

Python for Everyone Section 01

CS 22A

Fall 2023 3 Unit(s) 08/21/2023 to 12/06/2023 Modified 08/21/2023

Contact Information

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Course Description and Requisites

Introduction to Python programming in interesting, relevant, and practical contexts. Programming skills are developed to solve problems in such fields as social and life sciences, mathematics, and business. Fundamental programming constructs: data structures and algorithms, iterations, and functions. Course is intended for students who have no prior programming experience.

GE Area(s): B4. Mathematics/Quantitative Reasoning

Note(s): A grade of C- (1.7) or better is required to satisfy GE Area B4.

Corequisite(s): CS 1022AS required for Math Enrollment Categories M-III and M-IV.

Letter Graded

* Classroom Protocols

Students are expected to adhere to the Student Conduct Code found at the [SJSU Student Conduct website](http://www.sjsu.edu/studentconduct/) (<http://www.sjsu.edu/studentconduct/>). Additionally, students should regularly attend lectures and labs (if applicable), treat instructors and peers with respect.

- **Dual Role of WSQ 109:** Lecture/Lab WSQ 109 will be used as a dual-purpose room. It can be a regular lecture room, or it can be a computer laboratory for hands-on exercises.
- **Lecture Mode:** This is when WSQ 109 is used as a regular lecture room. Students are expected to listen and follow the lecture. Be considerate to your classmates and follow the lecture.
- **Lab Mode:** This is when WSQ 109 is used as a computer lab. Use your laptop computer. Work collaboratively on problems of the

Hands-On and share your ideas and solutions with your classmates.

- We shall alternate between the two modes. A typical class will begin with a lecture (Lecture Mode) followed by a hands-on (Lab Mode).
- Regular class attendance is highly recommended and strongly encouraged.
- Please arrive to class on time so that you benefit fully from the course experience and you do not disturb classmates and the instructor while class is in session.
- Students are responsible for knowing all materials covered in class lectures, readings, assignments, and other course-related work.
- Laptops, tablets, and other devices should only be used for course-related purposes.

Program Information

Welcome to this General Education course.

SJSU's General Education Program establishes a strong foundation of versatile skills, fosters curiosity about the world, promotes ethical judgment, and prepares students to engage and contribute responsibly and cooperatively in a multicultural, information-rich society. General education classes integrate areas of study and encourage progressively more complex and creative analysis, expression, and problem solving.

The General Education Program has three goals:

Goal 1: To develop students' core competencies for academic, personal, creative, and professional pursuits.

Goal 2: To enact the university's commitment to diversity, inclusion, and justice by ensuring that students have the knowledge and skills to serve and contribute to the well-being of local and global communities and the environment.

Goal 3: To offer students integrated, multidisciplinary, and innovative study in which they pose challenging questions, address complex issues, and develop cooperative and creative responses.

More information about the General Education Program Learning Outcomes (PLOs) can be found on the [GE website \(https://sjsu.edu/general-education/ge-requirements/overview/learning-outcomes.php\)](https://sjsu.edu/general-education/ge-requirements/overview/learning-outcomes.php).

Course Learning Outcomes (CLOs)

Program Learning Outcomes (PLO) for BS Data Science

Upon successful completion of this course, students will be able to:

PLO 1. Analyze a complex problem involving large datasets and apply principles of computing and other relevant disciplines to identify solutions.

Course Learning Outcomes (CLO)

Upon successful completion of this course, students will be able to:

CLO 1. Explain fundamental programming constructs such as assignments, sequential operations, iterations, conditionals, and defining functions in Python.

CLO 2. Use basic mathematical techniques for solving quantitative problems.

CLO 3. Apply fundamental programming construct and mathematical concepts in solving real-world problems.

CLO 4. Use Python libraries to explore and analyze data.

CLO 5. Interpret data visualization and summary statistics in the context of a particular problem.

GE Area B4: Mathematics/Quantitative Reasoning

Area B4 courses develop students' abilities to reason quantitatively, practice computational skills, and explain and apply mathematical and/or quantitative reasoning concepts to solve problems at the college level. Completion of Area B4 with a grade of C- or better is a CSU graduation requirement.

GE Area B4 Learning Outcomes

Upon successful completion of an Area B4 course, students should be able to:

1. use mathematical methods to solve quantitative problems, including those presented in verbal form;
2. interpret and communicate quantitative information using language appropriate to the context and intended audience;
3. reason, model, draw conclusions, and make decisions based on numerical and graphical data; and
4. apply mathematical or quantitative reasoning concepts to solve real life problems.

Writing Practice: Students will write a minimum of 500 words in a language and style appropriate to the discipline.

