SILICON VALLEY HIGH SCHOOL®

Introduction to Programming – Java

Introduction to Programming – Java is broken into two parts. Part 1 covers units 1 to 5, and Part 2 covers units 6 to 9. Each unit concludes with a unit test and assignment. At the end of each part there is a final project and final exam.

Course Description:

Introduction to Programming Java introduces students to computer science and programming. In this course, students learn:

- The fundamentals of computer programming in Java
- The broader field of computer science and algorithmic thinking
- The fundamental approach that computer scientists take to solving problems.

Students write and use sub-programs within computer programs. They develop creative solutions for various types of problems as their understanding of the computing environment grows.

Unit 1: Program Design

Students begin their studies by learning what programming is and its importance in today's society. The unit covers the various types of programming languages, what they are and their functions in programs. Students learn how to set up a development environment.

Unit 1 Modules:

- What is Programming?
- Types of Programming Languages
- Setting up a Development Environment

Unit 1 Learning Objectives:

- Students learn what programming is, how it works and its importance.
- Students are introduced to algorithms and data structure.
- Students learn how to define 'algorithms' and describe their functions in computer programming.
- Students study the various types of programming languages including HTML, XML, JavaScript, VBScript and PHP.
- Students learn how to define the various types of programming languages, understand their functions and roles in computer science and give examples of each.
- Students learn how to set up a development environment, what a development environment is and how a development environment works.

Unit 2: Variables, Expressions, and Assignments

Unit 2 introduces students to variables, expressions and assignments. They look at naming conventions, various data types and methods. They learn about arguments and parameters which includes a look at Java Basics.

Unit 2 Modules:

- Naming Conventions
- Primitive Data Types
- Variables, Constants, and Expressions
- Methods
- Arguments & Parameters

Unit 2 Learning Objectives:

- Students begin the study of variables, expressions and assignments as related to the study of computer science.
- Students learn about naming conventions, what they are and their roles/functions.
- Students look at various identifier types of naming conventions including packages, classes, interfaces and methods.
- Students study and learn how to give information about the function of the identifier including whether it is a constant, package or class and give examples of the various types.
- Students learn about eight Java Primitive Data Types including Boolean, char, and byte.
- Students learn and study variable, constant and literal in Java. They learn how to define and identify these and how they are used in programming.
- Students study and learn the structure of a method, what a method is and how to write their own Java methods.
- Students learn about arguments and parameters as related to the study of computer science. This includes a look at identifying method arguments, void and value-returning methods and argument evaluation.

Unit 3: Reference Types and Other Data Structures

This Unit introduces students to reference types and other data structures. Students learn about classes and object, strings, and arrays. Students gain a better understanding of these reference types, their definitions and their role in programming. This Unit provides students with a more in-depth study into programming and the study of computer science.

Unit 3 Modules:

- Classes & Objects
- Strings
- Arrays
- Array List

Unit 3 Learning Objectives:

- Students build upon prior lessons and continue with studying objects and classes.
- Students learn the difference between an object and class, how to define each and their roles/functions in regards to computer programming.
- Students learn how to define local variables, instance variables and class variables.
- Students are introduced and study Java strings. They learn how to define what a string is, relations with programming, how strings work and how to create their own strings.
- Students continue their studies by learning about arrays in Java. This includes defining what an array is, how it works and its relationship within programming.
- Students learn the differences between array and arraylist in Java.

Unit 4: Control Structures

This Unit concentrates on control structures as it related to computer science and programming. Students learn that all programming languages have some form of "if" statements that allows them to test conditions. Students learn about various programming structures including conditionals, iteration and recursion. Students learn to identify and define these structures and give examples of each.

Unit 4 Modules:

- Conditionals
- Iteration
- Recursion

Unit 4 Learning Objectives:

- This unit provides further study and insight into control structures as related to programming and computer science.
- Students learn about the "if-else" class of statements, how they work and their form when writing computer programs.
- Students learn the basics of source coding, its structure and the various ways to use it.
- Students learn the "while, do while & for loops" of Java source coding.
- Students learn how to define and give examples of various Java source coding and their structures in program writing.
- Students are introduced to recursion in computer science and programming. Students gain knowledge of recursion so that they will be able to define what recursion is and how it relates to computer programming functions.
- Students will have a Unit assignment that will allow them to expand upon the information and knowledge learned with each Modules. Unit assignments vary depending on the Unit's main topic.

