

# Computer Programming 12

**District Name:** Mission  
**District Number:** 75  
**Developed by:** Jeremy Ellis  
**School Name:** Heritage Park Secondary  
**Principal's Name:** Kevin Kaardal  
**Board/Authority Approval Date:** January 15, 2004

**Board/Authority Signature:**

**Course Name:** Computer Programming Levels C, D  
**Grade Level of Course:** 12  
**Number of Course Credits:** 2  
**Number of Hours of Instruction:** 60

**Prerequisite(s):** None.

**Special Training, Facilities or Equipment Required:**

Class set of Computers, web browser software (suggest IE 6 or greater). Teacher will need experience in: computer programming using either C++, JavaScript, Delphi, cSharp or some other object oriented programming language. (Note: This curriculum will concentrate on JavaScript while attempting to be compatible with other languages). Teacher may need experience with: web page design using HTML, web page programming using JavaScript and CGI style programming such as: CGI, PERL, PHP or ASP and experience with editing software and programming compilers.

**Course Synopsis:**

This set of four 2 credit courses is an introduction to the concepts, techniques and tools of computer programming. The courses are designed in 4 levels A = beginner, B = intermediate, C = advanced, D = Programmer, each level is worth 2 credits in which there may be students from any grade ranging from grade 10 to grade 12. The course is designed for those students who are intending to major in computer science or with interests in business, advanced science, web programming or game development. The course emphasizes a fundamental approach to problem analysis, algorithm development and top-down design.

**Rationale:**

These sets of courses are designed to be the introduction to the university level computer science curriculum. Although many programming languages may be taught, the students' abilities may improve by using one language in depth (Suggest JavaScript although the course may be adapted for many object oriented programming languages).

This course will cover the basic concepts of how a computer program actually works. Topics that will be covered in the course will include: output, input, constants, variables, expressions, decision and looping structures, arrays, functions, files and recursion. Structured programming will be stressed. This course is designed to serve as an introduction to high level computer programming languages and will focus on the fundamental language structures of a programming language(s) (either: JavaScript, Delphi, PHP, C++ or C#, etc). Students will learn to write, edit, debug and run computer programs to demonstrate mastery of data handling and input/output control. The focus of the course will be in using computer programs to perform mathematical calculations and manipulate data. A certain degree of competence in Algebra is expected for the student to be successful in this course. Students will be expected to work both independently and in small groups to master all of the skills covered and demonstrate proficiency in these skills.

## Organizational Structure:

Unit	Title	Time
Unit 1	Introduction	4 hours
Unit 2	Algorithms	4 hours
Unit 3	Introduction to a Computer Language	4 hours
Unit 4	Programming Calculations	4 hours
Unit 5	Block Structure and Scope	4 hours
Unit 6	Top-Down Design	4 hours
Unit 7	User Defined Types	4 hours
Unit 8	Loops	4 hours
Unit 9	Programming Decisions	4 hours
Unit 10	Types and Declaration of Types	10 hours
Unit 11	Final Project	14 hours
	Total Hours	60 hours

## Unit Descriptions

### 1. Introduction

- **Level C– (1-Introduction)**
- *It is expected that students will:*
  - a) Be able to identify parts of a computer and their function
  - b) Be able to name several programming languages and when to use each
  - c) Be able to use an editor to effectively communicate
  - d) Update a web page with links to important programming references organized by programming language and sorted by most useful to least useful
  - e) Be able to communicate about variables, constants, functions, operators and expressions, classes, objects, properties, methods
- **Level D– (1-Introduction)**
- *It is expected that students will:*
  - a) Be able to identify parts of a computer and their function
  - b) Be able to name several programming languages and when to use each
  - c) Be able to use an editor to effectively communicate
  - d) Update a web page with links to important programming references organized by programming language and sorted by most useful to least useful
  - e) Be able to communicate about variables, constants, functions, operators and expressions, classes, objects, properties, methods

