work and save as a PDF or Word.doc. Submit to GAP.

Week 7

Assignments to complete this week:

- Reading:
  - Chapter 13: "Performance Tuning" (Pages 361-390)
  - Chapter 14: "Optimizing Python Code" (Pages 391-420)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Performance Analysis

Week 7 Live Class Activity -

This live class activity will be with the entire peer group. In your class activity you will be provided the Binance BTCUSDT 2024 minute dataset (BINANCE BTCUSDT DATASET). Using this data you will conduct the following:

- Access the provided dataset
- Create various types of plots with Matplotlib
- Enhance visualizations with labels, titles, and legends
- Summarize your experience using these. Consider ease of use, intuitive applications, and ease of navigation. Provide a brief summary to the live class.

Discussion Question (Rubric) – CLO 7

Consider the ideas examined this week and outlined in your assigned reading.Explore the significance of performance analysis and optimization in Python programming. What are some techniques to enhance the efficiency of Python code? Provide examples Share your ideas with your peers and respond to others in this discussion.

Assignment – (Rubric) - CLO 7

Create a Python program that analyzes the performance of a given algorithm. Use profiling tools to identify bottlenecks and optimize the code for better performance. Use comments to explain each part of the process. Please take a screenshot of your work and save as a PDF or Word.doc. Submit to GAP.

Week 8

Assignments to complete this week:

- Reading:
    - Chapter 15: "End-to-End Data Projects" (Pages 421-450)

Assignments Due:

- Post DQ Initial Response
- Post 2 DQ Peer Responses
- Submit Assignment: Comprehensive Data Project (including a written report, 5-7 pages, APA 7th Edition Style)

Discussion Question (Rubric)– CLO 8

Consider the ideas examined this week and outlined in your assigned reading.Reflect on the knowledge and skills gained throughout the course. How can you apply these concepts in real-world programming projects? Provide examples Share your ideas with your peers and respond to others in this discussion.

Assignment – (Rubric)- CLO1, CLO2, CLO3, CLO4, CLO5, CLO6, CLO7, CLO8, CLO9

Develop a complete Python application that incorporates the concepts learned throughout the course. This project should include data manipulation, visualization, machine learning, and file I/O operations. Provide a written report documenting your design, implementation, and testing process (5-7 pages, APA 7th Edition Style).