UNIVERSITY OF GUAM
COLLEGE OF NATURAL & APPLIED SCIENCES

MA 510 Python for Data Science (2 credits)

Section Information
Section: MA510-01
Course Delivery Mode: Face-to-Face
Course Schedule Days/Times: Friday / 4:00pm – 5:50pm
Location/Room: TBA

Instructor Information
Name: Byoungyong Lee
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Office: WB Room #4
Office Hours: TBA
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CATALOG DESCRIPTION

In this course, students will learn the basic syntax and data structures of the Python language required for Data Science, and how to utilize Numpy and Pandas for data analysis and statistical processing.
Additionally, students will learn basic SQL for manipulating data in databases.

COURSE TOPIC SCHEDULE

Students will learn a comprehensive set of Python programming through lessons, demonstrations, and homework assignments.

- Python Data Types
- Loops and IF Statements
- Design with Functions
- Lists, Tuples, and Dictionaries
- Strings and Text Files
- Numpy Basics
- Getting Started with Pandas
- Plotting and Visualization
- Structured Query Language (SQL) in Database

STUDENT LEARNING OUTCOMES

Course SLOs:	**Program Learning Outcomes (PLOs)**	**University Graduate Learning Outcomes (IGLOs)**	**Method of Assessment**
Understand the syntax and structure of Python programs	PR-2	IGLO-1 IGLO-2	Homework Exam

Utilize data structures such as Lists, Tuples, and Dictionaries	PR-2	IGLO-1 IGLO-2	Homework Exam
Conduct data analysis using the Numpy and Pandas	PR-2	IGLO-1 IGLO-2	Presentation & Project, Exam
Create plots and visualizations for data analysis	PR-3 PR-5	IGLO-1 IGLO-2	Presentation & Project, Exam
Retrieve data from a database using SQL	PR-3, PR-5	IGLO-1 IGLO-2	Homework Exam

MS in Data Science Program Learning Outcomes (PLOs)

PR-1 Design and execute statistical experiments and hypothesis tests to extract meaningful insights from data.
PR-2 Analyze and interpret complex statistical data using advanced statistical methodologies and tools.
PR-3 Visualize data for exploration, analysis, and communication.
PR-4 Develop and implement predictive models and machine learning algorithms to make data-driven decisions.
PR-5 Communicate statistical analyses, findings, and recommendations to both technical and non-technical audiences effectively.
PR-6 Collaborate with interdisciplinary teams to design, implement, and evaluate statistical projects.

Institutional Graduate Learning Outcomes (IGLOs)

IGLO-1: Demonstrate mastery of critical skills, theories, methodologies, and other content knowledge at a level that will enable them to address fundamental questions in their primary area of study;
IGLO-2: Plan, conduct, and complete significant research or creative project;
IGLO-3: Exercise oral and written communication skills sufficient to publish and present work in their field;
IGLO-4: Adhere to the ethical principles of academia and their respective disciplines in coursework, fieldwork, and other appropriate situations; and
IGLO-5: Exemplify, through service, the value of their discipline to the academy and the community at large, interacting productively and professionally with people from diverse backgrounds.

COURSE REQUIREMENTS

- Software: Colab (Cloud-based Jupyter Notebook environment provided by Google)
- Recommended Textbooks:
  - *Python for Data Analysis 3rd Edition.* 2022. Wes McKinney. O'REILLY.
  - *Fundamentals of Python First Programs 2nd Edition. 2019*. Kenneth A. Lambert, CENGAGE.

Access Statement

"Students must have access to a computer daily. The computer should have access to general software applications for word processing software, electronic spreadsheets, graphic presentation, video viewing software, the recommended web browser and a reliable internet connection. The student must be able to navigate the Learning Management System site, upload and download materials, participate in assigned online activities, and follow generally accepted online etiquette." (direct statement from: UOG, 2022, Log No. 6771 "Faculty Guide for Developing Course Syllabus for Traditional and Online Learning Delivered Courses", p. 6).

GRADING INFORMATION

Course Grade Scale (Letter to Percent Range)

A+	98-100%
A	93-97%

A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	70-76%
D	60-69%
F	<60%

UW: Unofficial withdrawal assigned by Registrar—Student stopped attending classes and did not submit/file required documents.
W: Withdrawal assigned by Registrar—Student stopped attending classes and submits/files required documents.

GRADE CATEGORIES: ASSIGNMENTS AND PERCENTAGES

Assessments/Assignments and Grade Percentage

1. Homework 20%
2. Programming Project 20%
3. Presentation 15%
4. Midterm Exam 20%
5. Final Exam 25%

COURSE CALENDAR

Week 1: Introduction to Python and Programming Basics
- Topics: Overview of Python, installation, Python IDEs, basic syntax, variables, and operators.
- Activities: Simple programs to practice syntax and familiarize with the environment.
- Homework: Create a program to calculate the area of a rectangle using user input.
  Targeted SLO: Understand the syntax and structure of Python programs.