### 2. Algorithms

- **Level C– (2-Algorithms)**
- *It is expected that students will:*
  - a) Write an object oriented algorithm to solve a problem
- **Level D– (2-Algorithms)**
- *It is expected that students will:*
  - a) Review Algorithms

### **3. Introduction to a computer language**

- **Computer Programming Levels C, D**

- *It is expected that students will:*

- Write “Hello World” Computer Program
- Write a simple program that demonstrates correct syntax and semantics
- Copy a preview program or web page that simply shows how to create an object , with simple input and output from one form element to another (suggest JavaScript)
- Write a simple program that demonstrates some of the:
  - language character set – Unicode etc
  - reserved words
  - numeric literals
  - identifiers
  - how to use comments
- Write a simple program that demonstrates simple data types including
  - String
  - float
  - integer
  - char
- Write a simple program that demonstrates variables and constants including:
  - String Functions
  - Integers
  - Real numbers (float)
  - Using a String class
  - Using a Math class
  - Using a Date Class
  - Converting Strings to Numeric Data Types
- Write a simple program that demonstrates Input statements
- Write a simple program that demonstrates Output format of strings and numbers
- Write a simple program that demonstrates code and output organization

### **3. Programming Calculations**

- **Computer Programming Levels C, D**

- *It is expected that students will:*

- Write a computer program that demonstrates the use of:
  - operator precedence
  - modulus and integer division
  - + - \* /
  - The assignment symbol “=”
  - Compound arithmetic operators += -= etc
- Write a computer program that demonstrates the use of standard functions
- Write a computer program that demonstrates issues using real vs. integer numbers

### **4. Block Structure and Scope**

- **Computer Programming Levels C, D**

- *It is expected that students will:*

- Write a computer program that demonstrates the use of Objects
- Write a computer program that demonstrates the use of local variables
- Write a computer program that demonstrates the use of global variables
- Write a computer program that demonstrates the use of nested procedures

- 1) Demonstrates positive and negatives of recursion
- e. Write a computer program that demonstrates the use of variable passing

## 6. Top-Down Design

- **Level C– (6-Top-Down Design)**

- *It is expected that students will:*

- a. Students write their own algorithm to solve a complex problem while demonstrating top down design
- b. Write a web page or GUI program that uses forms, menus, text boxes, images, buttons, dialogs, checkbox, radio, listbox, etc have objects that interact with the user when clicked

- **Level D– (6-Top-Down Design)**

- *It is expected that students will:*

- a. Students write their own algorithm to solve a complex problem while demonstrating top down design
- b. Students attempt to write a computer program based on their algorithm
- c. Write a web page or GUI program that uses forms, menus, text boxes, images, buttons, dialogs, checkbox, radio, listbox, etc have objects that interact with the user when clicked

## 7. User-Defined Types

- **Computer Programming Levels C, D**

- *It is expected that students will:*

- a. Write a computer program that demonstrates a logical use of enumerated types
- b. Write a computer program that demonstrates the use of constant values

## 8. Loops

- **Computer Programming Level C, D**

- *It is expected that students will:*

- a. Write a computer program that demonstrates the use of the FOR statement
- b. Write a computer program that demonstrates the use of a REPEAT-UNTIL statement or program language equivalent
- c. Write a computer program that demonstrates the use of the WHILE statement

## 9. Programming Decisions

- **Level C– (9-Programming Decisions)**

- *It is expected that students will:*

- a. Write a computer program that demonstrates the use of boolean expression
- b. Write a computer program that demonstrates the use of the IF statement
- c. Write a computer program that demonstrates the use of the IF – ELSE statement
- d. Write a computer program that demonstrates the use of the CASE / SWITCH – BREAK statement
- e. Write a computer program that demonstrates the use of relational operators (==, !=, <=, >=, <, > &&, ||, !)
- f. Write a computer program that demonstrates the use of the conditional operator ?: (optional)

