Mobile App Design & Computer Coding
Course Outline

Course Description

Silicon Valley CTE's 519 hour, year-long Mobile App Design & Computer Coding course is a beginning design and computer programming course. The main objective is to design and develop iOS apps that could be submitted to the Apple App Store. The course has three main sections: (1) Design basics, including color, type, layout, logos, icons, image formats, etc. (2) Programming basics, including HTML, CSS, and JavaScript. (3) iOS programming using Xcode and Swift.

Course Details

Length of Program and Academic Credits Earned:
Year-long 3 hour course = 519 hours total (~261/semester)
   30 total units (15/semester):
     ● 20 non-a–g elective credits (10/semester)
     ● 10 UC a–g "g" elective credits (5/semester)
Pre-Requisites:
     ● High School Junior or Senior, or 16 years or older
     ● Completed algebra and geometry or Integrated Math 1 & 2
	CTE Classification:
	     ● **Industry Sector:** Information and Communication Technologies
	     ● **Industry Pathway:** Software and Systems Development
	     ● **CA Basic Education Data System (CBEDS) Code:** 4616

Work Based Learning: ● Guest Speakers	**Certifications & State Tests:** SVCTE Certificate of Completion awarded with "C" or better average for both semesters.

Possible Education & Career Pathways

College & Career Pathways:	Career Opportunities	O*NET Codes
Post-Secondary: Students with a high school diploma and having successfully completed this course have a number of entry-level career opportunities, as well as continuing their education.	• Web Developer • Graphic Designer • Multimedia Artist	15-1134.00 27-1024.00 27-1014.00
Community College Majors & Degrees: • AA, AS or certificate in Computer Science • AA, AS or certificate in Graphic Design • AA, AS or certificate in Game Design • AA, AS, or certificate in Digital Media	• Web Developer • Graphic Designer • Computer Programmer • Video Game Designer • Multimedia Artist	15-1134.00 27-1024.00 15-1131.00 15-1199.11 27-1014.00
University Majors & Degrees: • BA or BS in Computer Science	• Web Developer • Graphic Designer • Computer Programmer • Software Developer • Video Game Designer • Multimedia Artist	15-1134.00 27-1024.00 15-1131.00 15-1132.00 15-1199.11 27-1014.00
Post-Baccalaureate Degrees • MA or MS in Computer Science	• Web Developer • Graphic Designer • Computer Programmer • Software Developer • Video Game Designer • Multimedia Artist	15-1134.00 27-1024.00 15-1131.00 15-1132.00 15-1199.11 27-1014.00

Unit 1: Career Readiness & Professionalism   3.2 weeks (48 hours)

Students will develop personal and professional skills in the classroom that will transfer to the workplace.
- Time management and organization
- Interpersonal skills
- Work with a variety of technology
- Creative thinking and problem solving
- Job search skills including: resume, job applications and effective interview skills

Students will write resumés, explore college and career options, investigate FAFSA, participate in class, and demonstrate employable demeanor and attire in class.
- Resumé writing in several different formats
- College and career workshops
- Portfolio creation
- Team collaboration/empathy

Course Competencies Addressed in this Unit:
1.1, 1.2, 1.3,

Standards Alignments:
CCSS: LS 11-12.1, 11-12.2, 11-12.3, 11-12.6; **WS** 11-12.4, 11-12.5, 11-12.6

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Students will write their resumes in a printable format such as Pages, MS Word, or Google Docs. **Assessment:** rubric, observation, peer and self- assessment	2.4, 2.5, 2.7, 2.8, 3.0, 7.0, 8.0	
✓ **Key Assignments:** Students will demonstrate HTML and CSS skills by recreating their resumes as an HTML web page. **Assessment:** rubric, observation, peer and self- assessment	2.4, 2.5, 2.7, 2.8, 3.0, 7.0, 8.0	
✓ **Key Assignments:** Students will write a statement of their college and career plans, or a mission statement or another exemplary writing sample. **Assessment:**	2.4, 2.5, 2.7, 2.8, 3.0, 7.0, 8.0	
✓ **Key Assignments:** Students will complete individual portfolios that demonstrate their technical skills, including case studies, resumes and other writing samples.	2.4, 2.5, 2.7, 2.8, 3.0, 7.0, 8.0, 11.5	

Assessment: rubric, observation, peer and self- assessment		

Unit 2: Language Skill Development and Research Skills — 2.2 weeks (36 hours)

Students will perform research, read articles, write coherent summaries or responses.
- Apple developer library (Swift)
- Mozilla developer library (JavaScript)
- Other programming web sites (e.g. StackOverflow)
- Popular general search engines (e.g Google)
- Students will investigate selected topics such as homelessness, nutrition, and welding.
- Students may collaborate with students in other classes to develop app ideas and understand target audience.

