2015-2016 School Year

AP Computer Science A

Course Syllabus

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Course Overview:

This advanced course is provided as an introduction to college level computer programming, using the Java language. A fundamental skill to the study of computer science is to develop computer programs to solve problems. A large part of this course is built around the development of computer programs or parts of programs to solve a given problem using object oriented designs. Students will also learn to create and manipulate applications, applets, and GUI components. The course will be highly project based and geared towards real world applications using a variety of hands on lab exercises, case studies, and team learning tasks. It is expected that all students will seek college credit by taking the Advanced Placement Computer Science Examination in May.

Textbook: Fundamentals of Java, 3rd Edition

Lambert/Osborne

COLLEGE BOARD CURRICULAR REQUIREMENTS:

CR1-Teaches students to design and implement computer based solutions to problems

CR2a-The course teaches students to use and implement commonly used algorithms

CR2b-The course teaches students to use commonly used data structures

CR3-Teaches students to select appropriate algorithms and data structures to solve problems

CR4-Teaches students to code fluently in object-oriented paradigm using Java

CR5-Teaches students to uses elements of standard Java library for the AP Java subset

CR6-Structured labs comprised of a minimum of 20 hours of hands-on lab experiences

CR7-Teaches students to recognize the ethical and social implication of computer use

Details of Major Texts and Resources:

Lambert, Ken, and Osborne, Martin. *Fundamentals of Java, AP Computer Science Essentials for the A Exam*. 3rd Edition. Boston: Course Thomson Course Technology,2006

Ancillary materials: Lambert, Ken, and Osborne, Martin. *Fundamentals of Java, AP Computer Science Essentials for the A Exam*. 3rd Edition. Boston: Course Thomson Course Technology,2006: *Student Data Files, Instructor's Manual, PowerPoint Presentations, Test Bank & Test Engine*.

Litvin, Maria. *Be Prepared for the AP Computer Science Exam in Java 5.0*. 2nd Edition. Andover: Skylit Publishing., 2006

College Board. AP *Magpie Chatbot Lab, Elevens Lab and Picture Lab.* 2014.

TOPIC 1 - History of Computer Programming

Objectives-

A) A brief history of computers and programming

B) Hardware vs. Software

C) Binary, Octal and Hexadecimal number systems

D) The evolution of computer programming

E) Object oriented programming

F) Ethical and social implications

G) Major Assignments-

1) Questions and Answers on computer programing through the years.

2) Various exercises, case studies and project from chapter 1.

3) Personal Essay on ethical and social implications

Tests-Multiple Choice Chapter 1 Test

Curricular Requirements-CR7

Total Lab Time-0 hours

Total Time – 8 hours

TOPIC 2- What is JAVA and First Programs

Objectives:

A) For students to be able to write their first programs in JAVA

B) The JVM (Java Virtual Machine)

C) To be able to write Hello World Programs

D) Learning choice of a user interface style

E) Introduction to Eclipse

F) Formatting programs to produce commonly expected pleasing consistent appearance

Major Assignments-

1) Hello World and variations of programs
2) Hot Java Coffee Cup Program
3) Temperature Conversion Code
4) Textbook exercises

Tests-Chapter 2 Test made up of multiple choice, fill in blanks and a writing simple code by hand

Lab Time – 3 hours (Total course lab time: 3 hours)

Time – 10 hours (Total course time-18 hours)

Curricular Requirements-CR1, CR4, CR6

TOPIC 3- Syntax, Errors and Debugging

Objectives:

A) Students will Learn a systematic approach to debugging
B) Students will learn the major components of the Math Class
C) Students will learn the difference between an int, a double
D) Mixed mode aritmetic
E) Students will put the math class into programs
F) Students will learn what a GUI is and write their first programs using the GUI
G) Students will write programs containing a main class and a subclass
H) Students will learn the reserved words in JAVA

Major Assignments-

1) Coding and vocab questions from textbook
2) Writing a code to find the average of 5 tests
3) Writing code to find the area and circumference of a circle
4) Writing the GUI code to display a crescent moon

Test- Chapter 3 Test Multiple Choice, Fill in the blank, Short Answer and code writing

Lab Time- 6 hours (Total Course Lab Time-9 hours)

Total Time – 13 hours (Total Course 31 hours)

Curricular Requirements-CR1, CR2a, CR3, CR4, CR6

TOPIC 4-Control Statements

Objectives:

