MODESTO CITY SCHOOLS

COURSE OUTLINE

COURSE TITLE: Exploring Computer Science

COURSE NUMBER:

RECOMMENDED GRADE LEVEL: 9 - 10

ABILITY LEVEL: Unsectioned

DURATION: One year

CREDIT: 5 units per semester

GRADING FORMAT: Standard

MEETS GRADUATION REQUIREMENTS: Practical Arts, Elective

REQUIRED FOR GRADUATION:

CBEDS CODE:

MEETS UC AND CSU ENTRANCE REQUIREMENTS: Yes, "g" requirement

CREDENTIAL REQUIREMENTS:

REPLACES:

Course Description:

Exploring Computer Science is a way to make computer science education fun and accessible, equipping students with the necessary skills for the current and future job market. Students learn best when they have a meaningful experience and are interested in the topic. Exploring Computer Science provides students with opportunities for problem solving, designing, collaborating, critical thinking, and communicating. Students will learn perseverance, developing concepts and working through challenges to develop their ideas and understanding of how technology works through authentic real-world projects. Students will be introduced to the central ideas of computer science, inviting students to develop the computational thinking vital for success across multiple disciplines, and giving everyone the chance to learn coding, a skill that provides limitless creative opportunity.

Recommended Prerequisites: Currently enrolled in Secondary Math I

Date Aligned with State Standards:

Board Approved:

REQUIRED TEXTBOOK (Title, publisher, year): Exploring Computer Science Curriculum (Latest Version)

INSTRUCTIONAL MATERIALS

This course does not designate one particular programming language or robotics kit. Teachers have the flexibility to choose a coding curriculum, programming language, or robotics kit that is most appropriate for their students to use in the classroom.

Coding Curriculum

Teachers have the flexibility to select the best material for their students' needs.

REQUIRED TEXT(S):

      Exploring Computer Science (Version 8.0), Chapman, Gail & Goode, Joanna, University of Oregon, 2018

SUPPLEMENTARY TEXT(S):

      CodeHS.com Online Curriculum
      + Introduction to Python
      + Introduction to JavaScript
      Web Design
      Cybersecurity
      ~ CodeAvengers.com
      ~ CodeCombat.com
      ~ PlayCodeMonkey.com
      ~ Codesters.com
      ~ Code.org
      ~ Dash (dash.genera.ly)
      ~ An Introduction to Programming Using Python (Textbook)
      ~ An Introduction to Programming Using Visual Basic (Textbook)

Robotic Kits

      ~ Dexter Industries: Raspberry Pi Robots
      ~ Barobo: Linkbots
      ~ Lego: Mindstorms
      ~ Pitsco: Tetrix
      ~ VEX Robotics

Accessories (Chips, Parts, and Sensors)

      ~ Adafruit
      ~ Arduino
      ~ Micro:Bit
      ~ Raspberry Pi
      ~ Supply of Batteries

INSTRUCTIONAL MATERIALS (continued)

Curriculum, robotic Kits and Accessories may vary and/or change according to licensing, software availability, and keeping up with industry trends/standards. There are a number of other online materials available, as well as other robotics kits and supplies, which can aid with learning.

<u>Sources</u>

~ Exploringcs.org
~ Code.org
~ CodeHS.com
~ AP College Board
~ K-12 CA Computer Science Standards

Exploring Computer Science

Course Overview

Here in the 21st century, understanding technology is a foundational skill, just like reading and writing. Coding is the language used for creating technology. Computer Science is the fastest growing profession with opportunities in every field. Exploring Computer Science is a course to make computer science education fun and accessible, equipping students with the necessary skills for the current and future job market. The course introduces students to the central ideas of computer science, inviting students to develop the computational thinking vital for success across multiple disciplines, and giving everyone the chance to learn coding, a skill that provides limitless creative opportunity.

Course Prerequisites

It is recommended that a student in this course should be concurrently enrolled in a first-year high school algebra (Secondary Math I) course with a strong foundation in basic algebraic concepts dealing with function notation, such as $(x) = x + 2$, and problem-solving strategies that require multiple approaches and collaborative efforts. In addition, students should be able to use a Cartesian (x, y) coordinate system to represent points on a plane. It is important that students understand that any significant computer science course builds on a foundation of mathematical reasoning.