Standards Alignments:
CCSS: LS 11-12.1, 11-12.2, 11-12.6; **RSIT** 11-12.1; **WS** 11-12.3, 11-12.6; **SLS**.11-12.1 A, B, C, D, 11-12.2, 11-12.3, 11-12.4,.11-12.5, 11-12.6

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Students will demonstrate the ability to search for the information they need to complete their projects, by adding new features to the Apple tutorials. **Assessment:** observation, quiz, or test	2.4, 2.5, 2.7, 2.8, 4.0, 5.0, 10.12, 10.14	
✓ **Key Assignments:** Students will create web sites and apps that use appropriate language and have proper grammar, spelling, and punctuation. **Assessment:** rubric, observation	2.4, 2.5, 2.7, 2.8, 5.0	
✓ **Key Assignments:** Students will write up app ideas and reflect on target audiences for those ideas. **Assessment:** rubric, observation	2.4, 2.5, 2.7, 2.8, 5.0	C 2.3, C 2.4, C 2.5

Unit 3: Mac Fundamentals — 2 weeks (30 hours)

Students will learn about Mac files, menus, window, applications, keyboard shortcuts, good ergonomic practices.
- Cmd-Space keyboard shortcut to activate Spotlight and start applications
- Navigate to the Desktop from within the Save dialog box using keyboard shortcuts
- Create folders on the desktop and put their work in the folders

Standards Alignments:

CCSS: AD 12.8.2, 12.8.3; **WH** 10.11

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Individually, students will demonstrate their understanding of concepts taught by developing an HTML table of keyboard shortcuts for common applications. **Assessment:** rubric, observation	4.0, 6.0, 10.0	C 2.2

Unit 4: Design Fundamentals   4 weeks (60 hours)

Students will design icons and logos, explore colors and fonts, and discuss differences between devices (web vs. iPhone vs. iPad).
- Fonts and colors
- iOS and Android user interface guidelines
- Icon and widget sizes and icon requirements for app store submission
- SVG and Adobe Illustrator for recreating popular icons and logos
- Target audience

Standards Alignments:
CCSS: AD 12.8.2, 12.8.3; **WH** 10.11

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Individually, students will demonstrate their understanding of fonts, colors, and layout by creating a tic-tac-toe game that uses contrasting colors and Google fonts. **Assessment:** rubric, observation, and self- assessment	9.0, 10.6	C 2.3, C 3.2, C 6.2, C 6.5, C 6.6, C 6.7
✓ **Key Assignments:** Students will work in Project-Based Learning teams to demonstrate their understanding of fonts, colors, layout, and target audience by designing and developing homeless websites or other sites that deal with real-world problems. Initially, students will develop one "prototype" web site each, then they will collectively work to develop one "final" web site in their PBL groups. These principles of design and development will be applied to other web sites developed throughout the year. **Assessment:** rubric, observation, and self- assessment	2.4, 2.5, 2.7, 2.8, 7.2, 7.3, 7.4, 7.5, 9.0, 10.6	C 1.1, C 1.4, C 1.5, C 2.3, C 2.4, C 2.5, C 3.2, C 6.2, C 6.5, C 6.6, C 6.7
✓ **Key Assignments:** Individually, students will demonstrate understanding of colors and layouts by designing a personal or class logo and a web site or app icon.	9.0, 10.0	C 2.3, C 3.2, C 6.2, C 6.5, C 6.6, C 6.7

Assessment: rubric, observation, and self- assessment		

Unit 5: Web Programming   7 weeks (105 hours)

