

FOLSOM CORDOVA UNIFIED SCHOOL DISTRICT



Programming Algorithms Using Python

Board Approval Date: November 16, 2023	Course Length: 2 Semesters
Grading: A-F	Credits: 5 Credits per Semester
Proposed Grade Level(s): 11, 12	Subject Area: Elective Elective Area (if applicable): Career Technical Education
Prerequisite(s): AP Computer Science Principles	Corequisite(s): N/A
CTE Sector/Pathway: Information & Communications Technologies / Systems Programming	
Intent to Pursue 'A-G' College Prep Status: Yes	
A-G Course Identifier: (c) Mathematics, (d) Laboratory Science, (g) College-preparatory elective	
Graduation Requirement: No	
Course Intent: District Course Program (if applicable): CTE	
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COURSE DESCRIPTION:

This course first introduces students to the Python programming language then applies computational problem-solving skills in a variety of application areas. Units will apply computation thinking to such areas as art, science, music, math, game design, machine learning and artificial intelligence. Problems will be solved using the Python programming language.

DETAILED UNITS OF INSTRUCTION:

Unit Number/Title	Unit Essential Questions	Examples of Formative Assessments	Examples of Summative Assessment
1. Introduction to Python	How can students use if or else statements to control programs? How can functions be called from various locations in a program? How can students use loops to control iteration? How can students use lists to reduce the complexity of their programs? How do dictionaries affect the efficiency of a program?	*Create a program to have a snake grow and continuously loop the eggs based on the mouse input *Create a program to change the armor of the knight	*Create a program from scratch that includes the use of three of these four concepts (Concepts are: If Else statement, a loop, a list, or a dictionary)
2. Art	How to apply perception to a picture using a program? How to apply color to a picture using a program? Why do we use motion to enhance art? What are ways to simulate motion using a program? What is procedural generation? How to create complex curves using simple curves? What is emergent behavior and how do we use it with programs? Why is Conway's Game of Life an example of emergent behavior?	*Create an island with grass using procedural generation. Grass can only be placed where the island does not touch water. *Using the provided code create a realistic landscape	*Create a piece of digital art which displays an example of emergent behavior
3. Object	What separates object-	*Complete the program	*Define a class called

Oriented Programming	<p>oriented programming from procedural programming?</p> <p>How are classes created?</p> <p>How are super classes different from child classes?</p>	<p>displaying a landscape so that the trees change as the season changes</p> <p>*Add a storm cloud as a child of clouds so that lighting randomly is displayed</p>	<p>Dog that has instance variables name, size and color</p> <p>*Additionally define three methods in the class: eat (), bark (), and run()</p> <p>*Then use the class in place dogs into a kennel with rooms that are for large, medium, and small dogs</p>
4. Game Development	<p>What is the purpose of MVP (Minimum Viable Product)?</p> <p>What is a Core Mechanic?</p> <p>How do you implement animation in a program?</p> <p>How is the game design development process implemented in a project cycle?</p> <p>How are states used in a game program?</p> <p>What is the purpose of stages?</p> <p>What aspects of aesthetics are important in game design and why?</p> <p>How are non-playable characters developed?</p> <p>What are the challenges of multiplayer and 3D games?</p>	<p>*The formative assessments will take place as the students build the platformer game over three separate assignments.</p>	<p>*Students will be asked to develop a game collaboratively.</p> <p>*They will need to use the game design development process in order to produce a game with one player, who can win and score points, move through several stages and track's high scores.</p>
5. Science and Simulation	<p>What is a Monte-Carlo simulation?</p> <p>Why is it useful to learn?</p> <p>What is a Monte Hall simulation?</p> <p>Why is it useful to learn?</p> <p>How are Dynamic Simulations developed?</p> <p>What are the impacts of errors or miscalculations?</p> <p>How is gravity and force programmed?</p> <p>How are large numbers dealt with in programming</p>	<p>*Complete a drawing of a double stranded DNA</p> <p>*Program a simulation of mosquito's growth over time</p>	<p>*Create a simulation in one of three fields: Ecology, Genetics, or Astrophysics</p>

