Introduction to CS Bootcamp Syllabus

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All students must have a computer that has internet access, can hold Zoom meetings, and can run programs on IDE's. The class will be taught in Python. We will be mainly using PyCharm for an IDE, but students can use their IDE of choice (if not PyCharm, we recommend Atom).

Class Objectives:

1. Students will understand the use of computer programming and how it can solve various complex problems.
2. Students will know how to program in an integrated development environment (IDE).
3. Students will learn Python syntax.
4. Students will understand structural programming fundamentals in Python that can be applied to nearly all programming languages.
5. Students will learn how to create, use, and manipulate various data structures in Python, the ideas of which are applicable to most programming languages.
6. Students will understand the basic principles of object-oriented programming.
7. Students will learn how to use print statements and the built-in debugger in an IDE to find bugs in their programs and debug them.
8. Students will learn the importance of unit and integration testing in programming and how to create them effectively.
9. Students will understand how to effectively create a project that meets certain given specifications.
10. Students will build and develop programming intuition that will aid them in the future.

Class Structure:

Each week will consist of two days of instruction, each being 2 hours long. The first hour will be a lecture for the whole class, followed by an hour-long small-group discussion section, where students will work on a worksheet based on that day's material. We will be providing office hours throughout the 6 weeks intermittently, where students can ask us for private conceptual or debugging help.

Small programming assignments as homework will be assigned after each lesson. These assignments are not required and will not be checked, but are highly recommended to practice concepts we learned in class and get ready for the substantively larger project.

There will also be a take-home exam in week three. After the exam, we will be meeting with students one on one to discuss their progress in the course and understanding of the material. We will release the project spec and skeleton code after the exam has been completed.

We expect the project to take a maximum of 3 weeks to complete, so students should be able to finish by the end of the course.

Curriculum:

Week 1: Programming Fundamentals
       Day 1: IDE's & Variables, Functions, Data Types (strings, chars, booleans, etc.)
       Day 2: Conditional statements, Loops, and String Iteration

Week 2: Programming Fundamentals 2
       Day 1: Basic Python Data Structures (lists, sets, dictionaries, etc.)
       Day 2: Objects, Classes, Functions, etc. (object-oriented programming)

Week 3: Exam
       Day 1: Content Review (Exam after this day)
       Day 2: Exam Corrections and One-on-One Sessions

Week 4: Project-Building
       Day 1: Debugging Overview and Building Intuition
       Day 2: Introduction to Project

Week 5: Project 1
       Day 1: Work and Built-in Office Hours
       Day 2: Work and Built-in Office Hours

Week 6: College Planning/Advising
       Day 1: Overview of Integrating CS into College Apps
       Day 2: One-on-One sessions

<u>Brief Project Overview (developed from Berkeley course CS 61B):</u>

The Enigma Machine was used by the German military in World War 2 to encrypt secret messages, made famous by the recent movie Imitation Game. Students will build and configure the machine on their computers to have it encrypt messages to a certain machine configuration. We have simplified the original machine and the 61B project so that students will not need to understand electrical engineering or mechanics nor more advanced programming concepts that we will not cover in the course.

We will provide a skeleton code in Python that will do some of the heavy lifting. We will also provide a project spec and videos detailing debugging and an overall project introduction.

We expect that students will use everything they have learned in the course to complete the project.