Students will create HTML web pages and SVG images. Students will add interactivity and animation using JavaScript.
- Device sizes, aspect ratios, icon sizes, and colors
- SVG images such as icons, logos, a basketball, a speedometer, a gear, a molecule, and a snow globe
- JavaScript to add interactivity to the web pages, including buttons and keystrokes
- JavaScript to add animations to the SVG images using the rotate and translate transformations
- Basic programming constructs such as variables, constants, decisions, loops, arrays, and random numbers
- Algebra and geometry concepts

Standards Alignments:
CCSS: A-REI 1, 2; **F-IF** 4; **F-LE** 6; **C** 5; **G-GPE** 4, 5, 6; **G-MG** 1, 3; **N-Q** 1, 2, 3; **N-CN** 4, 5, 6; **S-ID** 1; **S-MD** 1, 6;
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **ESS** 3-6; **PS** 2-1, 2, 3, 4, 5, 6; 3-2; 4-1,3,4,5

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Students will utilize HTML, SVG, and JavaScript to develop a bouncing basketball. **Assessment:** rubric, observation	1.0, 4.0, 5.0, 10.0	C 4.6, C 4.7, C 4.9, C 7.5
✓ **Key Assignments:** Students will use HTML5 Canvas and JavaScript to develop a snow globe that has several different animated layers and take into account different artistic qualities and principles. **Assessment:** rubric, observation, critique	1.0, 4.0, 5.0, 10.0	C 4.6, C 4.7, C 4.9, C 7.5
✓ **Key Assignments:** Students will develop a slideshow of icons using HTML, SVG, and JavaScript. **Assessment:** rubric, observation	1.0, 4.0, 5.0, 10.0	C 4.6, C 4.7, C 4.9, C 7.5
✓ **Key Assignments:** Students will use SVG circles, lines, polylines, gradients, and text to draw a chocolate (theobromine) molecule in hand-written code. **Assessment:** rubric, observation	1.0, 4.0, 5.0, 10.0	C 4.6, C 4.7, C 4.9, C 7.5

Unit 6: Xcode and Swift Fundamentals   5 weeks (75 hours)

Students will explore the Xcode application and all its panels. Students will learn basic iOS concepts.
- Basic iOS concepts such as storyboards, constraints, labels, buttons, actions, outlets, views, and the picker widget
- Basic Swift concepts such as variables, constants, inferred typing, if statements, for...in loops, arrays, and ran
- Apple tutorials: Word Collage, Clock, Stopwatch, Unit Converter
- Additional tutorials such as Random Circles

Standards Alignments:
CCSS: A-REI 1, 2; **F-IF** 4; **F-LE** 6; **C** 5; **G-GPE** 4, 5, 6; **G-MG** 1, 3; **N-Q** 1, 2, 3, **N-CN** 4, 5, 6; **S-ID** 1, **S-MD** 1, 6
NGSS: SEP 1, 2, 3, 4, 5, 6, 7, 8; **ESS** 3-6; **PS** 2-1, 2, 3, 4, 5, 6; 3-2; 4-1,3,4,5

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Students will create the "Unit Converter" project which will include storyboards, constraints, labels, actions, outlets, the picker widget, and user interface tradeoffs **Assessment:** rubric, observation, peer feedback	4.0, 10.0	C 1.1, C 3.2, C 4.3, C 4.6, C 4.7, C 4.8, C 4.9, C 5.4, C 5.5, C 5.6
✓ **Key Assignments:** Students will develop the layout for a Tic Tac Toe game app by creating storyboards and constraints. **Assessment:** rubric, observation, demonstration	4.0, 10.0	C 1.1, C 3.2, C 4.3, C 4.7, C 4.8, C 5.4, C 5.6
✓ **Key Assignments:** Students will develop an app that draws random color circles, then changes the colors in response to touch movements. They will produce storyboards, constraints, views, bezier paths, random numbers, arrays, loops, touch detection, and utilize the HSV color model. **Assessment:** rubric, observation, critique, student conference	4.0, 10.0	C 1.1, C 3.2, C 4.3, C 4.6, C 4.7, C 4.8, C 4.9, C 5.4, C 5.5, C 5.6

Unit 7: Intermediate Swift and Interactive Apps   5 weeks (75 hours)

Students will learn to use the browser view, map view, map kit, geolocation framework, gestures, image buttons, sounds, and drawing.
- Apple tutorials: Easy Browser, Found, Noise Maker, Gesturizer, Finger Painter
- Tutorials such as Animals Portfolio, Basketball, and Tic Tac Toe

