OCS01: AP Computer Science

Course Description

AP Computer Science is a one-year course that covers an introduction to fundamental topics in computer science using the Java programming language. The course is intended to prepare students for the College Board Advanced Placement Test in Computer Science level A and covers all topics in the level A test.

This course introduces students to the concept of object oriented programming. The basic and some advanced features of Java are studied including designing and building applications such as web applets. Core topics in the context of the Java programming language: fundamental data structures such as arrays and algorithms (especially those for sorting and searching) and the relationship between computer hardware and a compiled program. Much of the course is project-based, with assignments stressing the design of classes and algorithms appropriate to a problem.

Learning Objectives

Upon completion of AP Computer Science, students will be able to:

• Use standard software development tools including compilers, linkers, debuggers, and project managers to develop computer programs in Java

• Learn the concepts of object oriented program design and apply them in writing programs:
  ▪ Understand the basic concepts of object-oriented program design including abstraction, encapsulation, information hiding, and object relationship including composition, containment, inheritance, cohesion and coupling.

• Develop computer programs to solve real world problem using object-oriented principles including inheritance and polymorphism:
  ▪ Learn the basic concepts of objects, variables, methods, primitive data types, references, control structures, strings, arrays, classes, inheritance, polymorphism, and exceptions.
  ▪ Use and implement commonly used algorithms and data structures.
  ▪ Learn the basic concepts of graphical user interfaces, event handling, introduction to MVC pattern and I/O streams.

Required Textbook

Absolute Java, Walter Savitch

Course Topics

• Introduction
  Origins of the Java language, byte-code and Java Virtual Machine, class loader, compiling and running a Java program, and Just-In-Time compiling
• **Fundamentals of Java**
  The structure of Java programs, Java primitive types, variables, assignment operator, arithmetic operators, relational operators, Boolean operators, arithmetic expressions, Boolean expressions, String class, console and file input and output

• **Basic Control Statements**
  The if statement, if-else statements, nested if statements, for loop, while loop, foreach loop, nested loops, switch-case statements, and the ternary operator

• **Arrays**
  Arrays, multidimensional arrays, generics and ArrayList class

• **Classes**
  What are classes? Class definitions, information hiding and encapsulation, instance variables and methods, static methods and variable, methods overloading, reference types, inheritance, polymorphism, abstract classes, interfaces, and inner classes

• **Algorithms**
  Basic sorting and searching techniques—bubble sort, selection sort, insertion sort, quick sort, sequential search, and binary search

• **Grid World Case Study**
  Understanding the implementation details of the AP Computer Science Grid World case study

**Overview of Assignments**

• **In class participation:** You are expected to participate in in-class discussions and discussions on the course webpage and be part of an active learning environment. This portion of your grade will be determined based on your attendance, regular participation in the discussion including asking and answering questions, and work (usually in small groups) on in-class labs.

• **Quizzes, homework and programming labs:** The primary homework will be programming assignments. In addition to programming assignments, there will be occasional worksheets or other written assignments.

• **Midterm:** There will be a two-hour proctored midterm exam.

• **Final Exam:** There will be a three-hour proctored final exam.