Indiana CTE

Computer Science II: Programming

Task Analysis

1 **Students evaluate the tasks a computer program is to perform.**

1. Differentiate between the different tasks a computer program should perform CS2P-1.1
2. Formulate solutions to the different tasks a computer program should perform CS2P-1.2
3. Interpret prior solutions; In case prior code and design could be reused CS2P-1.3

Problem Analysis

1 **Students analyze a problem and develop an advanced solution by creating a computer program.**

1. Recognize and explain how to use a computer program to solve a problem CS2P-2.1
2. Construct interactive computer programs that accept various forms of input and produce various forms of output, as a solution to an advanced computer programming problem CS2P-2.2
3. Use print charts, file layouts, program narratives, hierarchy charts, and system flowcharts, which accurately depict the problem assigned and describe the solution CS2P-2.3
4. Justify what programming methodology to use—object oriented or procedural CS2P-2.4
5. Appraise the program schematics and usage; document the program and describe its use CS2P-2.5
6. Recognize and explain the standard program flowchart symbols and use them correctly within the context of the basic control structures of sequence, selection and looping CS2P-2.6

Software Tools

1 **Students apply and adapt software tools to develop an advanced computer program.**

1 Construct an advanced program that processes information CS2P-3.1

2 Identify programming languages as procedural and object oriented CS2P-3.2

3 Recognize and explain class in object oriented programming CS2P-3.3

4 Recognize and explain object in object oriented programming CS2P-3.4

5 Recognize and explain method in object oriented programming CS2P-3.5

6 Recognize and explain instance variable in object oriented programming CS2P-3.6

7 Recognize and explain polymorphism in object oriented programming CS2P-3.7

8 Recognize and explain inheritance in object oriented programming CS2P-3.8

9 Recognize and explain overwriting methods in OOP CS2P-3.9

10 Recognize and explain encapsulation in computer programming CS2P-3.10

11 Apply and adapt at an advanced level fundamental programming concepts, including data types, control structures, methods, and arrays CS2P-3.11

12 Develop advanced programs using reusable modules (modularization) CS2P-3.12

13 Use advanced debugging techniques to correct and validate the computer program CS2P-3.13

14 Construct the program in a high-level programming language based on a created design CS2P-3.14

15 Determine how to integrate a computer program with a web browser CS2P-3.15

16 Determine how to use a common code/ GUI library CS2P-3.16

17 Identify controls (push buttons, entry fields, etc.), their properties, methods, and when to use each control CS2P-3.17

Algorithms

1 **Students design a solution to the problem using algorithms.**

1 Develop advanced algorithms to solve a computer programming problem(s) CS2P-4.1

2 Apply and adapt math operators in a computer program CS2P-4.2

3 Prescribe the use of algorithms to provide a solution to a programming problem CS2P-4.3

4 Use pseudo code to describe a solution to an advanced programming problem CS2P-4.4

5 Create a program flowchart and ANSI standard flowcharting symbols to define a solution to an advanced programming problem CS2P-4.5

6 Explain how the algorithm can be used to solve a problem CS2P-4.6

Program Development

1 **Students create an advanced functional computer program.**

1 Define the process of programming. For example: STAIR, Statement, Tools, Algorithm, Implement, and Refine CS2P-5.1

2 Create an advanced computer program that corresponds to an algorithm or proposed solution CS2P-5.2

3 Demonstrate programming structures CS2P-5.3

4 Appraise the use of data variables and constants CS2P-5.4

5 Appraise the use of local and global scope CS2P-5.5

6 Appraise the use of conditionals (IF statements) CS2P-5.6

7 Appraise the use of loops (while statements, for statements) CS2P-5.7

8 Use single and multidimensional Arrays CS2P-5.8

9 Create programmer defined functions and methods to break down the program logic and support reuse CS2P-5.9

10 Define the graphical user interface CS2P-5.10

11 Identify the parts of the programming platform CS2P-5.11

12 Identify different types of errors and handle them programmatically CS2P-5.12

13 Use the order of operations when using calculations CS2P-5.13

14 Construct an advanced computer program using proper condition and loop techniques CS2P-5.14

15 Use correct naming conventions in variable declarations, function declarations, class declarations, and other CS2P-5.15

Program Verification and Debugging

1 **Students prove that an advanced computer program solution works by using verification and debugging techniques.**

1 Predict and explain output CS2P-6.1

2 Identify cause/effect for input/output CS2P-6.2

3 Perform input validation CS2P-6.3

4 Scrutinize peers code for errors CS2P-6.4

5 Show the use of proper internal documentation and coding comments CS2P-6.5

Documentation

1 Students connect the associated task with the code by providing documentation.

1. Describe the function of an advanced computer program CS2P-7.1
2. Identify the purposes of an advanced computer program CS2P-7.2
3. Explain concepts related to an advanced computer program CS2P-7.3
4. Evaluate how to use an advanced computer program CS2P-7.4
5. Identify cause/effect by explaining input and output related to an advanced computer program CS2P-7.5
6. Interpret input/output of an advanced computer program CS2P-7.6