Standards Alignments:
CCSS: **A-REI** 1, 2; **F-IF** 4, **F-LE** 6; **C** 5; **G-GPE** 4, 5, 6; **G-MG** 1, 3; **N-Q** 1, 2, 3; **N-CN** 4, 5, 6; **S-ID** 1; **S-MD** 1, 6
NGSS: **SEP** 1, 2, 3, 4, 5, 6, 7, 8; **ESS** 3-6; **PS** 2-1,2,3,4,5,6; 3-2; 4-1,3,4,5

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Students will develop an app that displays different musical instruments and plays their sounds by using the audio framework and image buttons. **Assessment:** rubric, observation	2.5, 2.6, 4.0, 10.0	C 3.2, C 4.7, C 4.8, C 4.9, C 5.4,C 5.6, C 6.1
✓ **Key Assignments:** Students will develop an app that allows finger painting and has a user interface for changing colors and stroke widths while using gestures, drawing, colors, and user interface. **Assessment:** rubric, observation	4.0, 10.0	C 3.2, C 4.7, C 4.8, C 4.9, C 5.4,C 5.6
✓ **Key Assignments:** Students will demonstrate understanding of storyboards, constraints, and segues by developing a portfolio app (Animals) that has multiple views with navigation between the views and within a view. **Assessment:** rubric, observation	4.0, 10.0	C 3.2, C 4.7, C 4.8, C 4.9, C 5.4,C 5.6
✓ **Key Assignments:** Students will practice and explore multiple views and drawing by developing an app that displays a bouncing basketball and allows the user to manipulate it using buttons, gestures, or other user interface methods. **Assessment:** rubric, observation	4.0, 10.0	C 3.2, C 4.7, C 4.8, C 4.9, C 5.4,C 5.6
✓ **Key Assignments:** Students will demonstrate understanding of storyboards, constraints, actions, outlets, and math by developing a Tic Tac Toe game for iPhone and iPad using Xcode and Swift. **Assessment:** rubric, observation	4.0, 10.0	C 3.2, C 4.7, C 4.8, C 4.9, C 5.4,C 5.6

Unit 8: Advanced iOS Widgets and Frameworks   3 weeks (45 hours)

Students will explore standard native iOS widgets and user interface elements such as navigation controllers, tab bar controllers, table view controllers, and segues. Students will learn about client-server programming by working with RSS data found on the Apple web site.
- Apple tutorials: Flash Cards, RSS Reader, and Journal.
- Navigation Controllers
- Tab Bar Controllers
- Segues

- Table View Controllers
- RSS data

Standards Alignments:
CCSS: **A-REI** 1, 2; **F-IF** 4; **F-LE** 6; **C** 5; **G-GPE** 4, 5, 6; **G-MG** 1, 3; **N-Q** 1, 2, 3, **N-CN** 4, 5, 6; **S-ID** 1; **S-MD** 1, 6
NGSS: **SEP** 1, 2, 3, 4, 5, 6, 7, 8; **ESS** 3-6; **PS** 2-1,2,3,4,5,6; 3-2; 4-1,3,4,5

Key Assignments	CTE Anchor Standards	CTE Pathway Standards
✓ **Key Assignments:** Students will utilize one or more advanced widgets such as navigation controllers, tab bar controllers, and table view controllers by developing one of the Level 4 Apple tutorials. **Assessment:** rubric, observation	4.0, 10.0	C 3.2, C 4.7, C 4.8, C 4.9, C 5.4, C 5.6
✓ **Key Assignments:** Students will demonstrate collaboration and empathy by working in groups to build an app that benefits others, such as an app that benefits homeless people, a nutrition app, or an app that benefits another class (welding, fashion design, mechatronics, or animation). **Assessment:** rubric, observation, instructor, public and peer feedback	4.0, 7.2, 7.3, 7.4, 7.5, 9.0, 10.0	C 1.1, C 1.4, C 1.5

Unit 9: Adobe Illustrator and Photoshop	3 weeks (45 hours)

