Final Project

Overview

The climax of this course is its final project. The final project is your opportunity to take your knowledge of programming out for a spin and develop your very own piece of software. So long as your project draws upon this course's lessons, the nature of your project is entirely up to you, albeit subject to the staff's approval. You may implement your project in any language(s) as long as the staff approves. You are welcome to utilize infrastructure other than the CS50 Appliance and `cloud.cs50.net`, provided the staff ultimately has access to any hardware and software that your project requires. All that we ask is that you build something of interest to you, that you make something useful, that you solve an actual problem, or that you somehow impact campus or the world beyond. Strive to create something that outlives this course.

This semester will conclude with the CS50 Fair, a campus-wide exhibition of final projects at which friends, family, and strangers are welcome.

Inasmuch as software development is rarely a one-person effort, you are allowed an opportunity to collaborate with one or two fellow students for this final project. Needless to say, it is expected that every student in any such group contribute equally to the design and implementation of that group's project. Moreover, it is expected that the scope of a two- or three-person group's project be, respectively, twice or thrice that of a typical one-person project. A one-person project, mind you, should entail more time and effort than is required by each of the course's problem sets. Although no more than three students may design and implement a given project, you are welcome to solicit advice from others, so long as you respect the course's policy on academic honesty.

If at a loss for ideas, turn to the below (and your teaching fellow) for inspiration!

APIs
`https://manual.cs50.net/APIs`

Discussions
`http://help.cs50.net/discussions/final-projects`

CS50 Fair 2010 Printed Program
`http://cdn.cs50.net/2010/fall/projects/program.pdf`

Programming Projects (proposed by the Harvard community)
`https://projects.cs50.net/`

Seminars
`https://manual.cs50.net/Seminars`

Academic Honesty

All work that you do toward fulfillment of this course's expectations must be your own unless collaboration is explicitly allowed in writing by the course's instructor. Collaboration in the completion of problem sets is not permitted unless otherwise stated by some problem set's specification.

Viewing or copying another individual's work (even if left by a printer, stored in an executable directory, or accidentally shared in the course's virtual terminal room) or lifting material from a book, website, or other source—even in part—and presenting it as your own constitutes academic dishonesty, as does showing or giving your work, even in part, to another student or soliciting the work of another individual. Similarly is dual submission academic dishonesty: you may not submit the same or similar work to this course that you have submitted or will submit to another. Nor may you provide or make available solutions to problem sets to individuals who take or may take this course in the future. Moreover, submission of any work that you intend to use outside of the course (*e.g.*, for a job) must be approved by the staff.

You are welcome to discuss the course's material with others in order to better understand it. You may even discuss problem sets with classmates, but you may not share code. In other words, you may communicate with classmates in English, but you may not communicate in, say, C. If in doubt as to the appropriateness of some discussion, contact the course's instructor.

You may turn to the Web for instruction beyond the course's lectures and sections, for references, and for solutions to technical difficulties, but not for outright solutions to problems on problem sets or your own final project. However, failure to cite (as with comments) the origin of any code or technique that you do discover outside of the course's lectures and sections (even while respecting these constraints) and then integrate into your own work may be considered academic dishonesty.

All forms of academic dishonesty are dealt with harshly. If the course refers some matter to the Administrative Board and the outcome for some student is *Admonish*, *Probation*, *Requirement to Withdraw*, or *Recommendation to Dismiss*, the course reserves the right to impose local sanctions on top of that outcome for that student that may include, but not be limited to, a failing grade for work submitted or for the course itself.

Grades

Your pre-proposal, proposal, and status report will be evaluated on the bases of, at least, clarity and thoroughness. Your implementation will be evaluated along four axes primarily:

Scope. To what extent does your code implement the features required by our specification?
Correctness. To what extent is your code consistent with our specifications and free of bugs?
Design. To what extent is your code written well (*i.e.*, clearly, efficiently, elegantly, and/or logically)?
Style. To what extent is your code readable (*i.e.*, commented and indented with variables aptly named)?

