

# Computer Science III – Advanced Placement G/T

## [AP<sup>®</sup> Computer Science A]

### Syllabus

#### Course Overview

This course is a fast-paced advanced level course that focuses on the study of the fundamental principles associated with object-oriented programming using the Java language. Topics include classes, objects, data types, variables, Boolean expressions, methods, looping, and input and output. Advanced topics include searching, sorting and recursion. The objective of this course is to prepare students for the A version of the Advanced Placement (AP) Computer Science examination.

Prerequisites for this course are Algebra I and at least one year of pre-AP computer programming.

This course uses both *Java Software Solutions for AP<sup>®</sup> Computer Science A* as the primary text and the course package of support materials, including progressively structured labs, end of chapter self-review, multiple choice and true/false questions, and supplementary programming projects. All end of chapter material is used to build knowledge and check understanding in preparation for chapter tests. Test questions are drawn from the test bank that accompanies the primary textbook and the Barron's AP<sup>®</sup> Study Guide listed as a supplementary text.

Hands-on work consists of the completion of structured labs included in the text course package and assignments of several more open-ended programming projects that are found at the end of each chapter of the textbook.

A Java Style Guide is provided the first week of the course and is used throughout the course as a basis for evaluating students' programs and their adherence to acceptable style and documentation.

#### Primary Text:

Lewis, John, Loftus, William, and Cocking, Cara. *Java Software Solutions for AP<sup>®</sup> Computer Science A*, Boston: Pearson/Addison-Wesley, 2006.

#### Supplementary Texts:

AP<sup>®</sup> *GridWorld Case Study*. Princeton: The College Board, 2006.

Teukolsky, Roselyn. *Barron's Advanced Placement (AP<sup>®</sup>) Exam Computer Science 2007 Levels A and AB*, Hauppauge, NY: Barron's Educational Series, 2006.

## Course Planner [C2]

The resources listed include the following text references: *Java Software Solutions* (LLC), *Barron's AP<sup>®</sup> Computer Science: Levels A and AB* (BAR), and the *AP<sup>®</sup> GridWorld Case Study* (GridWorld).

The curricular requirements that each unit addressed are designated in brackets. A list of requirements keyed to the designators is provided at the end of the syllabus.

Unit (Weeks)	Topic	Required Reading	Major Assignments & Assessments
1 (1)	Computer Systems: [C8, C9] <ul style="list-style-type: none"> <li>• Computer Basics</li> <li>• Java Basics</li> <li>• Using the Compiler and recognize common compile errors</li> <li>• Computer Code of Conduct and Lab Procedures</li> <li>• Approach to Testing and Debugging</li> <li>• Java Style Guide</li> </ul>	LLC Chap. 1	Ethical Use of School-Provided Computing Tools  p. 52, LLC, Programming Project (PP) 1.1&2 Test  p. 53, LLC PP1.6, Initials  Written Test 1
2 (2-4)	Objects and Primitive Data: [C3, C4, C6] <ul style="list-style-type: none"> <li>• Introduction to Algorithms</li> <li>• Input/Output</li> <li>• Arithmetic Operators</li> <li>• Primitive Data Types</li> <li>• Variable Declaration</li> <li>• Object use</li> <li>• Math, Random, and String classes</li> <li>• Wrapper classes: Integer, Double</li> <li>• Java constants: Integer.MIN_VALUE, Integer.MAX_VALUE</li> </ul>	LLC Chap. 2	p.119, LLC, PP 2.4, TempConverter p.119, LLC, PP 2.5 MileConverter p.120, LLC, PP 2.6 TimeConverter p. 120, LLC, PP 2.7 RevTimeConverter p. 120, LLC, PP 2.9 Sphere p. 120, LLC, PP2.13 RandomPhoneNo  LLC Labs: Lab 1C Two Meanings of Plus Lab: Experimenting with the Integer Class  BAR, Chapter 4  Written Test 2
3 (5-8)	Program Statements: [C3, C4, C5] <ul style="list-style-type: none"> <li>• if statements</li> <li>• Complex decision making statements</li> <li>• Flow of control</li> <li>• while statements</li> <li>• for and for each statements</li> </ul>	LLC Chap. 3	p. 187, LLC, PP 3.2 & 3.3, LeapYear p. 187, LLC, PP 3.6, Digits p. 188, LLC, PP 3.10, Hi-Lo p. 188, LLC, PP 3.11, PalindromeTester  LLC Labs :  Lab 1C, Activities at Lake Lazy Days Lab 1D, Rock, Paper, and Scissors Lab 1E, Date Validation Lab 3B, Powers of 2  BAR, Chapter 1 Written Test 3
4 (9-12)	Writing Classes: [C3, C4, C6, C7] <ul style="list-style-type: none"> <li>• Class definitions</li> <li>• Encapsulation</li> <li>• Method declarations</li> <li>• Method invocation and parameter</li> </ul>	LLC Chap. 4	p. 251, PP 4.3, 4.4, 4.5 use of Die class  LLC Labs: Lab 1 Phase 1 & 2 Using the Coin Class Lab 2A Bank Account Lab 3 Phase 1 Tracking Grades