Students will use Adobe Illustrator to make logos, icons, and other graphics for their apps. Students will use Photoshop to resize photos and other graphics for use in web and app projects.
- Bitmap graphics vs. vector graphics
- Basic Illustrator panel layout and keyboard shortcuts
- Basic vector shapes such as lines, rectangles, squares, ellipses, circles, polygons, stars, and text
- Pen tool for making more complicated shapes
- Pathfinder tool for combining simple shapes into more complex ones
- Align, layer, and artboard panels

Standards Alignments:
CCSS: **G-C** 5; **G-CO** 12; **G-GMD**

Key Assignments	CTE Anchor	CTE Pathway

	Standards	Standards
✓ **Key Assignments:** Students will demonstrate their understanding of the pen tool by creating complex shapes in the form of icons and logos. **Assessment:** rubric, observation	10.3	C 6.5, C 6.6, C 6.7
✓ **Key Assignments:** Students will drawing gears with the pathfinder and align tools. **Assessment:** rubric, observation, demonstration	10.3	C 6.5, C 6.6, C 6.7
✓ **Key Assignments:** Students will demonstrate understanding of the pen, pathfinder, align, layer, artboard, and export tools by drawing a set of navigation icons in a single Illustrator file, exporting them as PNG in different colors. **Assessment:** rubric, observation	10.3	C 6.5, C 6.6, C 6.7
✓ **Key Assignments:** Students will use Photoshop crop tool to export images in different sizes as either perfectly square or in specified aspect ratios, so they will line up perfectly in a web or app project. **Assessment:** rubric, observation	10.3	C 6.5, C 6.6, C 6.7

Instructional Materials

Textbooks:	Electronic Media/Supplemental Print Materials/Online Resources:
JavaScript for Kids Nick Morgan No Starch Press © 2015 ISBN: 1-59327-408-4	*JavaScript for Kids* includes a PDF version that students can read online or used at home.

Standards Assessed in this Course

CTE Anchor Standards

1.0   Academics: Academics standards are aligned to pathways; see below.

2.0   Communications: Acquire and use accurately sector terminology and protocols at the career and college readiness level for communicating effectively in oral, written, and multimedia formats.

3.0   Career Planning and Management: Integrate multiple sources of career information from diverse formats to make informed career decisions, solve problems, and manage personal career plans.

4.0	Technology: Use existing and emerging technology, to investigate, research, and produce products and services, including new information, as required in the sector workplace environment.
5.0	Problem Solving and Critical Thinking: Conduct short, as well as more sustained, research to create alternative solutions to answer a question or solve a problem unique to the sector using critical and creative thinking, logical reasoning, analysis, inquiry, and problem-solving techniques.
6.0	Health and Safety: Demonstrate health and safety procedures, regulations, and personal health practices and determine the meaning of symbols, key terms, and domain-specific words and phrases as related to the sector workplace environment.
7.0	Responsibility and Flexibility: Initiate, and participate in, a range of collaborations demonstrating behaviors that reflect personal and professional responsibility, flexibility, and respect in the sector workplace environment and community settings.
8.0	Ethics and Legal Responsibilities: Practice professional, ethical, and legal behavior, responding thoughtfully to diverse perspectives and resolving contradictions when possible, consistent with applicable laws, regulations, and organizational norms.
9.0	Leadership and Teamwork: Work with peers to promote divergent and creative perspectives, effective leadership, group dynamics, team and individual decision making, benefits of workforce diversity, and conflict resolution.
10.0	Technical Knowledge and Skills: Apply essential technical knowledge and skills common to all pathways in the sector following procedures when carrying out experiments or performing technical tasks.

Information and Communication Technologies Sector — Software and Systems Development Pathway Standards

C1.0 **Identify and apply the systems development process.**

C1.1   Identify the phases of the systems development life cycle, including analysis, design, programming, testing, implementation, maintenance, and improvement.

C1.2   Identify and describe models of systems development, systems development life cycle (SDLC), and agile computing.

C1.3   Identify and describe how specifications and requirements are developed for new and existing software applications.

C1.4   Work as a member of, and within the scope and boundaries of a development project team.

C1.5   Track development project milestones using the concept of versions.

C1.6   Diagram processes using flowcharts and the Unified Modeling Language.

C2.0 **Define and analyze systems and software requirements.**

C2.1   Describe the major purposes and benefits of development, including automation, improving productivity, modeling and analysis, and entertainment.

C2.2   Recognize and prevent unintended consequences of development work: programming errors, security issues, health and environmental risks, and privacy concerns.

