

Glendale Unified School District

High School

November 5, 2019

Department: Career Technical Education

Course Title: Honors Software Development Internship

Course Code: 5156V/5157V

Grade Level(s): 10-12

School(s)  
Course Offered: Crescenta Valley High School

UC/CSU Approved  
(Y/N, Subject): Yes, "g" College-Preparatory Electives credits with honors designation

Course Credits: 10

Length of Course: Full Year

Recommended  
Prerequisite: AP Computer Science

Recommended  
Textbook: Ruby on Rails Tutorial, Michael Hartl, Addison Wesley Professional, 2016

Course Overview: Honors Software Development Internship is the capstone course for the ICT industry sector, Software Systems Development & Networking pathway. This course builds on the Software and Systems Development skills that students have learned in AP Computer Science A. In this course, students will create apps, and/or develop webpages, and/or create a project from the ground up. Throughout the course, students will be communicating with their "customers" in order to understand and meet their needs. Students will practice real-world application of their skills both in the classroom setting and in 90 hours of internship at local companies. Each quarter contains a major project that the students should complete in support of their customers. This course will further prepare students for industry certificates and employment.

## Section 1-Planning

### Unit 1: Developing Marketable Skills

(4 weeks)

#### STANDARDS

Common Core Language Standards: 11-12.6

Common Core Writing Standards: 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C1.0, C2.0

- A. Students will use this first section of the course to further develop the skills developed within the AP Computer Science course into skills marketable to the public. This will primarily include the transition of computer programming languages from Java, as used in the AP Computer Science curriculum, to the Ruby programming language. Students will also transition from a single-language development environment using java to a multi-language web development framework, Ruby on Rails, which uses the programming languages HTML, SQL, CSS, Javascript, and ruby. This transition will be supplemented by the course textbook, Ruby on Rails tutorial by Michael Hartl. In parallel, students will take steps to identify a need for software development in their community, developing a professional relationship with the client. Students will develop project management skills in accordance to Agile and Scrum project management frameworks, especially in applying these ideas to their own projects. These skills will also be applied towards the creation of a group of peers, where each student will find a distinct role in accordance with the Scrum systems development framework.
- B. *Key Assignment: Ruby on Rails Book Study*  
Students will read and study the book “Ruby on Rails Tutorial” by Michael Hartl to gain a deep understanding of the web development framework Ruby on Rails. Students will also be aided by course-specific notes which relate the book specifically to the workflow of the course. The instruction will be fast paced, and students will be assessed on their knowledge of web development using the Ruby on Rails framework to ensure they meet industry grade standards. As a result, students should be able to demonstrate the ability to use the appropriate software, coding languages, tools, and frameworks to produce a web app using Ruby on Rails. Students will be given internship opportunities later in the year based directly on the aptitude exhibited during this unit.

#### *Key Assignment: Project Management Study*

Students will study the fundamentals of project management as it relates to software development. Students will be expected to display a thorough understanding of software development frameworks such as Agile and Scrum. Students will be guided in their studies with specialized notes which relate these project management ideas specifically to the practices and workflow of CV Enterprises. In addition, students will demonstrate an understanding of the tools and specific processes needed to bring a software project from inception to completion.

*Key Assignment: Version Control Study*

Students will analyze and describe the processes of version control as it relates to software development. Students will be expected to fully understand and be able to use the industry standard version control system, git. In addition, students will be required to create an account on github.com to host their remote repositories. Students will be assessed on their ability to use git adds, commits, pull requests, pushes, and other git commands to submit a full pull request of a new file to a remote repository on github.

*Key Assignment: Initialize Online Presence*

Students will be required to initialize their marketable online presence through both an account on github.com and a personal portfolio website. The exact implementation of this website will vary, but it must include some form of online presence where their process can be documented and their projects can be shared with the world. Students will develop this online presence through the year, culminating in their final project.

**Unit 2: Client/Customer Acquisition**

(4 weeks)

STANDARDS

Common Core Language Standards: 11-12.6

Common Core Writing Standards: 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C1.0, C2.0

A. This unit will introduce students to the process of first identifying, then facilitating a positive professional relationship with a client. Students will identify a need within their community or abroad, connecting this need with a client. Because the client is rarely the only person affected by the problem, additional stakeholders will also be identified and kept in communication. Students will be guided in developing a relationship between their group and the customer to ensure they are able to develop a product which accurately addresses the need in the community or elsewhere.

B. *Key Assignment: Find target clientele*

The student will identify at least three specific fields he/she wants to explore (eg. full-stack development, robotics, bioinformatics, virtual reality). The student will rank the three fields by order of preference, complete with reasoning and technical involvement. Students must provide research into this specific field outlining the practical applications of the field and its relation to software development.

*Key Assignment: Apply/Cold-Email*

Students will take the necessary steps to secure a job/project. This may include traversing a formal application and interview process, or simply a cold email to numerous companies/laboratories. Along the way, students will learn how to communicate their passion and commitment to potential employers.