All students, whether taking the course Pass/Fail or for a letter grade, must ordinarily submit this and all other problem sets to be eligible for a passing grade (*i.e.*, Pass or A to D–) unless granted an exception in writing by the course's instructor.

Schedule

A schedule appears below. The pages that follow elaborate on these dates.

Pre-Proposal
due by noon on Mon 11/7

Proposal
due by noon on Mon 11/14

CS50 Hackathon
from 8:00pm on Fri 12/2 until 7:00am on Sat 12/3

Status Report
due by noon on Mon 12/5

Implementation
due by noon on Thu 12/8

CS50 Fair
from 11:00am until 4:30pm on Fri 12/9

Extensions on the final project are not granted, except in cases of emergency. Technical difficulties are not considered emergencies. Problem sets' late days cannot be spent on the final project. Late submissions may be penalized 1% per minute late up to a maximum of 100%. Lateness of submissions is determined by submissions' timestamps.

Pre-Proposal

Intended to promote early thought, the pre-proposal is your opportunity to bounce one or more ideas off of your teaching fellow. Quite simply, by this pre-proposal's deadline, send an email to your teaching fellow, CCing `projects@cs50.net`, describing one or more ideas that you have for your final project. Short, casual emails are fine, but do explain the motivation behind each of your ideas (*i.e.*, why it interests you). Treat this requirement as an opportunity for counsel. Certainly include any questions or concerns that you have in this email.

The subject line of your email should be **Pre-Proposal**.

If, incidentally, you have an idea for a final project that you think someone should do (if not you), post it at `http://help.cs50.net/discussions/final-projects`! And if you'd like to solicit one or two collaborators, do post there as well.

Proposal

The proposal is your opportunity to receive approval and counsel from your teaching fellow before you proceed to design. Submitting a proposal amounts to answering a few questions about your idea. Once you have a project in mind, submit your proposal at the URL below.[1]

`http://www.cs50.net/projects/proposal/`

Your teaching fellow will either approve your proposal or require modifications on your part for subsequent approval. Your proposal, even if approved, is not binding; you may alter your plan at any point, provided you obtain the staff's approval for any modifications. Projects submitted without approval may not receive credit.

After submitting your proposal, a teaching fellow other than your own may be appointed your advisor and grader for the remainder of the final project, depending on your proposal's nature.

CS50 Hackathon

The CS50 Hackathon is an epic all-nighter during which you can dive into your final project's implementation alongside classmates and staff. If you choose to partake, you'll be asked to propose three milestones for yourself that evening: a "good" one that you intend to achieve no matter what; a "better" one that you think you can achieve; and a "best" one that you hope to achieve.

Pizza will be served at 10:00pm; Chinese food will be served at 2:00am; and those still standing at 5:00am will be treated to breakfast at IHOP.

Additional details on the Hackathon's logistics will be announced via email and the course's home page the week before the Hackathon.

Status Report

Not only is the status report intended to keep the staff apprised of your progress, it is an opportunity to keep yourself on track. Submitting a status report amounts to answering a few questions about your project. Your answers will also influence the setup of the CS50 Fair. Submit your status report at the URL below.[2]

`http://www.cs50.net/projects/report/`

[1] If collaborating with one or two classmates, only one of you needs to submit a proposal. If you are not the one submitting, though, let your teaching fellow know via email the name and username of the collaborator who submitted on your behalf.

[2] If collaborating with one or two classmates, only one of you needs to submit a status report. If you are not the one submitting, though, let your teaching fellow know via email the name and username of the collaborator who submitted on your behalf.