C2.3   Develop strategies that target the specific needs and desires of the customer.

C2.4   Analyze customers' needs for development.

C2.5   Determine and document the requirements and alternative solutions to fulfill the customers' needs.

C3.0   **Create effective interfaces between humans and technology.**

C3.1   Describe and apply the basic process of input, processing, and output

C3.2   Design effective and intuitive interfaces using knowledge of cognitive, physical, and social interactions.

C3.3   Support methods of accessibility for all potential users, including users with disabilities and non-English-speaking users.

C4.0   **Develop software using programming languages.**

C4.1   Identify and describe the abstraction level of programming languages from low-level, hardware-based languages to high-level, interpreted, Web-based languages.

C4.2   Describe the interaction and integration of programming languages and protocols such as how client-side programming can work with server-side programming to use a query language to access a database.

C4.3   Identify and use different authoring tools and integrated development environments (IDEs).

C4.4   Identify and apply data types and encoding.

C4.5   Demonstrate awareness of various programming paradigms, including procedural, object oriented, event-driven, and multithreaded programing.

C4.6   Use proper programming language syntax.

C4.7   Use various data structures, arrays, objects, files, and databases.

C4.8   Use object oriented programming concepts, properties, methods, and inheritance.

C4.9   Create programs using control structures, procedures, functions, parameters, variables, error recovery, and recursion.

C4.10 Create and know the comparative advantages of various queue, sorting, and searching algorithms.

C4.11 Document development work for various audiences, such as comments for other programmers, and manuals for users.

C5.0   **Test, debug, and improve software development work.**

C5.1   Identify the characteristics of reliable, effective, and efficient products.

C5.2   Describe the ways in which specification changes and technological advances can require the modification of programs.

C5.3   Use strategies to optimize code for improved performance.

C5.4   Test software and projects.

C5.5   Evaluate results against initial requirements.

C5.6   Debug software as part of the quality assurance process.

C6.0   **Integrate a variety of media into development projects.**

C6.1   Identify the basic design elements necessary to produce effective print, video, audio, and interactive media.

C6.2   Describe the various encoding methods of media and trade-offs: vector graphics vs. bitmaps, and bit depth.

C6.3   Use media design and editing software: keyframe animation, drawing software, image editors, and three-dimensional design.

C6.4   Develop a presentation or other multimedia project: video, game, or interactive Web sites, from storyboard to production.

C6.5   Analyze the use of media to determine the appropriate file format and level of compression.

C6.6   Integrate media into a full project using appropriate tools.

C6.7   Create and/or capture professional-quality media, images, documents, audio, and video clips.

C7.0   **Develop Web and online projects.**
C7.1   Identify the hardware (server) and software required for Web hosting and other services.
C7.2   Describe the full process of online content delivery, registering domain names, setting up hosting, and setting up e-mail addresses.
C7.3   Attract Web-site visitors through search engine optimization using various strategies like keywords and meta-tags.
C7.4   Enable e-commerce capabilities to sell products, create a shopping cart, and handle credit card transactions.
C7.5   Create an online project, Web-based business, and e-portfolio.
C7.6   Optimize fast delivery and retrieval of online content such as Web pages.
C8.0   **Develop databases.**
C8.1   Describe the critical function of databases in modern organizations.
C8.2   Identify and use the basic structures of databases, fields, records, tables, and views.
C8.3   Identify and explain the types of relationships between tables (one-to-one, one-to-many, many-to-many) and use methods to establish these relationships, including primary keys, foreign keys, and indexes.
C8.4   Use data modeling techniques to create databases based upon business needs.
C8.5   Use queries to extract and manipulate data (select queries, action queries).
C8.6   Develop databases that are properly normalized using appropriate schemas.
C8.7   Export and import data to and from other applications and a database recognizing the limitations and challenges inherent in the process.
C8.8   Analyze and display data to assist with decision making using methods like cross tabulations, graphs, and charts.
C9.0   **Develop software for a variety of devices, including robotics.**
C9.1   Demonstrate awareness of the applications of device development work, including personalized computing, robotics, and smart appliances.
C9.2   Install equipment, assemble hardware, and perform tests using appropriate tools and technology.
C9.3   Use hardware to gain input, process information, and take action.
C9.4   Apply the concepts of embedded programming, including digital logic, machine-level representation of data, and memory-system organization.
C9.5   Program a micro-controller for a device or robot.
C10.0   **Develop intelligent computing.**
C10.1   Describe models of intelligent behavior and what distinguishes humans from machines.
C10.2   Describe the major areas of intelligent computing, including perception, proximity, processing, and control.
C10.3   Know artificial intelligence methods such as neural networks, Bayesian inferences, fuzzy logic, and finite state machines.
C10.4   Implement artificial intelligent behavior through various methods: mathematical modeling, reinforcement learning, and probabilistic analysis.

