Introduction to Programming with Python

Lyon College, Summer Term I (2023), CSC 109
Dr. Marcus Birkenkrahe

This four-week course is designed to provide students with a comprehensive introduction to programming in Python, covering fundamental concepts and practical applications of the language. Using "Python Crash Course" by Eric Matthes as the textbook, students will learn how to install Python and an IDE, and get started with basic data types, control flow statements, functions, files, and exceptions. They will also gain hands-on experience with more advanced topics such as object-oriented programming, modules and packages, testing and debugging, and data analysis and visualization.

The second half of the course will focus on game development with the Pygame library, starting with basic game framework development and gradually building up to a fully functional "space invaders" game. In addition, students will learn how to use Matplotlib and Seaborn to create visualizations for data analysis, and how to use Pandas to manipulate and analyze data.

Throughout the course, students will have ample opportunity to practice their programming skills with a variety of exercises and projects using the Google Colaboratory and DataCamp platforms. They will also receive guidance and feedback from the instructor on their progress and final projects. By the end of the course, students should have a solid foundation in Python programming and be able to apply their skills to a wide range of projects, from game development to data analysis and visualization. This course is ideal for anyone with little or no programming experience who wants to learn Python or for those who have some experience in programming and want to learn more advanced concepts and practical applications.

Week 1

Day 1 (2 hours)

- Introductions
- Overview of course and expectations
- Installing Python and IDE (Integrated Development Environment)
- Getting started with Python interpreter and basic data types

Day 2 (2 hours)

- Review of Python syntax and data types
- Introduction to control flow statements (if/else, while, for)
- Exercises using control flow statements

Day 3 (2 hours)

- Review of control flow statements
- Introduction to functions and parameters

- Exercises using functions and parameters

Day 4 (2 hours)

- Review of functions and parameters
- Introduction to files and exceptions
- Exercises using files and exceptions

Day 5 (2 hours)

- Review of files and exceptions
- Introduction to lists
- Exercises using lists

Week 2

Day 6 (2 hours)

- Review of lists
- Introduction to dictionaries
- Exercises using dictionaries

Day 7 (2 hours)

- Review of dictionaries
- Introduction to tuples
- Exercises using tuples

Day 8 (2 hours)

- Review of tuples
- Introduction to classes and objects
- Exercises using classes and objects

Day 9 (2 hours)

- Review of classes and objects
- Introduction to inheritance
- Exercises using inheritance

Day 10 (2 hours)

- Review of inheritance

- Introduction to modules and packages
- Exercises using modules and packages

Week 3

Day 11 (2 hours)

- Review of modules and packages
- Introduction to testing and debugging
- Exercises using testing and debugging techniques

Day 12 (2 hours)

- Review of testing and debugging
- Introduction to data visualization with Python
- Exercises using Matplotlib to create visualizations

Day 13 (2 hours)

- Review of data visualization with Python
- Introduction to Pygame library
- Exercises using Pygame to build a basic game framework

Day 14 (2 hours)

- Review of Pygame library
- Introduction to game sprites and animation
- Exercises using game sprites and animation to develop a basic game

Day 15 (2 hours)

- Review of game development with Pygame
- Introduction to game logic and event handling
- Exercises using game logic and event handling to develop a simple "space invaders" game

Week 4

Day 16 (2 hours)

- Review of "space invaders" game development
- Introduction to debugging and optimization techniques for games
- Exercises using debugging and optimization techniques to improve the "space invaders" game

Day 17 (2 hours)

- Review of game development with Pygame
- Introduction to advanced data visualization with Python
- Exercises using Seaborn to create more complex visualizations

Day 18 (2 hours)

- Review of advanced data visualization with Python
- Introduction to data analysis with Python
- Exercises using Pandas to manipulate and analyze data

Day 19 (2 hours)

- Review of data analysis with Python
- Final project development
- Discussion and review of final project progress

Day 20 (2 hours)

- Final project presentation
- Review and feedback on final projects

Standard and course policies

- **Standard Lyon College Policies** are incorporated into this syllabus and can be found at: lyon.edu/standard-course-policies.
- The **Assignments and Honor Code** and the **Attendance Policy** are incorporated into this syllabus also and can be found at: tinyurl.com/LyonPolicy.

DataCamp

The course includes a free subscription to the DataCamp classroom at datacamp.com for assignments, and the opportunity to earn a certificate.

Google Colaboratory

Google Colab (colab.research.google.com/) is a (free) online platform to create, edit and run interactive notebooks in R or Python. This enables students to learn literate programming techniques. All code-along and practice exercises for this class will be on Google Colab.

GitHub

All course materials are available as `ipynb`, `org` and `pdf` files in a GitHub repository (github.com/birkenkrahe/py). GitHub is the premier online platform for software development.