Course Outline

Unit 1: Human-Computer Interaction

In this unit students are introduced to the concepts of a computer and computing, while investigating the major components of computers and the suitability of these components for particular applications. Students will experiment with internet search techniques, explore a variety of websites and web applications and discuss issues of privacy and security. Fundamental notions of Human Computer Interaction (HCI) and ergonomics are introduced. Students will learn that "intelligent" machine behavior is not "magic," but is based on algorithms applies to useful representations of information, including large data sets.

Students will learn the characteristics that make certain tasks easy or difficult for computers, and how these differ from those that humans characteristically find easy or difficult. Students will gain an appreciation for the many ways in which computing-enabled innovation have had an impact on society, as well as for the many different fields in which they are used. Connections among social, economic, and cultural contexts will be discussed.

Unit 2: Problem Solving

This unit provides students with opportunities to become "computational thinkers" by applying a variety of problem-solving techniques as they create solutions to problems that are situated in a variety of contexts. The range of contexts motivates the need for students to think abstractly and apply known algorithms where appropriate, but also create new algorithms. Analysis of various solutions and algorithms will highlight problems that are not easily solved by computer and for which there are no known solutions. This unit also focuses on the connections between mathematics and computer science. Students will be introduced to selected topics in discrete mathematics including Boolean logic, functions, graphs, and the binary number system. Students are also introduced to searching and sorting algorithms and graphs.

Unit 3: Web Design

This section prepares students to take the role of a developer by expanding their knowledge of algorithms, abstraction, and web page design and applying it to the creation of web pages and documentation for users and equipment. Students will explore issues of social responsibility in web use. They will learn to plan and code their web pages using a variety of techniques and check their sites for usability.

Students learn to create user-friendly websites. Students will apply fundamental notions of Human Computer Interaction (HCI) and ergonomics.

Unit 4: Computer Programming

Students are introduced to some basic issues associated with program design and development. Students design algorithms and create programming solutions to a variety of computational problems using an iterative development process in Scratch. Programming problems include mathematical and logical concepts and a variety of programming constructs.

Unit 5: Computing and Data Analysis

In this unit students explore how computing has facilitated new methods of managing and interpreting data. Students will use computers to translate, process, and visualize data in order to find patterns and test hypotheses. Students will work with a variety of large data sets that illustrate how widespread access to data and information facilitates identification of problems. Students will collect and generate their own data related to local community issues and discuss appropriate methods for data collection and aggregation of data necessary to support making a case or facilitating a discovery.

Unit 6: Robotics/Textiles

This unit introduces robotics as an advanced application of computer science that can be used to solve problems in a variety of settings from business to healthcare and how robotics enables innovation by automating processes that may be dangerous or otherwise problematic for humans. Students explore how to integrate hardware and software in order to solve problems. Students also explore electronic textiles (e-textiles): articles of clothing, accessories, or home furnishings with embedded electronic and computational elements. Students will see the effect of software and hardware design on the resulting product. Students will apply previously learned topics to this unit.

Computer Science's Evolving Topics

As computer science is constantly growing and evolving, the teacher may find it suitable to explore other computer science topics, such as (to name a few) Virtual and Augmented Reality, Artificial Intelligence, Big Data, Internet of Things, Self-Driving Vehicles, Digital Studio, and 3D Design and Printing.

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TEXTBOOK ADOPTION

NAME OF BOOK: Exploring Computer Science (Version 8.0)

AUTHOR(S):   Chapman, Gail & Goode, Joanna

PUBLISHER: University of Oregon

COPYRIGHT DATE: 2018

ISBN #:   N/A – Digital File/PDF from ExploringCS.org

PRICE: $0

DEPARTMENT:

CLASS:

GENERAL DESCRIPTION:

Exploring Computer Science is a high school introduction to the world of computer science and problem solving. It is a yearlong course consisting of 6 units, approximately 6 weeks each. The curriculum package comes with daily instructional lesson plans for teachers, plus supplemental extension resources.

ASSURANCE OF SOCIAL APPROPRIATENESS: The selection committee has determined that the materials comply with the State of California Standards for Evaluation of Instructional Materials with Respect to Social Content.

APPROVED BY:

Selection Committee:
Andrew W. Johnson, Matthew Ketchum, Bill Flesher, Brandon Harker

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Curriculum Area Chairperson   Brad T. Goudeau
                                        Senior Director, Educational Services