

# Python for Everyone Section 61

## CS 22A

Summer 2024 3 Unit(s) 06/03/2024 to 08/09/2024 Modified 06/03/2024

### Contact Information

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Office Hours	TBA ( <a href="https://calendly.com/tahereh-arabghalizi-sjsu-fall23">by appointment (https://calendly.com/tahereh-arabghalizi-sjsu-fall23)</a> ) - All questions should be asked during the office hours, unless they are short/simple questions.
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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):  $\frac{1}{2}$ CS 1022ASi;  $\frac{1}{2}$ required for Math Enrollment Categories M-III and M-IV.i;  $\frac{1}{2}$

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, and refrain from the use of cell phones during any classroom activities.

- 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.
- Please do not leave the class before the class ends. You need to work on your hands-on exercises until the end of the class time.
- 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

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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)

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### 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 Student Learning Objective	When will this GELO be assessed?
<p>GELO 1: Mathematical concepts courses should prepare the student to use mathematical methods to solve quantitative problems, including those presented in verbal form.</p>	<p>Quantitative word problems will be present on both homework and exams throughout the course.</p> <p>An example from Homework 2 that meets GELO1: Find the measures of central tendency in the given dataset that contains the Top Rated Movies data. Load the dataset in csv format into a pandas dataframe. Use the Python built-in functions <code>sum()</code> and <code>len()</code> to answer the following questions:</p> <ul style="list-style-type: none"> <li>● What is the mean Gross revenue? (Hint: mean = sum of values / total # of values)</li> <li>● What is the median Gross revenue? (Hint: sort the list of values before finding the middle value)</li> <li>● Which year has the most top movies produced? (Hint: use a Python dictionary to store the frequency of each value)</li> </ul> <p>Word Count Estimate: 50</p>

<p>GELO 2: Mathematical concepts courses should prepare the student to demonstrate the ability to use mathematics 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 GELO2: 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.</p> <p>Word Count Estimate: 120</p>
<p>GELO 3: Mathematical concepts courses should prepare the student to arrive at conclusions 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 GELOs 1, 2 &amp; 3: 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. Here are the first few rows of the dataset.</p> <p>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?</p> <p>Explain how you come up with the answer.</p> <p>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 (<math>R^2</math> score).</p> <p>Word Count Estimate: 150</p>

### 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.

## Course Materials

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### Required Texts/Readings

- **Textbook:** Practical Statistics for Data Scientists (PSDS): 50+ Essential Concepts Using R and Python by Peter Bruce, Andrew Bruce, and Peter Gedeck ISBN-13: 978-1492072942 ISBN-10: 149207294X (a copy is provided in the Canvas course shell for your personal use)
- **Other Readings:** Additional course readings (e.g., zyBooks), examples, exercises, etc. will be assigned and provided by the instructor.

### 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 idea 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

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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 before the end of class through Canvas.

**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 10th week of the semester. Each group will give a in-class presentation, during class time.

**Midterm Exam:** There will be an in-class midterm exam. 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

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### 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:

- In-class hands-on exercises (15%)
- Homework (15%)
- Term Project (20%)
- Midterm Exam (25%)
- Final Exam (25%)
- Class activity & Quizzes (extra 5%)

### Grade Scale:

- A plus = 100 to 97.0 points
- A = 96.9 to 93 points
- A minus = 92.9 to 90.0 points
- B plus = 89.9 to 87.0 points
- B = 86.9 to 82.0 points
- B minus = 81.9 to 80.0 points
- C plus = 79.9 to 77.0 points
- C = 76.9 to 72.0 points
- C minus = 71.9 to 70.0 points
- D plus = 69.9 to 67.0 points
- D = 66.9 to 62.0 points
- D minus = 61.9 to 60.0 points
- F = 59.9 points or 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) (https://www.sjsu.edu/healthadvisories). By working together to follow these safety practices, we can keep our college safer.

## University Policies

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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

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

PSDS - Textbook: Practical Statistics for Data Scientists, VA - Video Assignment, HW - Homework

Week	Date	Reading/Video Assignment	HW	Topics
1				Syllabus, Course Expectations, Introduction to Google Colab
1			HW1 due	Introduction to Python Programming
2		VA: Intro to Statistical Research Method  PSDS: Ch.1, p.7-13,29  VA: Central Tendency		Dictionaries, Lists, and Sets  Introduction to Pandas Dataframe and Series
2		PSDS: Ch.2, p.13-19  VA: Variability & Standardizing	HW2 due	Introduction to Statistical Research Process  Central Tendency



3		PSDS: Ch.2, p.69-71  VA: Normal Distribution		Measures of Variability  Normal Distribution and Standardized Scores
3		PSDS: Ch.2, p.57-61  VA: Sampling Distribution	HW3 due	Loops and Conditional Statement  Visualizing Data with Graphs
4				Sampling Distribution and Standard Error
4		PSDS: Ch.2, p.65-68  VA: Estimation	HW4 due	Writing User- Defined Functions
5	TBA			Estimation (Confidence Intervals) Margin of Error  <b>Midterm Exam</b>

6		PSDS: Ch.3, p.93-96  VA: Hypothesis Testing		
6				Hypothesis Testing
7		PSDS: Ch.3, p.110-112  VA: t-Tests	HW5 due	t-Tests to Compare Means
7		PSDS: Ch.3, p.118-121  VA: One-way ANOVA		t-Tests to Compare Means
8		PSDS: Ch.1, p. 30-36 Ch.4, p. 141-150  VA: Correlation. Regression  No class (Thanksgiving)	HW6 due	One-way ANOVA
8				Correlation & Regression
9			HW 7 due	Project Report  Project Presentations

10	TBA		Final Exam
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