*Key Assignment:* Relationship Facilitation

Students will be expected to take the steps necessary to develop a positive professional relationship with their client. They will take action to facilitate frictionless communication between themselves and the client and stakeholders.

Unit 3: **Project Proposal/Layout**

(5 weeks)

STANDARDS

Common Core Language Standards: 11-12.3

Common Core Writing Standards: 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C1.0, C2.0

- A. Once students have identified a specific need in the community and have identified their client, students will apply the ideas developed in Unit 1 to plan out the creation of their product. Students must ensure that they adhere to Agile standards of project management, including emphasis on customer collaboration, minimum viable products, iterative development, and adaptability to change. Industry level development technologies will be used, such as Trello and Slack, to ensure a proper degree of project management organization. These technologies will be used to ensure a high degree of communication and transparency between the students and the client, ensuring that the client is informed in all stages of development. Technologies such as Trello in particular will be used to facilitate Scrum and Agile processes of software development, such as sprint cycles and product backlogs. Technologies such as Trello will also be used by the students to collect specific requirements of the customer to fill the product backlog. Students will be required to break these requirements down into actionable steps to act upon throughout the year. These practices and requirements will be developed with a focus on longevity, flexibility, and transparency.
- B. *Key Assignment:* Requirements Document  
Students will outline the services and functions that their applications will provide. This document will be constructed through multiple client meetings with both the client and potential stakeholders to ensure that the project is focused on fulfilling the customer's needs. This document will define the scope of the project, and students will use what they learned about project management to ensure this scope is both reasonable and attainable.

*Key Assignment:* Construct a Timeline/Schedule

Students will establish timeframes and milestones while breaking up the project into logical tasks. The project management timeline will facilitate project efficiency and vision. Students will use industry standard technologies such as trello to serve both as an active project management tool and as a stored reference document in creating this timeline.

## Section 2-Execution

### Unit 4: Minimum Viable Product

(3 weeks)

#### STANDARDS

Common Core Language Standards: 11-12.5, 11-12.7

Common Core Writing Standards: 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C3.0-10.0

- A. In this unit, students will take the next step in the Agile software development life cycle, creating a minimum viable product. The focus of this unit is to develop a working product with an emphasis on speed of development, so students can receive feedback from their customers and target market as fast as possible. Students will apply their knowledge of the Agile software development life cycle to their workflow, operating in short iterations of the product called sprints. In this first phase, working effectively as a group will be emphasized as students adapt to the workflow in a group environment. Students will adhere to the rigorous requirements of industry standard software development practices, including sprint retrospective reports, the daily stand-up, sprint planning meetings, creating burndown charts, and otherwise.
- B. *Key Assignment:* Set up version control (git)  
The student must set up a version control system for their project using git. Students will learn and apply the following topics regarding version control systems:
- Creating and using git repositories
  - Version control workflow concepts, such as commits, branches, and merges
  - Version control best practices, as used in the industry
  - Hosting repositories on a remote server, such as github.com

#### *Key Assignment:* Sprint Planning

Students will demonstrate their knowledge of smart, iterative goal setting techniques in software development with their bi-monthly sprint planning meetings and corresponding meeting notes. Students will be expected to meet bi-monthly in their respective teams to plan out the upcoming sprint. This will include assigning specific tasks from the requirements document outlined during the planning stage to be completed within a set date. A document outlining each planning meeting will be assessed and kept by the team for reference.

#### *Key Assignment:* Sprint Review

Students will use class time to reflect on a sprint cycle once it is completed, addressing topics such as the degree to which the group was able to complete their goals, how effective they were at completing their goals, what specific methods worked during the cycle and what didn't, along with other points of reflection. Students will be required to

write a document outlining these reflection meetings both for assessment and for future reference.

*Key Assignment: Code Review*

Students will participate in a quarterly, in depth code review. The code reviews will be performed by their peers, assessing the extent by which the code they wrote for their software adheres with software development best practices, and whether or not it is properly commented and documented. This will be conducted in accordance with real business practices, and will prepare students for code reviews in the job market.

Unit 5: **Product Design**

(3 weeks)

STANDARDS

Common Core Language Standards: 11-12.5, 11-12.7

Common Core Writing Standards: 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C3.0-10.0

A. This unit will build upon the habits and practices of the previous unit, staying true to Agile software development practices such as iterative development, weekly sprint plannings/retrospectives, and the daily stand-up. While students had previously concerned themselves with developing their products focused on the speed of development of new features, this unit shifts the focus towards the usability of their product towards a wide audience. Students will be instructed on the basics of graphic design, the principles of design, and front end development using the languages HTML, CSS, and Javascript. Students will demonstrate the importance of accessible design to the marketability of a product, as well as understanding the steps needed to create an intuitive interface between humans and technology. Accessibility needs for all users will an emphasis of development, including those with visual or auditory impairments, those with disabilities, and those speaking languages other than English.

B. Key Assignment: Ensuring Accessibility Standards

Students will take the necessary steps to design their application in a way that is accessible to all users. This will include steps such as ensuring their software is accessible to languages other than English, by those visually or physically impaired, or those mentally impaired.

