

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT

AP COMPUTER SCIENCE PRINCIPLES

Date: January 2016

Proposed Grade Level(S): 10/11

Grading: A-F

Course Length: Term or 1 Year

Subject Area: CTE

Credits: 5 per semester

CTE sector / pathway: Information and Communications Technologies / Software and Systems Development

prerequisite: Grade C or better in Math 1

Intent to Pursue 'A-G' College Prep Status: Yes

COURSE DESCRIPTION:

Computer Science is an introductory course in methods to solve computing type problems and programming solutions. The majority of the class will focus on clearly defining problems, developing solutions, and how best to implement the solutions using computer technologies. In order to implement solutions, students will be introduced to programming methodologies and design principles. Students will develop an understanding of the impact different algorithms have on efficiency and performance. They will also develop an understanding of several programming languages; the role computational thinking plays in solving problems, and how to apply programming principles.

GENERAL GOALS/ESSENTIAL QUESTIONS:

By the end of the course students will:

- Solve computer related problems using protocols and algorithms.
- Be introduced to code writing, networking concepts, privacy, and security involving Web applications.
- Understand fundamental computer science concepts like objects, classes, and efficiency.
- Understand tools like HTML and CSS to create Web pages.
- Use and be familiar with the Python programming language.
- Be introduced to concepts in discrete mathematics, data visualization, and computational thinking.
- Develop an understanding of the concepts of state maps, probability, computability, and artificial intelligence.

CCSS READING COMPONENT:

Students will be required to:

- Use the internet to read, comprehend, and research programming language documentation.
- Read and comprehend test questions and answers.
- Read articles, programs, and handouts dealing with current programming concepts.

CCSS WRITING COMPONENT:

Students will be required to:

- Create and document protocols to solve various problems.
- Document developed software code.
- Describe algorithms and outcomes based on given scenarios.

CCSS SPEAKING AND LISTENING COMPONENT:

Students will be required to:

- Respond to questions and participate in class discussions.
- Participate in small groups to determine creative solutions to problems using techniques like brainstorming.
- Present creative solutions for given problems in a descriptive, persuasive, and informative way.

CTE CONTENT STANDARDS TO BE ADDRESSED:

Information and Communication Technologies Sector: Software and Systems Development Pathway

B1.0

Identify and describe the principles of networking and the technologies, models, and protocols used in a network.

B1.1

Define the terminology used in the design, assembly, configuration, and implementation of networks.

B1.2

List the fundamental elements of the major networking models established by the industry standards of recognized organizations: the Open System Interconnect (OSI) or transmission-control/Internet protocol (TCP/IP) models.

B1.3

Identify and explain how data, voice, and video/communications are carried through the most common network media.

B1.4

List the characteristics, advantages, and disadvantages of the various networking presentation functions, data formatting, data encryption, and data compression.

B1.5

Explain the characteristics of networking hardware and applications and the methods to deploy them

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.

C1.3

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.

C2.2

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

C3.1

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

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 programming.

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 queues, sorting, and searching algorithms.

C4.11

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

DETAILED UNITS OF INSTRUCTION:

Unit 1: Digital Information

This unit explores the technical challenges and questions that arise from the need to represent digital information in computers and transfer it between people and computational devices. Students will create and use protocols to show understanding and problem solving with these technical challenges.

Unit 2: The Internet

In this unit, students extend their understanding of the internet and how it functions by building off the concepts learned in Unit 1. The unit explores the structure and design of the internet and the implications

of those design decisions including the reliability of network communication, the security of data, and personal privacy. Topics include the Internet Protocol (IP), DNS, TCP/IP, cryptography, HTML, CSS and other security and hacking concerns.

Unit 3: Programming

This unit introduces the foundational concepts of computer programming and algorithms. It will emphasize how computational thinking affects every discipline, as computational thinking can put existing code to great use. Students will utilize the Python programming language in order to better understand how to implement and use algorithms to solve problems.

Unit 4: Data

Students will analyze problems through the use of data visualization; understand the implications of data mining with regard to security risks, privacy implications and storage; use APIs to access big data and create programs to extract data and then sort and clean the data.

TEXTBOOKS AND RESOURCE MATERIALS:

No textbooks are required. Resources include access to computers and the internet.