Week 2: Python Data Types
- Topics: Data types (int, float, string, boolean), type conversion, input/output functions.
- Activities: Identify data types of different values and convert between types.
- Homework: Write a program to solve a real-world problem using different data types.
  Targeted SLO: Utilize data structures such as Lists, Tuples, and Dictionaries.

Week 3: Loops and IF Statements
- Topics: For loops, while loops, nested loops, IF-ELSE statements.
- Activities: Create programs using loops for repetitive tasks.
- Homework: Implement a program that identifies prime numbers within a given range.
  Targeted SLO: Understand the syntax and structure of Python programs.

Week 4: Functions and Design
- Topics: Function syntax, parameters, return values, and scope.
- Activities: Develop reusable functions for common data science tasks.
- Homework: Write a function to compute the factorial of a number.
  Targeted SLO: Understand the syntax and structure of Python programs.

Week 5: Lists, Tuples, and Dictionaries
- Topics: List indexing, slicing, operations, and comprehensions; tuples and dictionaries.
- Activities: Use dictionaries to store and manipulate real-world data like a student database.
- Homework: Write a program to find and display the frequency of words in a text.
  Targeted SLO: Utilize data structures such as Lists, Tuples, and Dictionaries.

Week 6: Strings and Text Files
- Topics: String operations, text parsing, reading/writing files.
- Activities: Process text files and extract specific information (e.g., log files).
- Homework: Write a program to count lines, words, and characters in a text file.
  Targeted SLO: Understand the syntax and structure of Python programs.

Week 7: Numpy Basics
- Topics: Creating arrays, array indexing, slicing, and mathematical operations.
- Activities: Use Numpy for basic linear algebra (matrix operations).
- Homework: Implement a program to compute the dot product of two matrices.
  Targeted SLO: Conduct data analysis using Numpy and Pandas.

Week 8: Advanced Numpy Operations
- Topics: Broadcasting, statistical functions, random number generation.
- Activities: Generate synthetic datasets for analysis.
- Homework: Perform basic statistical analysis (mean, median, standard deviation) on a dataset.
  Targeted SLO: Conduct data analysis using Numpy and Pandas.

Week 9: Getting Started with Pandas
- Topics: Creating DataFrames, importing/exporting datasets, indexing, and filtering data.
- Activities: Load and analyze a small CSV dataset.
- Homework: Write a program to clean and preprocess a dataset.
  Targeted SLO: Conduct data analysis using Numpy and Pandas.

Week 10: Data Manipulation with Pandas
- Topics: Grouping, merging, and reshaping data in Pandas.
- Activities: Use Pandas to calculate group-level statistics.
- Homework: Write a program to merge two datasets and perform group-based analysis.
  Targeted SLO: Conduct data analysis using Numpy and Pandas.

Week 11: Plotting and Visualization
- Topics: Introduction to Matplotlib and Seaborn for visualization.
- Activities: Create scatterplots, histograms, and bar charts.
- Homework: Visualize relationships in a dataset (e.g., correlation between variables).
  Targeted SLO: Create plots and visualizations for data analysis.

Week 12: Advanced Visualization Techniques
- Topics: Customizing plots, multi-plot layouts, saving figures.
- Activities: Create advanced plots for presentation.
- Homework: Develop a dashboard-like visualization with multiple related plots.
  Targeted SLO: Create plots and visualizations for data analysis.

Week 13: Introduction to SQL
- Topics: Basics of SQL, SELECT statements, WHERE clauses, and basic operations.
- Activities: Use SQLite or a cloud-based SQL service to run basic queries.
- Homework: Retrieve specific data from a database (e.g., employees earning above a threshold).
  Targeted SLO: Retrieve data from a database using SQL.

Week 14: Advanced SQL Queries
- Topics: Joins, subqueries, aggregations, and updates.
- Activities: Query a real-world database to extract insights.
- Homework: Write queries to summarize data from multiple tables (e.g., sales and products).
  Targeted SLO: Retrieve data from a database using SQL.

Week 15: Integration of Python and SQL
- Topics: Using Python to interact with databases (e.g., SQLAlchemy, SQLite).
- Activities: Combine Python and SQL for a mini data analysis project.
- Homework/Final Project: Build a Python application that retrieves, processes, and visualizes data from a database.
  Targeted SLO: Retrieve data from a database using SQL; Conduct data analysis using Numpy and Pandas; Create plots and visualizations for data analysis.