Key Assignment: Achieving Design Standards

Students will apply their knowledge of graphic and web design to their products to ensure their product is both visually appealing and functional to their user base. This includes design specifications such as making sure that their app is functional on multiple browsers, or making sure their app is has full, frictionless navigation.

Unit 6: **Product Refinement**

(3 weeks)

STANDARDS

Common Core Language Standards: 11-12.5, 11-12.7

Common Core Writing Standards: 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C3.0-10.0

A. Now having a product which is both functional and usable, students will now make the necessary steps to ensure the longevity of their product. Students will continue to work on their product with necessary additions intended to reduce the maintenance needed to keep their project functional to an absolute minimum, and if this maintenance is necessary, ensure that it is able to be achieved even by someone not originally related to the project. Students will have previously learnt software development and coding best practices in the past, and this unit will develop on this with a focus on making the product fully robust. To develop a fully robust product, students must add rigorous documentation to their product, as well as a fully realized testing suite. Students must also make sure that their code is fully commented, so others can easily read and understand their code in the future.

B. *Key Assignment:* Build a test-suite  
Students will implement an industry standard test suite to ensure proper reliability of their projects. Students will apply their knowledge of test suites, the best practices for building them, and how to use these test suites to maintain the application. Students will also apply industry standard software development testing practices such as test-driven development, or writing their tests before writing their code.

*Key Assignment:* Documentation

Students will be required to thoroughly document their projects to ensure that their project is understandable for others. They will learn to write documentation that is readable and thorough. Students will be able to write their code alongside documentation in a way that people unrelated to the project could understand. This will also include thorough, robust commentary of their own code throughout their project.

**Section 3-Launch and Personal Marketability**

Unit 7: **Project Launch**

(6 weeks)

STANDARDS

Common Core Language Standards: 11-12.5, 11-12.7

Common Core Writing Standards: 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C3.0-10.0

- A. By this point in the year, students will have created a fully realized application which addresses the need in the community or otherwise which they identified in the beginning of the year. Ensuring that they have created a functional product which adheres to rigorous design standards and includes a full test suite with documentation, students will launch the software they built into the world. During this period, their software will begin to be used in the environment it was intended, and students will use this increased range of feedback to fix any bugs which arose from this increased usage. The goal of the time allotted in this unit is to manage their app in a real world production environment, ensuring that it is capable of being functional for years in the future, and fixing any issues which arise if it isn't.
- B. *Key Assignment 1: Delivery*  
Students will take the necessary steps to ensure that their product launches in accordance with the specifications of the client. This includes adhering to the timeline requirements of the customer, as well as the requirements and scope of the project initially outlined by the students, the customer, and stakeholders. The students will be assessed on their fulfillment of the customer's software needs.

*Key Assignment:* Set up a channel of post-delivery maintenance

The student will formalize the maintenance procedures necessary to ensure the continued practicality of the product. This may include monitoring data logs and pushing software updates regularly.

Unit 8: **Final Project**

(3 weeks)

STANDARDS

Common Core Language Standards: 11-12.5, 11-12.7

Common Core Writing Standards: 11-12.2, 11-12.4, 11-12.5, 11-12.6, 11-12.7

Common Core Number and Quantity Standards: 6

Information and Communication Technologies Knowledge and Performance Anchor Standards: 2.0, 3.0, 4.0, 5.0, 7.0, 8.0, 9.0, 10.0

Information and Systems Development Pathway Standards: C3.0-10.0

- A. With students now having the experience of the entire software development life cycle, from client acquisition to production, students will now prepare an industry recognized portfolio and resume showcasing their work. They will be required to create an electronic portfolio hosted on github, as to be most accessible to employers in the software development industry. This portfolio will highlight the level of mastery of software development they have developed over the course of the year. Students will also be required to write an article showcasing their experience in the class to be published on the CV Enterprises website to be used by future students.



- B. Key Assignment: Students will develop a personal portfolio and resume hosted online, and thus marketable to the general public. This portfolio will be hosted on github.com with their free hosting platform, and will thus be accessible by the large software development community on github. Students will need to apply ideas of web design and version control they have learned for their own personal portfolio website to market themselves in a way which is both substantively and visually appealing to potential employers. The student will be assessed on the quality and thoroughness of their personal portfolio.

Key Assignment: Students will prepare an article which reflects on the experience they had during the year in developing their software. Focuses of this article could include describing a development technique they used which helped them, a reflection on how the course has impacted them, a reflection on their plans for the future, or otherwise. This article will be hosted on the CV-Enterprises website, and allows students to both reflect on what they learned during the year and help students in the future.

### **Text Books/Reading List**

“Ruby on Rails”, Michael Hartl, Addison Wesley Professional, 2016

“Cracking the Coding Interview: 189 Programming Questions and Solutions 6th Edition”, Gayle Laakmann McDowell

“The C Programming Language”, Brian W. Kernighan and Dennis M. Ritchie