Advanced Computer Science A

Course Overview

This one-semester course is intended to introduce you to the concepts of computer programming. This course has 20 lessons organized into four units, plus four Unit Activities. Each lesson contains one or more Lesson Activities.

In Advanced Computer Science A, you will describe the basic concepts of computer programming. You will compile and run a simple Java program. You will use arithmetic, relational, and logical operators. You will implement algorithms, and use different types of loop and decision-making statements. You will create and use classes. You will create and manipulate one-dimensional and two-dimensional arrays. You will perform sequential search, binary search, selection sort, and insertion sort on an array. You will explain and implement object-oriented programming design. You will implement inheritance, polymorphism, and abstraction. Further, you will describe privacy and legality in the context of computing.

Your teacher will grade your work on the Unit Activities, and you will grade your work on the Lesson Activities by comparing them with the given sample responses. The Unit Activities (submitted to the teacher) and the Lesson Activities (self-checked) are major components of this course. There are other assessment components, namely the mastery test questions that feature along with the lesson; the pre- and post-test questions that come at the beginning and end of the unit, respectively; and an end-of-semester test. All of these tests are a combination of simple multiple-choice questions and technology-enhanced (TE) questions.

Course Goals

By the end of this course, you will be able to do the following:
• Describe the basic concepts of computer programming and compile a simple Java program.
• Identify, describe, and employ Java variables and data types.
• Describe and use arithmetic, relational, and logical operators.
• Describe and use different types of loop and decision-making statements.
• Describe, create, and use classes and methods.
• Create String objects, ArrayList objects, and one-dimensional and two-dimensional arrays.
• Perform selection and insertion sort on an array and compare their performance.
• Perform sequential and binary searches on an array and compare their performance.
• Explain and implement object-oriented programming design.
• Explain and implement inheritance, polymorphism, and abstraction.
• Create an interface.
• Describe privacy and legality in the context of computing.

Prerequisite Skills

These fundamental skills will be helpful:

• basic math and algebra

General Skills

To participate in this course, you should be able to do the following:

• Complete basic operations with word processing software such as Microsoft Word or Google Docs.
• Perform online research using various search engines and library databases.
• Communicate through email and participate in discussion boards.

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Plato Student Orientation document, found at the beginning of this course.

Credit Value

Advanced Computer Science A is a 0.5-credit course.

Course Materials

• notebook
• computer
• scanner
• printer
• word processing software
• Java Development Kit (JDK) from Oracle and a text editor such as Notepad++
  or
• free Java IDE such as BlueJ or DrJava
• Textbook: Horstmann, Cay. Big Java: Early Objects, 5th edition. Hoboken, N.J.: Wiley, 2013

Course Pacing Guide

This course description and pacing guide is intended to help you keep on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class. You can research online for more references regarding any of the unit activities. The unit activities include application of the learning of the respective unit.

Unit 1: Introduction to Computer Programming

Summary

In this unit, you will describe and explain the basic concepts of computer programming. You will compile and run a simple Java program. You will use unary and arithmetic operators, perform arithmetic calculations, and use the Math class. You will describe different types of errors, such as compile-time errors, runtime errors, and logical errors. You will also use relational and logical operators. You will identify the precedence of all Java operators. Finally, you will construct syntactically correct decision-making and loop statements, and implement algorithms.

Day	Activity/*Objective*	Type
1 day: 1	**Syllabus and Plato Student Orientation** *Review the Plato Student Orientation and Course Syllabus at the beginning of this course.*	Course Orientation
3 days: 2–4	**Computer Science** *Describe and explain the basic concepts of computer programming.*	Lesson
3 days: 5–7	**Java Basics** *Compile and run a simple Java program.*	Lesson
3 days: 8–10	**Variables and Data Types** *Identify, describe, and employ Java variables and data types.*	Lesson
3 days: 11–13	**Arithmetic Operators and the Math Class** *Describe and use unary and arithmetic operators, perform arithmetic calculations, and use the Math class.*	Lesson
4 days: 14–17	**Relational and Logical Operators** *Describe and use relational and logical operators.*	Lesson
3 days: 18–20	**Decision-Making Control Structures** *Describe and use decision-making statements (if, if…else, nested if, switch).*	Lesson
3 days:	**Loops and Algorithms**	Lesson