Common Core State Standards
Language Standards – LS – (Standard Area, Grade Level, Standard #)

LS 11-12.1:	Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
LS 11-12.2:	Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
LS 11-12.3:	Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
LS 11-12.6:	Acquire and accurately use general academic and domain-specific words and phrases sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Reading Standards for Informational Text – RSIT – (Standard Area, Grade Level, Standard #)

RSIT 11-12.1:	Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text, including determining where the text leaves matters uncertain.

Writing Standards – WS – (Standard Area, Grade Level, Standard #)

WS 11-12.3:	Write narratives to develop real or imagined experiences or events using effective technique, well-chosen details, and well-structured event sequences.
WS 11-12.4:	Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
WS 11-12.5:	Develop and strengthen writing as needed by planning, revising, editing, rewriting, or trying a new approach, focusing on addressing what is most significant for a specific purpose and audience.
WS 11-12.6:	Use technology, including the Internet, to produce, publish, and update individual or shared writing products in response to ongoing feedback, including new arguments or information.

Speaking & Listening Standards – SLS – (Standard Area, Grade Level, Standard #)

SLS 11-12.1:	Initiate and participate effectively in a range of collaborative discussions (one-on- one, in groups, and teacher-led) with diverse partners on grades 11–12 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
SLS 11-12.1A:	Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
SLS 11-12.1B:	Work with peers to promote civil, democratic discussions and decision-making, set clear goals and deadlines, and establish individual roles as needed.
SLS 11-12.1C:	Propel conversations by posing and responding to questions that probe reasoning and evidence; ensure a hearing for a full range of positions on a topic or issue; clarify, verify, or challenge ideas and conclusions; and promote divergent and creative perspectives.
SLS 11-12.1D:	Respond thoughtfully to diverse perspectives; synthesize comments, claims, and evidence made on all sides of an issue; resolve contradictions when possible; and determine what additional information or research is required to deepen the investigation or complete the task.

SLS 11-12.2:	Integrate multiple sources of information presented in diverse formats and media (e.g., visually, quantitatively, orally) in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.
SLS 11-12.3:	Evaluate a speaker's point of view, reasoning, and use of evidence and rhetoric, assessing the stance, premises, links among ideas, word choice, points of emphasis, and tone used.
SLS 11-12.4:	Present information, findings, and supporting evidence, conveying a clear and distinct perspective, such that listeners can follow the line of reasoning, alternative or opposing perspectives are addressed, and the organization, development, substance, and style are appropriate to purpose, audience, and a range of formal and informal tasks.
SLS 11-12.5:	Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
SLS 11-12.6:	Adapt speech to a variety of contexts and tasks, demonstrating a command of formal English when indicated or appropriate.

Algebra – A-REI – Reasoning with Equations and Inequalities – (Standard Area, Grade Level, Standard #)

A-REI-1:	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
A-REI-2:	Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

Functions – F-IF – Interpreting Functions – (Standard Area, Grade Level, Standard #)

F-IF-4:	For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities, and sketch graphs showing key features given a verbal description of the relationship. Key features include: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.

Functions – F-LE – Linear, Quadratic, and Exponential Models – (Standard Area, Grade Level, Standard #)

F-LE-6:	Apply quadratic equations to physical problems, such as the motion of an object under the force of gravity.

Geometry – C – Circles

C-5:	Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, and define the radian measure of the angle as the constant of proportionality; derive the formula for the area of a sector.