Implementation

Ultimately due are implementation and documentation of your final project.[3] Your submission thereof must include all of the below.

i. Documentation for your project in the form of a file called `documentation.html`, `documentation.pdf`, `documentation.php`, or `documentation.txt`. This documentation is to be a user's manual for your project. Though the structure of your documentation is entirely up to you, it should be incredibly clear to the staff how and where, if applicable, to compile, configure, and use your project. Your documentation should be at least several paragraphs in length, if not several pages. It should not be necessary for us to contact you with questions regarding your project after its submission. Hold our hand with this documentation; be sure to answer in your documentation any questions that you think we might have while testing your work.

ii. A "design document" for your project in the form of a file called `design.html`, `design.pdf`, `design.php`, or `design.txt` that discusses, technically, how you implemented your project and why you made the design decisions you did. Your design document should be at least several paragraphs in length, if not several pages. Whereas your documentation is meant to be a user's manual, consider your design document your opportunity to give the staff a technical tour of your project underneath its hood.

iii. Any and all files required to compile and execute your software (even if intended for some machine other than the CS50 Appliance and `cloud.cs50.net`), including source code as well as, if applicable, configuration files, Makefiles, sample inputs, and so forth.[4] Needless to say, all source code should be thoroughly commented. **If your project uses a MySQL database, be sure to export it to a file (*e.g.*, `project.sql`), as with phpMyAdmin's Export tab, and include that file in the directory that you submit.**

iv. An advertisement for your project in either of two formats (a or b):

   a. A short video (that's no more than 2 minutes in length) in which you present your project to viewers, as with slides, screenshots, voiceover, and/or live action. Your video should somehow include your project's title, your name and year, your dorm/house and concentration, and any other details that you'd like to convey to viewers. See `http://cs171.org/projects/presentations.html` for CS171's tips on how to make a "screencast," though you're welcome to use an actual camera. Save your video as, ideally, `video.mp4` or `video.mpg`, else `video.mov`, `video.flv`, `video.wmv`, or `video.avi`.

   b. A digital poster for your project in the form of a file called `poster.jpg`, `poster.png`, or `poster.pdf`. Your poster should include your project's title, your name and year, your dorm/house and concentration, and any other details that you'd like to convey to

[3] If you have collaborated with one or two other students, each of you should submit via this same process.
[4] If your project requires (for execution and testing) hardware or software other than that offered by the CS50 Appliance or `cloud.cs50.net`, be sure that the TF advising you is aware of and has approved your project's needs well in advance of your submission.

attendees. Graphics and screenshots are welcome, but keep any text big so that your poster is readable on an overhead projector. To make your poster, simply make a 1-slide Keynote presentation and then export it as a PNG called `poster.png` via **File → Export…** or a 1-side PowerPoint presentation and then export it as a PNG called `poster.png` via **File → Save As…**. Alternatively, make a 1-page 11" x 8.5" poster in landscape mode with Microsoft Word and save it as a PDF called `poster.pdf`.

Submit your work by executing the command below in the CS50 Appliance or on `cloud.cs50.net`, where `/path/to/project` is the directory in which i, ii, iii, and iv can be found.

```
submit50 /path/to/project
```

When prompted for **Course**, input **cs50**; when prompted for **Repository**, input **project**. When prompted for a username and password, input your CS50 Cloud username and password. For security, you won't see your password as you type it. The command will inform you whether your submission was successful or not, ultimately providing the URL of a PDF of your code (which further confirms its submission).

You may re-submit as many times as you'd like; we'll grade your most recent submission. But take care not to submit after the project's deadline, lest you risk rejection.

Finally, complete the survey at the URL below.

```
https://www.cs50.net/projects/implementation/
```

Note that you'll be asked to submit your video or poster a second time (so that we can retrieve them all programmatically).

CS50 Fair

The CS50 Fair is an epic display of final projects, your opportunity to showcase your work not only to us but also to others on campus. You will be expected to bring to the Fair a laptop with which to demonstrate your project.[5] Plan to tell attendees what you have done and why you have done it. And perhaps have in mind a few anecdotes about lessons you learned, roadblocks you hit, or the like.

The Fair will take place in the atrium of Northwest Science Labs at 52 Oxford Street.

Additional details on the Fair's logistics will be announced via email and the course's home page the week before the Fair.

[5] If you do not own a laptop, you are welcome to borrow a friend's or share a classmate's.