Unit 5: Operations

This Unit builds on prior lessons so that student continue to build their knowledge base and critical thinking skills by studying operations as related to programming and computer science. Students take a look at traversal and logical operators. This gives students a better understanding of the operational aspect of programming.

Unit 5 Modules:

- Traversal
- Logical Operators

Unit 5 Learning Objectives:

- Unit 5 provides a more in depth study of operations within computer programming.
- Students build upon prior lessons and continue to build their knowledge base in computer science programming.
- Students go into more details into the operational aspects of programming with a look at both traversal and logical operators.
- Students review prior introductory lessons on arrays and will continue with more detailed lessons of arrays, their functions and their structures pertaining to writing programs.
- Students learn about various types of operators including arithmetic, unary, equality and relational operators, and bitwise and bit shift operators. Students learn how to define and give examples of these various operators, understand their structures and write computer programs using them.

Unit 6: Testing & Debugging

In unit 6 students begin their study into testing and debugging as it relates to the study of programming and computer science. Students learn about programming errors, what they are and how to find them. This includes a look at debugging and hand tracing codes. This Unit allows students to utilize prior lessons and use their critical thinking skills.

Unit 6 Modules:

- Finding Errors
- Hand Tracing Code
- Debugging

Unit 6 Learning Objectives:

- Students learn how to use “if” statements in Java and continue to build upon prior lessons to increase their understanding and knowledge base.
- Students learn how to hand trace through a software code, what this means and what it requires in order to debug a program.

- Students learn what debugging is, how it affects a program and the steps involved in debugging.
- Students are introduced to breakpoint, watchpoint, exception and method breakpoints as related to debugging.

Unit 7: Analyzing Algorithms

Unit 7 introduces students to algorithms as they relate to the study of computer programming and computer science. Students learn their importance in programming, how they interaction and how to create them. The unit also introduces three specific types of algorithms: Big O, Big Omega and Big Theta.

Unit 7 Modules:

- Big O
- Big Omega
- Big Theta

Unit 7 Learning Objectives:

- Students learn to define algorithms, what they are and their importance in programming.
- Students learn about 3 types of algorithms: Big O, Big Omega and Big Theta. They learn how to define and give examples of each of these.
- Students learn the notations of algorithms, how to write and intercept notations.
- This unit allows students an opportunity to improve and use their analytical and critical thinking skills as they study the makeup and usages of algorithms as related to programming.

Unit 8: Number Systems

This Unit introduces students to the study of number systems. Students learn the importance of the number system as related to computer program, how number systems are created and how to create a program. Students learn the Binary system and the role of 0, 1, and 2 in programming and how to read sequences of numbers based on these three numbers. Students study the hexadecimal and octal number systems.

Unit 8 Modules:

- Binary
- Hexadecimal
- Octal

Unit 8 Learning Objectives:

- Students study 3 types of number systems: Binary, Hexadecimal and Octal.
- Students learn how to define these number systems, what they are and give examples of each.
- Students learn the importance of 0, 1, and 2 as related to the binary system, how to interpret and create a binary system in a computer program.
- Students learn how to convert from a binary to a decimal system. This lesson allow students to use their analytical and critical thinking skills.
- Students study the hexadecimal system and how to convert from a decimal to a hexadecimal system.
- Students are introduced to the octal numbering system. Students learn what an octal system is, how it is created and also how to convert from a decimal to an octal system.

Unit 9: Searching and Sorting

Unit 9 concludes the students' course in Introduction to Programming. In this Unit, students learn about searching and sort. This includes a look at sequential, binary, selection, insertion and merge sorting.

Unit 9 Modules:

- Sequential Search
- Binary Search
- Selection Sort
- Insertion Sort
- Merge Sort

Unit 9 Learning Objectives:

- Students learn about 5 searching and sorting types: Sequential, Binary, Selection, Insertion and Merge.
- Students learn how to define each type and give examples of each.
- Students learn how each of these types work, what is involved in searching and sorting and will be able to set up and create a search and sort program using each of the 5 types studied in this Unit.