

[Beta] Data Science Essentials With Python

Scope and Sequence

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BETA

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Target Audience

This course is for beginners and professionals looking to build a strong foundation in data science using Python. It's designed for:

- Aspiring data scientists
- Students in STEM or business disciplines
- High school students
- Anyone looking to work with data using modern tools

Learners will gain practical skills in Python programming, including data wrangling with Pandas, visualization with Matplotlib, and introductory data modeling and storytelling.

Prerequisites

This course has no formal prerequisites prior exposure to Python via Python Essentials 1 can be helpful.

Course Description

Data Science Essentials with Python is a fully interactive project-based learning course that incorporates games and visual coding puzzles to guide students through the foundations of Python, Pandas, Matplotlib and core data science concepts.

Course Objectives

By the end of this course, learners will be able to:

1. Instantiate objects, update variables and call methods and functions in Python.
2. Import Pandas and Matplotlib libraries into python.
3. Read CSV files into DataFrames.
4. Perform the core moves with DataFrames, including: `eval()`, `query()`, `groupby()`, and related methods.
5. Perform basic left merges to combine multiple DataFrames.
6. Generate plots and charts from DataFrames using Matplotlib.

7. Apply best practices for producing compelling and readable bar charts, scatter plots and line plots.
8. Understand the basics of fitting a linear model to paired data points and making sense of the goodness of fit.
9. Form and test hypotheses with explanatory mechanisms about data arrived at through exploratory data analysis.
10. Convey findings using basic data storytelling techniques.

Equipment Requirements

The **course content** is accessible online through any modern web browser. To participate, learners must have access to:

- A device with a modern web browser (preferably desktop or laptop)
- An active internet connection

Any recent version of popular browsers including Google Chrome, Mozilla Firefox, Microsoft Edge, or Apple Safari will work for accessing the course content.

The **downloadable extended projects** at the end of each chapter are designed to be done in a full python environment. This can be accomplished either by installing Python on the user's local system, or by using the online Google Colab environment. Installation instructions for Python and basic Google Colab instructions are provided in the course.

Course Outline

The course is organized into 6 chapters:

Chapter 1: A Game-Based Intro

This chapter introduces Python, Panda, Matplotlib and the core moves for working with DataFrames. It includes 4 lessons followed by a chapter assessment.

- Lesson 1: Zero to Python in 60 Seconds
- Lesson 2: Meet the DataFrame

- Lesson 3: Matplotlib's Pyplot
 - Lesson 4: Core Pandas Moves
 - Intro Assessment
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Chapter 2: Coding for Answers

This chapter practices the core moves to build python scripts for answering basic questions about datasets. This chapter uses interactive guided projects followed by open-ended projects.

- Project 1: Skeletal Variation
 - Project 2: Our World Connected
 - Project 3: Art as Data
 - Chapter 2 Assessment
 - Open-Ended Projects
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Chapter 3: Data Cleaning

This chapter covers basic techniques for preparing DataFrames for analysis in Python. Three guided projects are included followed by open-ended projects.

- Project 1: A Century of Top Songs
 - Project 2: A Plant-Based Coffee Shop
 - Project 3: Flight Delays
 - Chapter 3 Assessment
 - Open-Ended Projects
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Chapter 4: Data Visualization

This chapter uses guided projects to introduce Matplotlib basics and to instill best practices through a powerful set of Pro Tips for producing compelling bar charts, scatter plots and multi-line plots.

- Project 1: The Ocean's Deep-Diving Animals
 - Project 2: Is Granola Healthy?
 - Project 3: The Internet and Dating
 - Chapter 4 Assessment
 - Open-Ended Projects
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Chapter 5: Data Modeling

This chapter uses guided projects to introduce students to linear modeling and linear regression, including the interpretation of goodness of fit, and comparison with non-linear models.

- Project 1: Tusked Elephants
 - Project 2: Lion Attacks
 - Project 3: E-Bike Stopping Distances
 - Chapter 5 Assessment
 - Open-Ended Projects
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Chapter 6: Data Storytelling

This chapter leverages guided projects centered around a single dataset curated to be fruitful for crafting and testing hypotheses about trends in time-series data. Discussions include the importance of explanatory mechanisms, and considerations about causation vs correlation.

- Setup Activity: Setup the dataset and a reusable analysis function
- Project 1: Any Animal Except...

- Project 2: Warm Waters off Peru
- Project 3: The Cicadas are Coming
- Chapter 6 Assessment
- Open-Ended Projects

Support and Inquiries

For inquiries related to course delivery, technical issues, instructor support, or access to learning materials, please contact Cisco Networking Academy Support.

We hope you enjoy this fully interactive course!