YOSEMITE REGIONAL OCCUPATIONAL PROGRAM

Pre-Engineering Programming in C/C++ Mathematics

Course ID: 14013

CBEDS Code: 4619

JOB TITLES	<u>DOT NO.</u>
Electrical Engineering Technicians	17-3023.03
Surveying Technicians	17-3031.01
Maintenance and Repair Workers, General	49-9071.00
Architectural and Engineering Managers	11-9041.00
Computer Systems Analyst	15-1121.00
Computer Programmers	15-1131.00

Course description:

In this course students will obtain a computer literacy that goes well beyond that of a typical computer user. Students will understand how a computer works, and therefore be able to control the computer rather than simply react to it. Students will learn to use an integrated development environment for computer programming in C\C++ with mathematics. To attain these goals students will have to use critical thinking, problem solving, effective communication, and team work. Modular robots will be used so that students can see further application of programming. This course emphasizes object-oriented programming methodology with a concentration on problem solving and algorithm development, it also includes the study of data structures.

Recommended Prerequisites: Grade 11, 12

DURATION: 2 semesters

CREDIT: 5 units per semester

SCHOOLS OFFERED: Beyer, Davis, Downey, Enochs, Gregori, Johansen, Modesto

MEETS UNIVERSITY OF CALIFORNIA ENTRANCE REQUIREMENTS:

MEETS CALIFORNIA STATE UNIVERSITY REQUIREMENTS:

ARTICULATED WITH POSTSECONDARY INSTITUTIONS: No

RECOMMENDED INSTRUCTIONAL RESOURCES

Basic Text(s):

Learning C Programming Using C/C++ Interpreter Ch for the Absolute Beginner: An Introduction to Computer Science

Supplementary Text(s):

Learning Algebra Using C/C++ Interpreter Ch

Instructional Content	Student Outcomes				Hours
Instruction will include:	At the end of instruction, the		C	UL=U	assroom
	student will be able to:	Australi			n. Class.
1. Introduction to computers:	the uses of CPU Main Memory and External	CR	ICT	υL	LL
	Software, Machine code and Assembly	5.1	C4.1		
	language and Computer Programming		C4.4		
	Languages.	CR	C4.6		
	A. Understand different types of memory a	4			
	1 Code area				
	2. Global area				
	3. The heap				
	B. Student will work in different number				
	bases				
	a. Binary				
	b. Hex				
	C. Student will read and understand a				
	doals.				
2. Writing the First C Program	Goal: Students will recognize the format and	7.0	C3.1		
	syntax of a simple C program and apply this	CR	C4.6		
	knowledge to:	4 and 1			
2 Variables Data Turnes and Input/Output	A. Enter, edit and execute programs.	2.4	C1.6		
5. Variables, Data Types and inputOutput	types of variables in a C program and the	2.4 5.8	C4.0 C4.9		
	needs for these differences.	5.7	C5.6		
	A. Demonstrate the process of declaring	CR	C3.1		
	and initializing variables before they are	1			
	used.				
	B. Demonstrate use of debugging tools to				
	C. Describe data structures and their				
	appropriate use				
	D. Demonstrate use of standard				
	representation of integers, real				
	numbers, Boolean logical integers		C2.2		
	E. Demonstrate the difference between syntax errors vs algorithmic or logic				
	errors in the debugging process.				
4. Operators and Expressions:	Goal: Students will understand Operators and	5.8	C4.6	CL	CC
	Expressions	2.5	C8.3		
	A. Develop code to apply arithmetic	05	C10.4		
	operators to accomplish a C program				
	Multiplication Division	I			
	B. Use relational operators to test				
	relationships between values and				
	variables.				
	C. Demonstrate logical operators to test				
	Relationships between the results of two or more relational operators				
	D Demonstrate compound	57	C4 6		
	assignment operators as a shortcut	0.1	C4.4		
	when modifying the value of a variable	CR			
	E. Demonstrate increment an	1			
	decrement operators to add				
	of subtract values from/to a variable				

Instructional Content Instruction will include:	Student Outcomes At the end of instruction, the			CL=C	Hours lassroom
	student will be able to:		C	C=Com	m. Class.
4. Operators and Expressions: (continued)	 F. Demonstrate compound assignment operators as a shortcut when modifying the value of a variable. E. Demonstrate increment an decrement operators to add or subtract values from/to a variable 	Anchor/CR	CTE	CL	CC
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5. Introduction to the MoBot programming and The Robot Remote Control Program Configuring MoBots.	 Goal: Students will demonstrate ability to solve problems and think critically by completing challenging group and individual projects. A. Configure MoBots for remote control B. Demonstrate basic functions CMoBots C. Demonstrate Blocking and nonblocking motions D. Program multiple MoBots to perform identical tasks. 	5.1 5.4 2.1	B3.1 B4.0 B10.0 B3.4 C6.4 D6.7 C1.4		
6. Flowcharts, Making Decisions, Loops,	Goal: The student will understand the concept	5.3	C1.6		
and Random Numbers:	 of visually planning a computer program. A. Demonstrate use of graphical symbols to represent the actions and flow of a computer algorithm. B. Use selection/decision symbols in a flowchart. 	5.7 CR 1	C4.5		
7. Modular Programming with Functions,	Goal: The student will understand the concept		C4.6		
Standard C Header Files and Libraries	 of using functions to modularize a program. A. Incorporate a function prototype B. Demonstrate the concept of "void" type. C. Demonstrate CPlot graphical library to plot functions and computer generated data in different graphical formats E. Recognize there are several mathematical functions in a Standard C library 	A4.5	C4.7 C4.9		
8. Arrays for Data Processing:	 Goal: The student will demonstrate ability to write computer code A. Use computer code to initialize and assign values to an array B. Demonstrate structure of how an array is implemented in computer memory C. Write computer code D. Differentiate behavior of array variables against non-array variables when passed to a function 	A5.4 CR 1	C4.6 C4.9 C4.7		
9. Working with data files:	Goal: Students will demonstrate ability to	Anchor/CR	CTE	CL	CC
	 write code. A. Utilizing the FILE data type and functions "fopen()", "fclose()", "fgets()", "fscanf()", B. Plot graphs 	2.7 4.1	C4.6 C4.9		

Instructional Content Instruction will include:	Student Outcomes At the end of instruction, the		C	Hours CL=Classroom
10. Variables in Algebra and their applications in computing:	Goal: Students will understand systems of linear equations. A. Point slope, standard form B. Linear inequalities C. Polynomials	5.1 CR 1	C4.6 C4.9	
11. Exponential functions:	Goal: Students will demonstrate C algorithmsusing mathematical algorithmsA.Use the rules for radicals and exponentsB.Use general formulasC.Graph a system of equations in two variablesD.Write programs calculating the solutions to a quadratic equation			
12. Applications:	Goal: Students will demonstrate writing interactive code:A. Use of Pythagorean Theroem, plot scatter plots, answers area and perimeter questions, calculates distance, and compound interest	2.7 5.1 CR 1	10.4 4.6	
13. Impact of Computing:	Goal: Students will acquire an awareness and understanding of the ethical and social implications of computing systems. A. System reliability B. Privacy C. Legal issues D. Intellectual property E. Social & ethical ramifications of computer use	8.4 8.6 9.1 9.2 9.3 5.1 CR 8,7, and 4		