COMMON CORE STANDARDS TO BE ADDRESSED:

Common Core Standards Addressed for Course:

- CCSS.ELA-Literacy.CCRA.R.1 Read closely to determine what the text says explicitly and to make logical inferences from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text.
- CCSS.ELA-Literacy.CCRA.R.2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.
- CCSS.ELA-Literacy.CCRA.W.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.W.6 Use technology, including the Internet, to produce and publish writing and to interact and collaborate with others.
- CCSS.ELA-Literacy.CCRA.W.7 Conduct short as well as more sustained research projects based on focused questions, demonstrating understanding of the subject under investigation.
- CCSS.ELA-Literacy.CCRA.W.8 Gather relevant information from multiple print and digital sources, assess the credibility and accuracy of each source, and integrate the information while avoiding plagiarism.
- CCSS.ELA-Literacy.CCRA.W.10 Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.
- CCSS.ELA-Literacy.CCRA.SL.1 Prepare for and participate effectively in a range of conversations and collaborations with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
- CCSS.ELA-Literacy.CCRA.SL.2 Integrate and evaluate information presented in diverse media and formats, including visually, quantitatively, and orally.

- CCSS.ELA-Literacy.CCRA.SL.4 Present information, findings, and supporting evidence such that listeners can follow the line of reasoning and the organization, development, and style are appropriate to task, purpose, and audience.
- CCSS.ELA-Literacy.CCRA.SL.5 Make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
- CCSS.ELA-Literacy.CCRA.L.6 Acquire and use accurately a range of 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 encountering an unknown term important to comprehension or expression.
- CCSS.Math.Practice.MP1 Make sense of problems and persevere in solving them.
- CCSS.Math.Practice.MP2 Reason abstractly and quantitatively.
- CCSS.Math.Practice.MP3 Construct viable arguments and critique the reasoning of others.
- CCSS.Math.Practice.MP4 Model with Mathematics.
- CCSS.Math.Practice.MP5 Use appropriate tools strategically.
- CCSS.Math.Content.HSF-BF.A.1a Building Functions - Write a function that describes a relationship between two quantities: Determine an explicit expression, a recursive process, or steps for calculation from a context.
- CCSS.Math.Content.HSS-ID.A.13 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Represent data with plots on the real number line (dot plots, histograms, and box plots).
- CCSS.Math.Content.HSS-ID.A.3 Interpreting Categorical and Quantitative Data - Summarize, represent, and interpret data on a single count or measurement variable: Interpret differences in shape, center, and spread in the context of data sets, accounting for possible effects of extreme data points (outliers).
- CCSS.Math.Content.HSS-CP.A.1 Conditional Probability and the Rules of Probability - Understand independence and conditional probability and use them to interpret data: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events ("or" and "not").
- CCSS.Math.Content.HSS.IC.B.6 Evaluate reports based on data.
- CCSS.MATH.CONTENT.HSN.Q.A.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.
- CCSS.MATH.CONTENT.HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

DISTRICT ESLRs TO BE ADDRESSED:

Students will be:

- **Self-Directed Learners:** Students will utilize their knowledge of algorithms and computing principles to solve problems which have many possible solutions. This requires them to propose a solution, test, and verify the solution without the clarity of a predetermined answer.
- **Effective Communicators:** Solutions to problems will need to be solved within a group setting where communication will be the key to success. They will also learn how to effectively communicate between computer programs and the end user, and how best to request information, display information, and interpret that information.
- **Quality Producers/Performers:** Because proposed problems will have many possible solutions, students will be competing to provide the most creative, efficient, or exact solutions. How they arrive at the answer will be as important as the answer itself.
- **Constructive Thinkers:** Using the fundamentals of computer science and the concepts of computational thinking, students will be provided new tools to solve not only computer related problems but also problems related to many other disciplines.
- **Collaborative Workers:** Students will be working to solve problems in small groups where they as a team will work to develop their unique solution. They will need to establish team norms and processes to function effectively and resolve the problem in a timely manner.
- **Responsible Citizens:** Students will develop and practice processes to resolve conflicts within their groups, reach consensus, and agree to a final solution. These are all characteristics of a responsible citizen.

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