GE Area Learning Objective (ALOs)	When will this GE ALOs be assessed?
GE ALO 1: Use mathematical methods to solve quantitative problems, including those presented in verbal form.	Student will perform quantitative analysis in their term project using mathematical methods and present the results verbally to the class.
GE ALO 2: Interpret and communicate quantitative information using language appropriate to the context and intended audience	<p>Throughout the course, students will be focused on developing a range of abilities. These include effectively interpreting and conveying quantitative data using language that suits both the context and the intended recipients</p> <p>An example question from the midterm exam that meets GE ALO2: <i>Access the provided dataset containing movie ratings. Each record includes the movie title, genre, and user ratings. Examine the dataset to understand its structure and variables. Calculate summary statistics such as mean, median, and standard deviation of ratings for the entire dataset and for each genre. Create histograms or box plots to visualize the distribution of ratings within each genre. Use the visualization to compare and describe the distribution of ratings between the top-rated genre and the overall dataset.</i></p> <p><i>Word Count Estimate: 120</i></p>

<p>GE ALO 3: Reason, model, draw conclusions, and make decisions based on numerical and graphical data</p>	<p>This skill will be emphasized throughout the course.</p> <p>An example from the Final Exam that meets GE ALOs 1, 2 & 3: <i>Jane is trying to buy a house and is collecting housing data so that she can estimate the “cost” of the house according to the “Living area” of the house in feet.</i></p> <p><i>Using the given dataset, plot the data points in a scatter plot (Living Area on the x-axis and Price on the y-axis) and plot the regression line of the model in the same plot. Determine and print the slope, and the intercept of the regression line. Use the plot to answer the following question: Jane wants to purchase a 2,000 sq. feet house. How much is the estimated cost of the house?</i></p> <p><i>Explain how you come up with the answer.</i></p> <p><i>Write a Python program using the scikit-learn Python library to train a linear regression model for predicting the “cost” of the house based on the “Living area”. Evaluate the performance of the model using root mean squared error (RMSE) and the coefficient of determination (R^2 score).</i></p> <p><i>Word Count Estimate: 150</i></p>
<p>GE ALO 4: Apply mathematical or quantitative reasoning concepts to solve real life problems..</p>	<p>Students will learn multiple skills for solving real-life problems. This skill will be emphasized throughout the course.</p> <p>An example question from Midterm 1 that meets GE ALO4: <i>Given is the age dataset for the population of voters in the entire United States and a sample of voters in California. Use the scipy.stats Python library to conduct a one-sample t-test at a 95% confidence level and determine if it correctly rejects the null hypothesis that the California sample comes from the same distribution as the entire US population.</i></p> <p><i>Word Count Estimate: 120</i></p>
<p>Diversity requirement: Incorporate issues of diversity, equity, and inclusion (DEI).</p>	<p>Students will explore the connection between mathematics and social justice by using statistical methods to analyze DEI issues such as income inequality. Income inequality is a pressing societal issue, and mathematical tools can help us understand its dynamics and potential solutions.</p> <p>An example from hands-on assignment on performing hypothesis testing using t-test:</p> <p><i>Your task is to apply mathematical concepts to analyze real-world data related to income distribution, and then critically discuss the implications of your findings for social justice. Given the data set “Household income across United States by Race” from the US Census Bureau, determine if there is a statistically significant difference in the average household income between any two of the following groups: White/non-Hispanic, Black/African American, American Indian/Alaska Native, Asian, and Hispanic/Latino.</i></p> <p><i>Word Count Estimate: 100</i></p>

Required Texts/Readings

1. Click any zyBooks assignment link in Canvas

(Do not go to the zyBooks website and create a new account)

2. Subscribe. A subscription is \$64. You may begin subscribing on Aug 07, 2023 and the cutoff to subscribe is Dec 04, 2023. Subscriptions will last until Jan 03, 2024.

If you want to use your financial aid fund to pay for the subscription, please go to the SJSU bookstore to complete the purchase.

Pre-class Video Lessons

They can be accessed directly through Canvas. These are short videos (usually 1 to 3 minutes long) that present 1 to 2 ideas followed by a mini-quiz. These videos cover all the class topics.

Other technology requirements / equipment / material

Students will need either a personal laptop/desktop with Internet service or access to an on-campus computer lab. For the programming environment, we will be using [Google Colab \(https://colab.research.google.com/\)](https://colab.research.google.com/) with Chrome or any supported web browser.

Course Requirements and Assignments

The course will consist of pre-class video lectures, in-class lectures and hands-on exercises, homework, a term project, one midterm exam, and a final exam. All midterm and final exams are conducted in person.

Pre-class video lectures: Students should watch the assigned pre-class video lectures and complete the quizzes within the videos.

In-class hands-on exercises: After each lecture, students will be assigned a group partner to complete an in-class hands-on exercise during class, and it must be turned in through Canvas individually.

Homework: All homework will be completed online. The homework will reinforce and deepen the understanding of the content discussed in lecture, and also serve as preparation for the in-class midterm exams. No late assignments will be accepted. However, under exceptional circumstances, one problem set per student might be accepted late. It will need to be handed in before the following class meeting and will be graded with 30% off. Such an extension should be requested from the instructor.