Geometry – G-GPE – Expressing Geometric Properties with Equations – (Standard Area, Grade Level, Standard #)

G-GPE-4:	Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, Ã3) lies on the circle centered at the Origin and containing the point (0, 2).
G-GPE-5:	Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).
G-GPE-6:	Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

Geometry – G-MG – Modeling with Geometry – (Standard Area, Grade Level, Standard #)

G-MG-1:	Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder.
G-MG-3:	Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios)

Geometry – G-CO – Congruence – (Standard Area, Grade Level, Standard #)

G-CO-12:	Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

Geometry – G-GMD – Geometric Measurement and Dimensions – (Standard Area, Grade Level, Standard #)

G-GMD-5:	Determine how changes in dimensions affect the perimeter, area, and volume of common geometric figures and solids.

Numbers and Quantities – N-Q – Quantities – (Standard Area, Grade Level, Standard #)

N-Q-1:	Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
N-Q-2:	Define appropriate quantities for the purpose of descriptive modeling.
N-Q-3:	Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

Numbers and Quantities – N-CN – Complex Number System – (Standard Area, Grade Level, Standard #)

N-CN-4:	Represent complex numbers on the complex plane in rectangular and polar form (including real and imaginary numbers), and explain why the rectangular and polar forms of a given complex number represent the same number.
N-CN-5:	Represent addition, subtraction, multiplication, and conjugation of complex numbers geometrically on the complex plane; use properties of this representation for computation. For example, $(-1 + -\tilde{A}3\ i) = 8$ because $(-1 + -\tilde{A}3\ i)$ has modulus 2 and argument 120°.
N-CN-6:	Calculate the distance between numbers in the complex plane as the modulus of the difference, and the midpoint of a segment as the average of the numbers at its endpoints.

Statistics and Probability – S-ID – Interpreting Categorical and Quantitative Data – (Standard Area, Grade Level, Standard #)

S-ID-1:	Represent data with plots on the real number line (dot plots, histograms, and box plots).

Statistics and Probability – S-MD – Using Probability to Make Decisions – (Standard Area, Grade Level, Standard #)

S-MD-1:	Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
S-MD-6:	Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).

California State History - Social Science Standards

American Democracy – AD – (Standard Area, Grade Level, Standard #)

AD 12.8.2:	Describe the roles of broadcast, print, and electronic media, including the Internet, as means of communication in American politics.
AD 12.8.3:	Explain how public officials use the media to communicate with the citizenry and to shape public opinion.

World History – WH – (Standard Area, Grade Level, Standard #)

WH 10.11:	Students analyze the integration of countries into the world economy and the information, technological, and communications revolutions (e.g., television, satellites, computers).

Next Generation Science Standards:

Scientific and Engineering Practices

SEP 1	Asking questions (for science) and defining problems (for engineering)
SEP 2	Developing and using models
SEP 3	Planning and carrying out investigations
SEP 4	Analyzing and interpreting data
SEP 5	Using mathematics and computational thinking
SEP 6	Constructing explanations (for science) and designing solutions (for engineering)
SEP 7	Engaging in argument from evidence
SEP 8	Obtaining, evaluating, and communicating information

Disciplinary Core Ideas

PS2-1:	Analyze data to support the claim that Newton's second law of motion describes the mathematical relationship among the net force on a macroscopic object, its mass, and its acceleration.
PS2-2:	Use mathematical representations to support the claim that the total momentum of a system of objects is conserved when there is no net force on the system.
PS2-3:	Apply scientific and engineering ideas to design, evaluate, and refine a device that minimizes the force on a macroscopic object during a collision.
PS2-4:	Use mathematical representations of Newton's Law of Gravitation and Coulomb's Law to describe and predict the gravitational and electrostatic forces between objects.
PS3-2:	Develop and use models to illustrate that energy at the macroscopic scale can be accounted for as a combination of energy associated with the motions of particles (objects) and energy associated with the relative position of particles (objects).
PS4-1:	Use mathematical representations to support a claim regarding relationships among the frequency, wavelength, and speed of waves traveling in various media.
PS4-3:	Evaluate the claims, evidence, and reasoning behind the idea that electromagnetic radiation can be described

	either by a wave model or a particle model, and that for some situations one model is more useful than the other.
PS4-4:	Evaluate the validity and reliability of claims in published materials of the effects that different frequencies of electromagnetic radiation have when absorbed by matter.
PS4-5:	Communicate technical information about how some technological devices use the principles of wave behavior and wave interactions with matter to transmit and capture information and energy.
ESS3-6:	Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.