A) Students will extend JAVA knowledge to write programs with loops and booleans

B) Students will learn how to use if and if else statements

C) Students will learn how to use "while" statements in their code

D) Understanding and use of "for" loops

Major Assignments-

1) Coding tasks from textbook
2) Deciding if it's a right triangle program
3) Rental Car Program
4) Cumulative Profit Program
5) GUI Chess Board Program

Lab Time – 5 hours (Total Course Lab time: 14 hours)

Time - 12 hours (Course cumulative total 43 hours)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR6

TOPIC 5- Defining Classes

Objectives:

A) Students will clearly learn what a class is

B) Students will learn how to create and write their own classes

C) Students will extend JAVA knowledge to enable code that receives multiple input

D) Students will learn how to write code that sorts input

E) Students will learn how to display downloaded images in code

F) Students will learn mouse events and how to use them in code including dragging circles in a GUI

Major Assignments-

1) Defining and Writing an Operational Bank Class
2) Defining and Writing an Operational Student Class
3) Writing a GUI Code to display an image file
4) Writing a GUI code for movable circles
5) Back AP Test Free Response questions
6) The AP Computer Science Magpie Chatbot Lab

Lab Time- 10 hours (Total course lab time: 24 hours)

Total Time- 14 hours (Course cumulative total time: 57 hours)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR5, CR6

TOPIC 6- Testing if Statements, Nested Loops, HTML and Applets

Objectives:

A) Learn how to improve the user interface

B) Working with nested if statements

C) Testing if statements

D) Nested Loops

E) Students will be able to construct complex Boolean Expressions

Major Assignments-

1) Writing a program that calculates the correct letter grade for a given average

2) Write a program where the user defines the parameters of the letter grades

3) Complete code that finds area and perimeter to display the output in formatted columns

4) Program a thermometer class

5) Use the thermometer class to program a query driven loop

Tests-Chapter 6 Multiple Choice quiz and free response coding questions

Lab Time-8 hours (total course lab time: 32 hours)

Time 13 hours (Course cumulative total: 70 hours)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR5, CR6

TOPIC 7- Arrays

Objectives:

A) Learn what an Array is

B) Learn how declare and use an array

C) Use of the enhanced for loops

D) Create parallel and 2-D arrays

E) Working with Arrays of Objects

F) Students will use string methods appropriately

Major Assignments-

1) Write a student score code which displays test scores on multiple tests from multiple students

2) Running programmed codes using different sets of input

3) Use a file of input as input in student code

4) Write a method to manipulate an array

5) The Advance Placement Picture Explorer Lab

6) Write a method for searching an array

Lab Time-12 hours (Total course lab time: 41 hours)

Time - 17 hours (Course cumulative total: 83 hours)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR5, CR6

TOPIC 8- Recursion

Objectives:

A) Learning what Recursion is

B) Code reuse through inheritance

C) Students will learn Binary Search

D) Complexity Analysis

E) Understanding Merge sort and Quicksort

F) Learning how to draw recursive patterns

Major Assignments

1) Check and test a recursive method for correctness

2) Examples of recursive definitions in Fibonacci sequence

3) Roleplay activity to understand searching and sorting

4) Review sample JAVA applets and write a code

5) The Advanced Placement Elevens Lab

Lab Time-11 hours (Total course lab time: 55 hours)

Time-17 hours (Course cumulative total: 104 hours)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR5, CR6

TOPIC 9 - AP TEST REVIEW

Objectives:

A) For students to be prepared to score a 3, 4 or 5 on the AP Test

B) To review all of the content in the course

C) To strengthen test taking strategies

Major Assignments-

1) Coding tasks and problems from AP Review books including but not limited to the latest Barron's AP review book which will be given to each student

2) Back AP Free Response Problems

3) AP Multiple Choice practice and practice test

Lab Time-4 hours (Total course lab time: 59 hours)

Time- 13 hours (Course cumulative total: 117 hours)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR5, CR7

TOPIC 10- AFTER the AP TEST

Objectives:

A) To conclude the course with a culminating project that puts everything learned in the course together

Major Assignments-

1) Final Project-Where does Java go from here?(includes detailed original code and discussion on the impact of Java in the modern era of programming)
2) Students will create a culminating project of their choice that demonstrates the power of JAVA

Lab Time-10 hours (Total course lab time: 69 hours)

Time- 15 hours (Course cumulative total: 132 hours, 168 contact classes)

Curricular Requirements-CR1, CR2a, CR2b, CR3, CR4, CR6, CR7