Quizzes: Quizzes will be given during class to assess the level of understanding of the course materials.

Term Project: There will be a programming group project. Each group consists of two students. Information on the term project, including topics and deadlines, will be given later. The term project is due on the 15th week of the semester. Each group will give a 10-minute presentation (5 minutes per student).

Midterm Exam: There will be an in-class midterm exam. The midterm will be held in the 9th week of the semester. Success on the midterm exams will indicate a mastery of the associated materials. No make-up exams will be given unless proper documentation of an emergency is provided.

Final Examination: There will be a comprehensive final exam on a date and time to be determined.

Course Policies

Incomplete work: Points will be deducted for incomplete question responses and solutions that are partially functional. Consult individual assignments for details of point allocation for each problem.

Late assignments: No late homework will be accepted. However, under exceptional circumstances, one problem set per student might be accepted late. It will need to be handed in before the following class meeting and will be graded with 30% off. Such an extension should be requested from the instructor.

Makeup Exams: Makeup exams will only be given in cases of illness (documented by a doctor) or in cases of documentable, extreme

emergencies.

Academic Honesty: Students must only submit their own work for all quizzes, assignments, exams, and projects. Copying and any other form of cheating will not be tolerated and will result in a failing grade (F) for the course, as well as disciplinary consequences from the university.

✓ Grading Information

University Credit Hour Requirement

Success in this course is based on the expectation that you will spend, for each unit of credit, a minimum of 45 hours over the length of the course (normally three hours per unit per week) for instruction, preparation, and studying. Plan on spending at least 7 hours per week outside of lecture time engaging with the course material.

Grading Information for GE

For Fulfillment of Area B4: this course must be passed with a C- or better as a CSU graduation requirement.

Grading Information:

- Pre-class videos quizzes (10%)
- In-class hands-on exercises (20%)
- Homework (20%)
- Quizzes (10%)
- Term Project (20%)
- Midterm Exam (10%)
- Final Exam (10%)

Grade Scale:

Grade	Points
<i>A plus</i>	100 - 97.0
<i>A</i>	96.9 - 93
<i>A minus</i>	92.9 - 90.0
<i>B plus</i>	89.9 - 87.0
<i>B</i>	86.9 - 82.0
<i>B minus</i>	81.9 - 80.0
<i>C plus</i>	79.9 - 77.0
<i>C</i>	76.9 - 72.0
<i>C minus</i>	71.9 - 70.0
<i>D plus</i>	69.9 - 67.0
<i>D</i>	66.9 - 62.0
<i>D minus</i>	61.9 - 60.0
<i>F</i>	59.9 - lower

COVID-19 and Monkeypox Information

Updated CoS, SJSU, county, state and federal information and guidelines can be found on the [SJSU Health Advisories website \(https://www.sjsu.edu/healthadvisories\)](https://www.sjsu.edu/healthadvisories). By working together to follow these safety practices, we can keep our college safer.

University Policies

Per [University Policy S16-9 \(PDF\) \(http://www.sjsu.edu/senate/docs/S16-9.pdf\)](http://www.sjsu.edu/senate/docs/S16-9.pdf), relevant university policy concerning all courses, such as student responsibilities, academic integrity, accommodations, dropping and adding, consent for recording of class, etc. and available student services (e.g. learning assistance, counseling, and other resources) are listed on the [Syllabus Information \(https://www.sjsu.edu/curriculum/courses/syllabus-info.php\)](https://www.sjsu.edu/curriculum/courses/syllabus-info.php) web page. Make sure to visit this page to review and be aware of these university policies and resources.

Course Schedule

The course schedule is subject to change with fair notice. Changes will be announced on Canvas.

Week	Date	Topics
1	8/22, 8/24	Syllabus, Course Expectations, Introduction to Google Colab Introduction to Python Programming
2	8/29, 8/31	String manipulation Dictionaries, Lists, and Sets
3	9/5, 9/7	Introduction to Pandas Dataframe and Series Introduction to Statistical Research Process
4	9/12, 9/14	Central Tendency Measures of Variability
5	9/19, 9/21	Normal Distribution Standardized Scores
6	9/26, 9/28	Sampling Distribution Standard Error
7	10/3, 10/5	Loops Conditional Statement
8	10/10, 10/12	Estimation (Confidence Intervals) Margin of Error
9	10/17, 10/19	Midterm Review Midterm Exam

10	10/24, 10/26	Writing User-Defined Functions Hypothesis Testing
11	10/31, 11/2	Hypothesis Testing t-Tests to Compare Means
12	11/7, 11/9	t-Tests to Compare Means Discuss Midterm Results
13	11/14, 11/16	One-way ANOVA
14	11/21, 11/23	One-way ANOVA 11/23 - Thanksgiving Holiday - no class
15	11/28, 11/30	Correlation & Regression
16	12/5	Final Exam Review
	12/14	FINAL EXAM 7:15 - 9:30 AM