COURSE, PROGRAM, AND UNIVERSITY POLICIES AND OTHER INFORMATION

No Unauthorized Recording

Only the instructor may record class sessions. Unauthorized recording of online class meetings is not allowed, to include screen shots that include identifiable information of any person in the session. Not only is the delivery of course content the intellectual property of the instructor, but students enrolled in the course have privacy rights. Unauthorized recording and distribution of online courses may violate federal law.

Netiquette:

Remember your "netiquette," or network etiquette. Although you may traditionally interact informally with friends and family when you are online, it is important to note that this is a classroom environment and students must adhere to high standards of academic behavior. This classroom is a safe haven for all ideas. We are all unique individuals entitled to our own opinions and beliefs. Any comments, jokes, or remarks that denigrate the worth of an individual's physical/mental ability, body size, religion, race, creed, ethnic background, sexual preference, or gender are inappropriate and will not be tolerated.

a. Do not say things in an email or forum post that you would not say face to face.
b. Be polite, concise, and remember that all-caps signify yelling.
c. Do not send forwards to the class list or to the professor.
d. Proofread. Please avoid texting language, lack of punctuation, capitalization, or inappropriate signatures.
e. Emojis should not be used in graded assignments. You are welcome to use them in informal writing.

EEO and ADA Statement

Americans with Disabilities Act Amendments Act (ADAAA) Accommodation Services

The University is committed to providing an inclusive and welcoming environment for all members of our community free of all forms of discrimination and harassment in all programs, activities, and employment practices as required by Title VII and Title IX and other applicable statutes and policies. If you experience harassment or discrimination, report it immediately to the Director of EEO/ADA & TITLE IX Office, at 671-735-2244, 671-735-2971, 671-735-2244 (TTY) or eeo-ada@triton.uog.edu. For immediate assistance in an emergency call 911.

For individuals covered under the ADA (Americans with Disabilities Act), if you are a student with a disability requiring academic accommodation(s), please contact the Student Counseling and Advising Service Accommodations Office to discuss your confidential request. Please provide an accommodation letter from the Disability Support Services Student Counseling and Advising Service Accommodation counselor. To register for academic accommodations, please contact or visit the School of Education, Room #110, disabilitysupport@triton.uog.edu , or telephone/(TTY) 671-735-2460.

For applicants or employees with a disability requiring employment or workplace accommodation(s), please contact the Director of EEO/ADA & TITLE IX Office to discuss your specific needs. Please provide documentation concerning your disability and the need for employment or workplace accommodation. Our office is located at the Lya Hami Hall, Dorm 2, right side entrance, first floor, Room #104, and our contact numbers are 671-735-2244, 671-735-2971, 671-735-2244 (TTY).

Student Evaluation of Faculty Information

The student course and faculty evaluations for courses will be administered at the completion of the semester within CollegeNet. Student participation is essential and appreciated. Student responses are anonymous and cannot be traced back to individual students. You will need your WebAdvisor login credentials to complete the evaluation. If you experience login issues, please refer inquiries to OIT staff to assist at 735-2630/40.

Plagiarism Statement

Academic dishonesty cannot be condoned by the University. Such dishonesty includes cheating and plagiarism (examples of which are given below), which violate the Student Conduct Code and could result in expulsion from the University.

Cheating includes but is not limited to giving unauthorized help during an examination, obtaining unauthorized information about an examination before it is administered, using inappropriate sources of information during an examination, altering the record of any grades, altering answers after an examination has been submitted, falsifying any official University record, and misrepresenting the facts in order to obtain exemptions from course requirements.

Plagiarism includes but is not limited to submitting any document, to satisfy an academic requirement, that has been copied in whole or part from another individual's work without identifying that individual; neglecting to identify as a quotation a documented idea that has not been assimilated into the student's language and style, or paraphrasing a passage so closely that the reader is misled as to the source; submitting the same written or oral material in more than one course without obtaining authorization from the instructors involved; or dry-labbing, which includes (a) obtaining and using experimental data from other students without the express consent of the instructor, (b) utilizing experimental data and laboratory write-ups from other sections of the course or from previous terms during which the course was conducted, and (c) fabricating data to fit the expected results.

Communication Policy

University policy states that official communications will be sent using university assigned (@gotriton or @triton) email addresses. University electronic mail and messaging is to be used to enhance and facilitate teaching, learning, scholarly research, support academic experiences, and to facilitate the effective business and administrative processes of the University. (OIT policy manual, 3.10, p. 36)

Tobacco-Free and Smoke-Free Campus

The University of Guam has in place a Tobacco-Free Policy. Please read the policy at:
https://www.uog.edu/smoke-free-uog.php