- **Level D– (9-Programming Decisions)**

- *It is expected that students will:*

- Write a computer program that demonstrates the use of boolean expression
- Write a computer program that demonstrates the use of the IF statement
- Write a computer program that demonstrates the use of the IF – ELSE statement
- Write a computer program that demonstrates the use of the CASE / SWITCH – BREAK statement
- Write a computer program that demonstrates the use of relational operators (==, !=, <=, >=, <, > &&, ||, !)
- Write a computer program that demonstrates the use of the conditional operator ?: (optional)

#### 10. **Types and Declaration of Types**

- **Level C– (10-Types and Declaration of Types)**

- *It is expected that students will:*

- Write a computer program that demonstrates the use of the array type
- Write a computer program or web page that demonstrates the use of the class type including:
  - Object
  - Method
  - Properties
  - Inheritance
- Write a computer program or web page that demonstrates or explains the use :
  - Polymorphism
  - Interfaces
  - Delegates
  - Namespaces
- Write a computer program that demonstrates the ability to sort
- Write a computer program that demonstrates the ability to create a record or object
- Write a computer program that demonstrates the ability to catch errors with try statements (optional)

- **Level D– (10-Types and Declaration of Types)**

- *It is expected that students will:*

- Write a computer program that demonstrates the use of the array type
- Write a computer program or web page that demonstrates the use of the class type including:
  - Object
  - Method
  - Properties
  - Inheritance
- Write a computer program that demonstrates the ability to pack and unpack data (Box and unbox) types
- Write a computer program that demonstrates the ability to sort
- Write a computer program that demonstrates the ability to create a record or object
- Write a computer program that demonstrates the ability to catch errors with try statements (optional)
- Write a computer program or web page that identifies the issues with pointers and why many object oriented programming languages do not use pointers
- Write a computer program that demonstrates the ability to write a string to a file and then read a string from a file (suggest PHP )
- Write a computer program that demonstrates the ability to save data to a file and retrieve data from a file (database suggest PHP)

## **11. Final Project**

- **Level C– (11-Final Project)**

- *It is expected that students will:*

- a. Work in a group to design a solution algorithm to a problem
- b. Work individually on a part of the group algorithm in more depth
- c. Work individually to write a program to solve the students part of the group problem
- d. Present your working solution to the group
- e. Work as a group to create a group programming solution to the problem

- **Level D– (11-Final Project)**

- *It is expected that students will:*

- a. Design and produce a final computer programming project on their own (Students may choose to continue the group project if the teacher deems the project as a good use of the students time )

### **Curriculum Organizer**

#### **Assessment Components:**

##### **Type of Assessment**

Formative (80%) Multiple project based grading with feedback and re-grading.

Summative (20%) Single period computer program or web page design practical tests

##### **Category**

Practical Applications

Self-Rating Scale

Final Assessment

##### **Details**

Small daily projects

Final Web Site Project

Reflection and Presentation

##### **Performance Methods**

###### **Personal Communication**

- Group dialogue
- Student/instructor/mentor trilogies
- Logbook reflection
- Self evaluation
- peer evaluation

###### **Other**

- Weekly project assessment
- Teacher log
- Checklists
- Rubrics
- Rating scales

#### **Learning Resources:**

All resources can be found on the web using <http://www.google.com> or <http://www.howstuffworks.com/web-page.htm> or <http://www.devguru.com>

*JavaScript Quick Reference*, Rick Darnell, Que, 1996.

*JavaScript The Most Complete Reference*, Reynolds ad Wooldridge, Que 1996

*Web Design in a Nutshell*, Jennifer Niederst, O'Reilly & Associates, January 1999.

**Additional Course Information:** Schools will need adequate equipment and continuous access to computers to make the course run more smoothly. Many computer program outcomes may be grouped within one computer programming assignment. This would be necessary to be able to get through the course.