Unit (Weeks)	Topic	Required Reading	Major Assignments & Assessments
	passing <ul style="list-style-type: none"> <li>• Method overloading</li> <li>• Object relationships</li> <li>• Method decomposition</li> </ul> GridWorld Case Study Lesson 1	GridWorld, Chap 1	Lab 4 Representing Names  GridWorld, Reflection 1: Chap. 1, exercises 1,2,3 & 4, p. 8  BAR, Chapter 2 Written Test 4
5 (13- 16)	Enhancing Classes: [C3, C4, C6, C7] <ul style="list-style-type: none"> <li>• Reference aliases</li> <li>• Object references – passing as parameters</li> <li>• Static modifier (static variables and static methods)</li> <li>• Interfaces</li> <li>• The List interface</li> <li>• The Iterator and ListIterator interfaces</li> <li>• Nested classes</li> <li>• Exception Handling</li> </ul> GridWorld Case Study Lesson 2	LLC Chap. 5          GridWorld, Chap 2	p. 310, PP 5 Lockable  LLC Labs: Lab1, References Lab 2, Parameter Passing Lab 3A, Using the Comparable Interface Lab: Opening and Closing Accounts Lab 3D, Counting Transactions  Grid World, Reflection 2, exercises 1,2,3, Chap 2, pp. 12 – 13  BAR, Chapter 2 Written Test 5
6 (17-21)	Arrays: [C3, C4, C5, C6] <ul style="list-style-type: none"> <li>• Array definition</li> <li>• Passing arrays as parameters</li> <li>• Arrays of objects</li> <li>• ArrayList class</li> <li>• Iterative sorting</li> <li>• Sequential and binary search</li> <li>• Two-dimensional arrays</li> </ul>	LLC Chap. 6	p. 381, PP 4 Asterisks p. 382, PP 9 & 10 Quiz p. 385, PP 11 CDSorts Lab 1A Tracking Sales Lab 1B Grading Quizzes Lab 1C ReverseArray Lab 3 A Shopping Cart Lab 4A Shopping Cart Using ArrayList Class Lab: Magic Squares  BAR, Chapter 6 Written Test 6
7 (22- 25)	Inheritance: [C3, C4, C5, C6, C7] <ul style="list-style-type: none"> <li>• Class hierarchies</li> <li>• Abstract classes</li> <li>• Class relationships</li> <li>• Subclass design and modification</li> <li>• Interfaces – Comparable and Iterator</li> </ul> GridWorld Case Study, Lesson 3	LLC Chap. 7          GridWorld, Chap 3	Lab 1, Phase 1A, Exploring Inheritance Lab 1 Phase I B– A Sorted IntegerList Lab 1 Phase II B – Overriding the equals method  p. 457, PP 7.4, SportsStatistics  GridWorld, Reflection 3, Group Activity, pp. 24-25  BAR, Chapter 3 Written Test 7
8 (26-28)	Recursion: [C3, C4, C5, C6] <ul style="list-style-type: none"> <li>• Recursive methods/processing steps</li> <li>• Avoiding infinite recursion</li> </ul>	LLC Chap. 8	Lab 1A, Computing Powers  Lab 1B Counting and Summing Digits in an Integer

Unit (Weeks)	Topic	Required Reading	Major Assignments & Assessments
	<ul style="list-style-type: none"> <li>• Appropriate uses of recursion</li> <li>• Recursion in sorting and searching</li> </ul> <p>Recursion (continued)</p>		<p>Lab 2, Phase 1 Palindromes</p> <p>Lab 3, Phase 1A Recursive Sequential Search Lab3 Phase II Recursive Binary Search</p> <p>BAR, Chapter 7 Written Test 8</p>
9 (29)	<p>GridWorld Case Study [C7]</p> <ul style="list-style-type: none"> <li>• Interacting Classes</li> <li>• Supplementary Exercises</li> </ul>	GridWorld, Chap 4	GridWorld, Reflection 4, Chap 4, exercises 1 - 6, p. 32
10 (30-31)	Review for AP Exam	<p>LLC Chapters 1-8</p> <p>GridWorld Chapters 1-8</p>	
11 (32-36)	<p>Team Projects:</p> <ul style="list-style-type: none"> <li>• Java Graphics</li> <li>• Java GUIs</li> <li>• Java Game Programming</li> </ul>	LLC and Supplementary Materials	AP CS Exam
12 (27-39)	Final Project and Final Exam		

## Curriculum Designators and Requirements:

C1	The teacher has read the most recent AP Computer Science Course Description, available as a free download at <a href="http://apcentral.collegeboard.com/compsci">apcentral.collegeboard.com/compsci</a> .
C2	The course includes all of the topics listed in the “Computer Science A” column of the Topic Outline in the <i>AP Computer Science Course Description</i> .
C3	The course teaches students to design and implement computer-based solutions to problems in a variety of application areas.
C4	The course teaches students to use and implement commonly used algorithms and data structures.
C5	The course teaches students to develop and select appropriate algorithms and data structures to solve problems.
C6	The course teaches students to code fluently in an object-oriented paradigm using the programming language Java. The course teaches students to use standard Java library classes from the AP Java subset delineated in Appendixes A and B of the <i>AP Computer Science Course Description</i>
C7	The course teaches students to read and understand a large program consisting of several classes and interacting objects, and enables students to read and understand the current <i>AP Computer Science Case Study</i> posted on AP Central.
C8	The course teaches students to identify the major hardware and software components of a computer system, their relationship to one another, and the roles of these components within the system.
C9	The course teaches students to recognize the ethical and social implications of computer use