	<p>languages?</p> <p>How do you simulate two bodies and three bodies in motion?</p> <p>How does programming help solve problems using DNA?</p> <p>Why is this considered bioinformatics?</p> <p>Why do we use simulations to study organisms in their environment?</p>		
6. Artificial Intelligence	<p>Describe how programs learn?</p> <p>How does data help make decisions?</p> <p>How does distance help measure similarity?</p> <p>How do computers make predictions?</p> <p>How are parameters for linear models found?</p> <p>How do Neural networks help to solve more complicated problems?</p>	<p>*Complete the program to classify a perfume based on its smell</p> <p>*Complete the simulation of sipping a drink</p>	<p>*Using one of the methods discussed in this unit, develop a problem on the topic of your choosing and attempt to solve it</p>
7. Music	<p>How is music generated using programming?</p> <p>How and why are harmony, rhythm and melody used to produce music?</p> <p>What is the relationship of scales and motifs to melody?</p>	<p>*Use the existing code to complete the playing of the drum sequence provided</p> <p>*Create a song using the provided scales, adjusting the pitch and octave</p>	<p>*Create a melody generator by combining all the notes (from section 8.4)</p> <p>*Then generate melodies to build a full song by adding in drums, bass, and even harmony (Generating a second melody in the same scale as the first can give a verse-chorus structure to your song.)</p>

ESSENTIAL STANDARDS:

C1.0 Identify and apply the systems development process.
C2.0 Define and analyze systems and software requirements.
C3.0 Create effective interfaces between humans and technology.
C4.0 Develop software using programming languages.
C5.0 Test, debug, and improve software development work.
C6.0 Integrate a variety of media into development projects.
C10.0 Develop intelligent computing

RELEVANT STANDARDS AND FRAMEWORKS, CONTENT/PROGRAM SPECIFIC STANDARDS:

Link to Common Core Standards (if applicable):

Educational standards describe what students should know and be able to do in each subject in each grade. In California, the State Board of Education decides on the standards for all students, from kindergarten through high school.

<https://www.cde.ca.gov/be/st/ss/documents/finalelaccsstandards.pdf>

Link to Framework (if applicable):

Curriculum frameworks provide guidance for implementing the content standards adopted by the State Board of Education (SBE). Frameworks are developed by the Instructional Quality Commission, formerly known as the Curriculum Development and Supplemental Materials Commission, which also reviews and recommends textbooks and other instructional materials to be adopted by the SBE.

Link to Subject Area Content Standards (if applicable):

Content standards were designed to encourage the highest achievement of every student, by defining the knowledge, concepts, and skills that students should acquire at each grade level.

<https://www.cde.ca.gov/ci/ct/sf/documents/ctescrpflyer.pdf>

<https://www.cde.ca.gov/ci/ct/sf/documents/infocomtech.pdf>

Link to Program Content Area Standards (if applicable):

Program Content Area Standards apply to programs such as International Baccalaureate, Advanced Placement, Career and Technical Education, etc.

<https://www.cde.ca.gov/ci/ct/sf/documents/infocomtech.pdf>

TEXTBOOKS AND RESOURCE MATERIALS:

Textbooks

Board Approved	Pilot Completion Date (If applicable)	Textbook Title	Author(s)	Publisher	Edition	Date
<i>Updated Text will be approved with</i>		<i>Fundamentals of Python: First Programs</i>	Ken Lambert	Cengage Learning	2nd	<i>1/1/2019</i>

<i>approval of this outline</i>						
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Other Resource Materials

Carnegie Mellon online Computer Science Course 2, Anaconda Python toolkit. Replit online IED

Supplemental Materials

Board approved supplemental materials (Including but not limited to: Film Clips, Digital Resources, Supplemental texts, DVDs, Programs (Pebble Creek, DBQ, etc.):

N/A