

Course Title: Exploring Computer Science

Department: Business/Visual Arts

Course #: 7570

Grade Level/s: 9-12

Length of Course: 1 year

Prerequisite/s: None

UC/CSU (A-G) Req: (G) Elective

Brief Course Description: The Exploring Computer Science course is shaped by four intertwined elements: curricular materials, professional development, assessments, and local policy support. The course forwards a new orientation to computer science classrooms, one shaped with an interweaving of learning foundational computer science concepts while developing the computational practices that support an inquiry approach to solving problems and creating artifacts.

Exploring Computer Science teaches the creative, collaborative, interdisciplinary, and problems solving nature of computing with instructional materials that feature an inquiry-based approach to learning and teaching. As part of this course, students will delve into real-world computing problems that are culturally relevant, and address social and ethical issues while delivering foundational computer science knowledge. Students will engage in several in-depth projects to demonstrate real-world applications of computing. Students connect their informal knowledge, technology skills, and beliefs about computing to the theoretical and foundational tenets of computer science. The interdisciplinary nature of computing allows for the incorporation of subject-matter topics across various disciplines.

I. GOALS

The students will:

- A. Understand the major components of computers and their applications
- B. Use technology as a tool for problem solving
- C. Understand ethical and societal issues related to computing and computing careers

- D. Understand real-world technology problems
- E. Develop connections between mathematics and computer science
- F. Understand web design, data analysis, and programming techniques and technologies
- G. Understand the effects and dynamics of developments in computing
- H. Demonstrate appropriate use of technology in a variety of situations
- I. Demonstrate the ability to use a variety of job-related computer skills

II. OUTLINE OF CONTENT FOR MAJOR AREAS OF STUDY

Semester 1

- A. Computers and the Internet
 - 1. Hardware components
 - 2. Software components
 - 3. Interaction of components
 - 4. Selection of appropriate components
 - 5. Search engine fundamentals
 - 6. Collaborative tools
 - 7. Evaluating websites
 - 8. Security on the Internet
- B. Models of Intelligent Behavior
 - 1. What is intelligence?
 - 2. Computers vs. Humans
- C. Algorithms and Abstraction
 - 1. Understanding the problem
 - 2. Exploring problems: problem solving heuristics and strategies
 - 3. Design, creation and representation
 - 4. Problem data
 - 5. Solution accuracy
 - 6. Design, re-evaluation and refinement
 - 7. Decompose the complex
 - 8. Communicate results
 - 9. Algorithm efficiency
 - 10. Computational intensive problems
- D. Connections between Mathematics and Computer Science
 - 1. Logic
 - 2. Binary number system
 - 4. Basic sets
 - 5. Concepts of functions
 - 6. De Morgan's Law
 - 7. Graphs

Semester 2

- A. Creating Computational Artifacts (web pages, programs and robots)
 - 1. Break problem statements into specific requirements
 - 2. Design and develop solutions to problems
 - 3. Choose appropriate tools and techniques
 - 4. Code solutions from designs
 - 5. Test solutions to identify errors
 - 6. Refine solutions
 - 7. Documentation and justification
- B. Data and Information
 - 1. Representation and storage
 - 2. Methods for collection and generation
 - 3. Patterns, trends and discoveries
 - 4. Evaluation
 - 5. Computational models
 - 6. Rapid testing
- C. Societal Impacts of Computing
 - 1. Fostering innovation
 - 2. Legal and ethical concerns
 - 3. Exploitation of information
 - 4. Intellectual property
 - 5. Limits on information access
 - 6. Cultural influence
 - 7. Equity, access and power
 - 8. Social and economic values

III. ACCOUNTABILITY AND DETERMINANTS

- A. Key Assignments
 - 1. Daily participation, class discussion and collaborative work
 - 2. Homework to include reading, research and review
 - 3. Class assignments to include group and individual projects
 - 4. Quizzes based on readings, key terms and projects
 - 5. End of unit exams and/or end of unit projects
- B. Assessment Methods
 - 1. Internal Assessments
 - 2. Use of assessments to guide instruction

IV. INSTRUCTIONAL MATERIALS AND METHODOLOGIES

- A. Required Textbook(s):

None
- B. Supplementary Materials:
 - 1. Scratch programming language available at <http://www.scratch.mit.edu>.
 - 2. Internet browser, websites, and Internet tools

Course Title: Exploring Computer Science

C. Methodologies

All instructional methodologies address adaptations necessary for special needs learners and English Language Learners.

1. Group projects/presentations
2. Class discussions
3. Student presentations
4. Simulation activities
5. Close reading
6. Collaborative peer review
7. Teacher and student lead inquiry
8. Flowchart development