Day	Activity/*Objective*	Type
21–23	*Use different types of loop statements (while, for, nested) and implement algorithms.*	
1 day: 24	**Para Jumble**	Game
4 days: 25–28	**Unit Activity and Discussion—Unit 1**	Unit Activity Discussion
1 day: 29	**Posttest—Unit 1**	Assessment

Unit 2: Classes and Constructors

Summary

In this unit, you will define a class and create objects for the class. You will differentiate between static and nonstatic fields. You will demonstrate how to achieve encapsulation in Java. You will define and call a constructor. You will declare a method and the parameters in that method. Finally, you will describe and employ different approaches to using parameters in methods.

Day	Activity/*Objective*	Type
3 days: 30–32	**Classes** *Describe, create, and properly use classes.*	Lesson
4 days: 33–36	**Methods** *Describe, create, and call methods.*	Lesson
3 days: 37–39	**Method Parameters** *Describe and employ different approaches to using parameters in methods.*	Lesson
1 day: 40	**Space Jumble**	Game

Day	Activity/Objective	Type
4 days: 41–44	**Unit Activity and Discussion—Unit 2**	Unit Activity Discussion
1 day: 45	**Posttest—Unit 2**	Assessment

Unit 3: Data Structures, Searching, and Sorting Algorithms

Summary

In this unit, you will create the String object using string literal and new keyword. You will evaluate String expressions. You will create and manipulate one-dimensional and two-dimensional arrays. You will perform selection and insertion sort on an array and compare their performance. You will create a recursive method to solve a problem. You will implement merge sort. Finally, you will perform sequential and binary searches on an array and compare their performance.

Day	Activity/*Objective*	Type
4 days: 46–49	**The String Class** *Create String objects and use various String methods.*	Lesson
3 days: 50–52	**Arrays** *Create and manipulate one-dimensional and two-dimensional arrays.*	Lesson
3 days: 53–55	**The ArrayList Class** *Create an ArrayList object and use various ArrayList methods.*	Lesson
3 days: 56–58	**Sorting Algorithms** *Perform selection and insertion sort on an array and compare their performance.*	Lesson
3 days: 59–61	**Recursion and Merge Sort** *Understand the concept of recursion and implement recursive methods to solve problems.*	Lesson
3 days:	**Searching Algorithms**	Lesson

Day	Activity/*Objective*	Type
62–64	*Perform sequential and binary search on an array and compare their performance.*	
1 day: 65	**Para Jumble**	Game
4 days: 66–69	**Unit Activity and Discussion—Unit 3**	Unit Activity Discussion
1 day: 70	**Posttest—Unit 3**	Assessment

Unit 4: Object-Oriented Java and Ethics in Computing

Summary

In this unit, you will explain abstraction and code reuse. You will demonstrate inheritance by extending a class. You will discuss the benefits of overriding. You will describe and implement polymorphism. You will create and extend an abstract class. You will create an interface. You will describe the ways to control viruses and other malicious attacks on computer systems. Finally, you will describe privacy rights, intellectual property rights, copyrights, fair use, piracy, and software license agreements.

Day	Activity/*Objective*	Type
3 days: 71–73	**Object-Oriented Programming Design** *Explain and implement object-oriented programming design.*	Lesson
3 days: 74–76	**Inheritance and Polymorphism** *Explain the advantages of inheritance and polymorphism, and implement inheritance and polymorphism.*	Lesson
3 days: 77–79	**Abstraction and Interfaces** *Describe and implement abstraction, and create an interface.*	Lesson
3 days:	**Ethics in Computing**	Lesson

Day	Activity/*Objective*	Type
80–82	*Describe privacy and legality in the context of computing.*	
1 day: 83	**Thwack-A-Mole**	Game
4 days: 84–87	**Unit Activity and Discussion—Unit 4**	Unit Activity Discussion
1 day: 88	**Posttest—Unit 4**	Assessment
1 day: 89	**Course Review**	
1 day: 90	**End-of-Semester Exam**	Assessment

Course Map

You will achieve course level objectives by completing each lesson's instruction, assignments, and assessments. For a detailed look at how the materials meet these objectives, review the [course map](#).