

# Projects in Computer Science – Syllabus

Garfield High School, Fall 2013 semester

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## Description

This course will allow students who have completed the AP<sup>®</sup> computer science course to expand their programming knowledge and work on significant projects of their choice. Lessons on software development processes, project design & management, and other topics will assist in completing the projects as well as advance their programming skills. The **Apps for Good** (<http://www.appsforgood.org/>) project design process will be taught the first few weeks of the semester to provide a method of better refining ideas and creating effective and useful projects. Students are encouraged to compete in the Spring Apps for Good UK competition where student design and pitch Apps to win awards and have engineers build out their application. Students taking this course will be expected to be self directed and ambitious. Local computer engineers and programmers will be included to mentor students and provide relevant examples of how programming is used in their field and industry. These projects will allow students to experience the satisfaction in creating relevant projects of their own design to demonstrate the value and power of computer science.

## Prerequisite

Requires successful completion of AP CS, instructor approval, self-direction and ambition to program. Earns CTE/Occupational Education credits (0.5 credit per semester). Expectation is that students will devote an additional 2-4 hours each week on their team's project to ensure sufficient progress is made toward its completion.

## Course Objectives:

Successful completion of this course will provide students with an understanding of project design and software development process. In addition, several objectives have been enhanced adding the Apps for Good goals (as designated by an asterisk \*). Students in this course will be able to:

- identify a problem or need and define a project specification to solve it
- follow a development process to efficiently build, test, release and support an application
- research and analyze different programming environments and code libraries to use appropriate ones for a project
- \*work successfully in a team, trying several roles over the development of their App
- \*brainstorm, refine, screen and select computer-based App solutions to problems
- \*develop project “pitches” to clearly promote the key features and benefits of an App
- \*perform market and user research to better understand the need of their App, select best candidates and identifying ‘user personas’ to help guide product design.
- \*create App prototypes and solicit feedback on their design to perfect your App

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- \*regularly perform “Retrospectives” to reflect on your progress and determine how best to make adjustments to your approach, process and design while working on your Apps
- \*iterate & incrementally build Apps: testing, debugging, and integrating user feedback along the way
- \*develop a business strategy and marketing plan for your app to better insure its success
- assess whether a career in App design and/or a computing field is interesting to you
- discover, study, use, and implement algorithms and data structures
- plan and manage a programming project schedule to meet its goals and deadlines
- write clear and efficient code that can be used in others’ projects
- work on a team to contribute to a larger program consisting of many classes
- design, implement and debug computer-based solutions to problems in diverse application areas

Core Standards: students’ projects will strive to apply a variety of mathematics standards including the logical reasoning to solving problems. Technical readings will be occur while researching these projects, learning skills to apply in creating the projects. Students will document their app design process as a team as well as assemble reflections, demonstrating further writing and communications skills.

## Class Text and Required Supplies

We will not be using a paper textbook in this class. Instead, I will use the course website to link to readings, lecture summaries, and other resources. In addition, students will be researching programming environments, algorithms, data sources, and other material to complete their projects. Project requirements and the rubrics we will develop to evaluate them will be presented and discussed in class as well as clearly posted on the course website.

Please be sure to have writing instruments (pens and/or pencils) and composition book or binder for class everyday to keep your class notes and notes for your journal. When you work on your projects outside of school, you may need a flash drive and will be encouraged to use an online repository to share your team’s code files for work outside of class (preferably using GitHub, which is a popular industry standard for collaborating in coding projects).

We will be using many different software tools and finding new ones. Many are already installed on the computers in the lab and new one’s can hopefully be added once identified. Most of the software is free and available for anyone to download and use on their own computers. So you can also work at home or anywhere you have full access to another computer.

## Corporate Classroom Environment

In this Career and Technical Education (CTE) course, the classroom culture will be that of a professional workplace, and students will be treated as responsible employees working together to produce quality products – their assignments and projects. Students will be taught standard industry software development processes and project planning. They will be given leadership roles in running their projects, and as the teacher I will act similar to a manager, meeting periodically to assess progress and make suggestions to keep on track. However, the final success of each project will be the responsibility of the student team. These are similar to the high expectations and distributed management of a real workplace. Collaboration, innovation, and critical thinking as well as safe technology practices will be stressed to ensure students

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continue to develop solid 21<sup>st</sup> Century skills. Detailed classroom standards, procedures, code reviews and rules will be established together, discussed and clearly posted. These leadership, employability, and technology skills will be appraised in this CTE class.

