Coding 101 Tufts Pre-College Program

Final project ideas

Descriptions for each final project can be found in this document.
(Click on the table of contents directly to be navigated to the right section)

To complete your project write-up, use this template (also uploaded to Canvas).

Build on your personal website

We spent the first week of our program working on our personal website on Github. If you're interested in spending the rest of the day / week on building out your website - here's your chance! Be creative - design your website however you want. Either work on making it "aesthetically pleasing", or implement a website that serves a specific purpose - like for blog posting or describing different coding projects you've done, or hobbies you enjoy.

If you're already pretty nifty at web development and it's something you enjoy - build something cool and challenge yourself! Note that if you end up building a web application, your final project might be similar to the "design / pitch an app" project. That's alright, just be sure to include the intention or purpose of your website / web app in your project write-up either way.

What to do:

1. Take a 'before' picture of your website! You'll include it on your project write-up.
2. Have a plan of something you'd like to do. Have a reasonable, tangible goal for an outcome you'd like to accomplish with this project.
    a. If you want to *design* something for your website, or make it look a certain way, you might consider sketching out how the design might look before you start the real coding.
    b. If you want to *implement* something on your website, you might consider writing out what features or functionality you would like to include on your website or web application.
3. When you're done, take a few 'after' screenshots!
4. Include a link to your website in your project write-up.

Design & pitch a mobile/browser app

We spent the second week of our program learning about how to think of app ideas, prototype a design, and pitch the app. If you're interested in spending the rest of the day / week on designing, prototyping, implementing, and/or pitching an app - here's your chance! Be creative - design your app for whatever purpose or whatever audience you want.

You can submit the design for your app in your preferred visual medium. Sketch your design and a storyboard on paper, create it in powerpoint, or use a prototyping software (like sketch, Figma, AdobeXD, etc.) if you're already familiar with one.

If you plan to implement your app in real code (i.e., a web application or mobile app), then you are not required to submit a sketch. If you end up sketching your idea first anyway, please include it in your project write-up!

What to do:

1. Describe your app in the project write-up. What is its purpose, what does it do, and who are the intended users? Revisit our skills-building modules from this week for examples.

2. Describe the features of your app. If any of the features are complicated or uncommon to most apps, describe what they do.

3. Provide a few examples of how this app would be used. In other words, illustrate a few "use cases" or "usage scenarios" of how your target audience would use this app to serve its intended purpose.

4. Include a few sketches of your app design. What does the home screen or home page look like? What about the main features the app supports? You can use pen and paper, an online drawing software, powerpoint, figma, etc. (anything you want).

5. Add a storyboard that depicts one of the scenarios you wrote about in step #3. This storyboard should describe, in a series of drawn out panels (sort of like a comic) how your app would be interacted with by the user when using it.

6. Finally, write about the future plans or goals of your app. What would you need to make this app happen, or what else would need to be done? Do you need to learn more about coding, design, or do you need to do some user testing to see if this app is really going to work? There is no right or wrong answer, just explain in your own words.

Code a project in Python

If you'd like to work on a coding project in Python for your final project, please go to our Replit team page and use the "FinalProject" replit to write your program. If you do not want to use Python, then you may create a new replit in another programming language and invite me to it. If needed, pull some code from a previous lab to help you get started on writing your program. Please submit your final code for your project in Replit!

Tabletop board game simulator

Create a program that lets users choose from a series of tabletop games to play. If you are a beginner at coding, then pick a few of these games that you'd be interested in coding! Possible games to implement range from medium to hard difficulty. If there's another game you'd rather implement, please do!

Optional: If you want an extra challenge, design your code to have a parent Board class with subclasses that inherit from Board. Each of these subclasses can be individual board games.

Some board game ideas:

- Tic tac toe
- Hangman
- Yahtzee
- Connect 4
- Chess
- Code names
- Scrabble

Resources:

- 49 ideas for board games you can code

Text adventure game

Create a text adventure, role-playing game that leads to different outcomes depending on the user's input. To make the text game interactive and fun, try adding ASCII art or images straight into the console's output throughout the journey for the user. We've included resources for you to see how to incorporate ASCII art and images into your code.

Fun optional thing to incorporate: If you want to clear the screen at different stages of the adventure, find code that will clear the console output (we've included a resource about it!)

Resources:

- ASCII Art Library for Python
- Stackoverflow suggestions for how to easily print ASCII art
- One-line ASCII art in text form
- Stackoverflow suggestions for how to insert an image into your Python code
- How to clear the console output in Replit

Encrypted messenger service

Create a python program that can encrypt and decrypt messages using different ciphers. We've already implemented a Caesar cipher, can you implement another? Either implement a pre-existing cipher, or create your own! We've included a few resources to inspire you.

Hard mode: Let users choose from an option of ciphers to encrypt their message. Let users choose to either type a message or enter a file with text to be read. Write the encrypted message to a file. Add the ability to decrypt messages that are read from files. If you're feeling up to the challenge, mount a statistical attack on the various ciphers (similarly to the crypto lab) to test which of the ciphers work best.

Resources:

- Different ideas for ciphers you can implement
- Cryptographic algorithms according to NIST

Python project on a particular topic / concept

Are you interested in learning more about a certain coding / Python concept? "Automate the Boring Stuff with Python" is a free resource online that explains the concepts we covered these past two weeks in great detail, with interesting coding challenges throughout the explanations.

Choose a topic that either interests you or you would like to understand further. Read through the website's topic page and finish as many of the coding challenges as you can. Describe what you learned and what you coded in your project write-up.

What to do:

1. Go to https://automatetheboringstuff.com/
2. Scroll down to "Table of Content":

3. Choose the topic that interests you and read through it.
4. Include the code you write while reading through the concept in the below Replit link.
5. Describe what you learned in the project write-up.

Resources:

- Python documentation to read more about the concepts covered
- Python w3schools tutorials
- Python Tutorialspoint tutorials

Coding challenges

Do none of these sound interesting, but you still want to code something? Feel free to design your own project or complete a series of coding challenges! If there's something you've been itching to do, do it - now!

Want to do your project or coding challenges in a different programming language than Python? I won't stop you, feel free to do a project in JavaScript, Java, etc. Make sure you describe the project or series of challenges you've chosen / completed in your project write-up.

Resources:

- (Project Euler) Coding Problems Difficult problems to solve in Python.
- (Rosalind) Bioinformatics Coding Problems Difficult problems to solve in Python.
- (Advent of Code) Coding Problems A series of challenging coding tasks that you can solve in any language.
- (Reddit) Daily Programming Problems Plenty of ideas you can consider for choosing your own Python project.