## Grading:

This class will focus on self-driven group projects following best practices for project planning and software development processes. Points will be distributed between categories in approximately this way:

50% - Code quality (peer reviews), Project Planning & Software Development Processes

30% - Project Completeness & Client Satisfaction

20% - Periodic Reflection and self-assessments on building Projects, possibly an Exam as appropriate.

Final grade will be based on your weighted score following the [Seattle Public School District Grading Policy](#) (PDF).

## The Projects

From its name, Projects are the focus of this class, but there is more to building a project than just writing code. You will be learning project brainstorming, scoping, planning, researching, planning and the software development processes that will make your projects be more effective and go smoother, producing more bug-free and supportable applications. This class is designed to allow students to design their own projects and try out new coding environments. The actual number of projects, sizes of teams, deadlines and other details will need to be established as we select the products we choose to create. I will also be encouraging students to find “clients” within the school who need custom applications (i.e. a physics simulation tool or an App for students with special needs) to experience the challenge of working with a real client; if not, we will identify classmates for this role in each project. In addition, professional mentors will provide feedback on your projects along the way allowing you to make them better.

### Code Quality, Project Planning & Software Development Processes

During the development of your code, you will have detailed Code Reviews with fellow students and mentors to assess your following of best practices and coding conventions. Each team will also be assessed on how well they follow project planning and development processes, specifically following Scrum processes including the creation of stories, division of tasks, definition of testing methods, tracking of progress, reporting of status during “stand up” meetings, and releases of software. In addition, Each individual of a team project will be evaluated by his or her teammates and the project’s mentor to provide feedback on their contribution and help me assess collaborative efforts.

### Project Completeness & Client Satisfaction

Completed projects will be compared with the versions of the project specification and user expectations. Your “client” will be asked to provide feedback on the final application and appraise their level of satisfaction. Since I have spent many years testing software in industry, your projects will also get a thorough evaluation of quality by your teacher.

Delivering a project on its due date is not an easy task, even for seasoned professionals (ask Boeing about the 777). For the final grading, consideration will be made on the level of complexity and technical challenges encountered for each project when examining the final result. Identify, reporting, and document possible problems during the development process and consider triaging out features during development. There should not be any major functional surprises on the due date if our Project process has been followed well.

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## Exams & Final Reflection

There may be a few quizzes early in the semester to ensure that the project planning and software development processes are well understood. In addition, there will be a Final Reflection with several essay questions to determine what insights you have gained developing your projects. At several points in the semester, you will be asked to reflect on the project development process, and these will assist you greatly in creating an effective Final Reflection on your growth as a programmer.

## Providing Help

I have arranged two Microsoft programmers/TEALS instructors to act as mentors for our projects. These mentors and myself are not experts on every technology you will want to use, and you may want to make design decisions on what support we can be provided. These mentors will act as coaches to help guide your progress and assist in solving solve technical problems, but they are not another contributing programmer on your team. Their availability may be limited, and you will also be communicating via email and phone conversations in addition to in the classroom – just like many companies who uses team members around the globe. In addition, as your overall manager/teacher, I will arrange regular meetings to track the progress of the project and discuss recent decisions. As always, if you get stuck and have exhausted your other resources – please ask for help! I try to make myself available most days after school and you can also usually find me in the room during lunch and 5th period. I encourage you to make an appointment to make sure I'll be there. I will also answer all e-mail within 24 hours.

## Collaboration

The Projects in CS course is a cooperative corporation classroom, so you are encouraged to reuse software you created in earlier projects and talk to other class members to see if you can leverage their code – the only consideration is that you are required to clearly give credit to any code developed by other students by gaining their permission, citing the inclusion of their library in your code, and telling me of its use – I want to give them credit for creating reusable code. If you find a public Java library that does much of what you need for your project, propose using it to me and we will assess how it affects your plan and the scope of your project. However, you cannot have another student or person (i.e. parent or guardian) outside your team write code for your team without special permission from me – that will be considered cheating and dealt with accordingly.

## Feedback

I want to give you every opportunity to shape the class into something you love by our discussions during class and your suggestions for the projects. If you have more ideas or comments, you can always talk to me before/after class or send me e-mail. If you'd prefer to remain anonymous, I have posted a form on the website.