

AP Computer Science AB

Syllabus

Overview

This course extends the concepts of AP Computer Science A along with Texas courses Computer Science I & II. The course teaches the students to code fluently in an object-oriented paradigm using the programming language Java. The course teaches students to use standard library classes from the AP Java subset delineated in *Appendices A and C* of the *AP Computer Science Course Description*. The Java language is exclusively used; however, mention is made of other languages and similarities and differences with regard to Java are noted.

The first 14 very short lessons are intended as a review over fundamental programming concepts previously learned. The topics covered in this review include loops, decision structures, number systems, the *Math* class, data types, and simple *String* operations. Beginning with lesson 15 object-oriented programming (OOP) is emphasized for the remainder of the course.

Students are expected to become proficient at creating classes using inheritance and implementing interfaces. Data structures such as lists, linked lists, sets, maps, trees, and look-up tables are emphasized and studied in depth.

Each student has his own workstation and has an account on the local school domain via a LAN. The student is expected to learn how to store and retrieve data via the network. Lectures are done using a projector and chalkboard while the student follows along on his own workstation using an electronic version of the textbook. As a lecture progresses, each student is expected to run the code being discussed on his own workstation using an IDE. BlueJ is used as the IDE because it is a free download and because of its ability to “single-step”. The student will also be expected to learn how to use at least one other IDE (JCreator).

Most class periods are approximately one-third lecture with the remainder of the time spent in either lab or written work.

The following is a quick reference to various aspect of this syllabus:

The course includes all of the topics listed in the “*Computer Science AB*” columns of the *Topic Outline* in the *AP Computer Science Course Description*. This is referenced with [c2] in the main body of the syllabus.

The course teaches students to develop and select appropriate algorithms and data structures to solve problems. This is referenced with [c3] in the main body of the syllabus.

The course teaches students to use and implement commonly used algorithms and data structures. This is referenced with [c4] in the main body of the syllabus. Included are simple data type, classes, one and two-dimensional arrays, linked lists, stacks, sets, maps, queues, trees, heaps, and priority queues

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 *AP Computer*

Science Case Study, GridWorld, posted on AP Central. This is referenced with [c7] in the main body of the syllabus.

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. This is referenced with [c8] in the main body of the syllabus.

The course teaches students to recognize the ethical and social implications of computer use. This is referenced with [c9] in the main body of the syllabus.

Textbooks and Resources

- Cook, Charles. *Blue Pelican Java*, Virtual Book Worm, 2005
- Horstman, Cay, *Big Java*, Wiley 2002
- Lambert and Osborne, *Fundamentals of Java(FOJ)-Comprehensive Version*, 2003
- The College Board's GridWorld Case Study
- Leon Schram, *Multiple-Choice & Free-Response Questions*, 2004

Course Outline [C2]

<p>1st Six Weeks (review fundamental programming concepts: loops, decision structures, data types, <i>Math</i> class, simple <i>String</i> methods)</p>	
<p>Topic: Ethics (1 day) [C9]</p>	<p>Objectives: The student will...</p> <ul style="list-style-type: none"> • learn about user responsibility, • become aware of district policies, • learn ethical & social implications of responsible computer, network, and internet use, • learn about piracy and intellectual property. <p>Reading: <i>Blue Pelican Java</i>, Appendix T</p>
<p>Topic: Hardware and software components (1 day) [C8]</p>	<p>Objectives: The student will...</p> <ul style="list-style-type: none"> • observe and learn the physical components of a PC, • become familiar with operating systems and various computer languages. <p>Reading: <i>Blue Pelican Java</i>, Appendices N, S and V; <i>FOJ</i> 1.2</p>
<p>Topic: Fundamentals of the <i>main</i> method (1 day) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • signature of a method, • remarks (REMS), • using the <i>println</i> method to produce output. <p>Reading: <i>Blue Pelican Java</i>, Lesson 1, Appendix N; <i>FOJ</i> 2.4</p> <p>Programs: <i>From Me To You</i> Simple <i>main</i> method using <i>rem</i>s and <i>println</i>.</p>
<p>Topic: Data Types [C3] [C4]</p>	<p>Objectives: The student will...</p> <ul style="list-style-type: none"> • create <i>String</i>, <i>int</i>, and <i>double</i> type variables, • be aware of other numeric type (long, short, float, byte) • learn the difference between initializing and declaring, • learn how to create legal variable names. <p>Reading: <i>Blue Pelican Java</i>, Lesson 2, Appendix C: <i>FOJ</i> 3.1</p>
<p>Topic: Simple <i>String</i> operations (2 days) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • concatenation, <i>length</i>, <i>substring</i>, <i>toLowerCase</i>, <i>toUpperCase</i>, • escape sequences. <p>Reading: <i>Blue Pelican Java</i>, Lesson 3</p> <p>Programs: <i>Name That Celebrity</i>: Makes use of several <i>String</i> methods.</p>
<p>Topic: Using numeric variables (2 days) [C3]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • assignment, incrementing, decrementing, compound operators • modulus, • rules concerning integer & double arithmetic and round-off.

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	<p>Reading: <i>Blue Pelican Java</i>, Lesson 4</p> <p>Programs: <i>Cheating On Your Arithmetic Assignment</i> Using the above methods and rules develop algorithms to solve math problems.</p>
<p>Topic: Mixed data types, casting, and constants (1 day) [C3]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • uses of the keyword <i>final</i>, • mixing data types in an expression, • casting. <p>Reading: <i>Blue Pelican Java</i>, Lesson 5</p>
<p>Topic: The <i>Math</i> class (1 day) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • the fundamental methods of <i>Math</i>, • the advanced methods using trigonometry and some of the higher math functions. <p>Reading: <i>Blue Pelican Java</i>, Lesson 6</p> <p>Programs: <i>Compute This</i> Using complex math expressions</p>
<p>Topic: Input from keyboard (1 day) [C3] [C4]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • the <i>Scanner</i> class in general, • using <i>nextInt</i>, <i>nextDouble</i>, <i>next</i>, and <i>nextLine</i> to input from the keyboard. <p>Reading: <i>Blue Pelican Java</i>, Lesson 7, Appendix M, FOJ 4.3</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Going in circles:</i> Given the area of a circle, compute its radius. • <i>What's My Name?</i> Input first and last name from the keyboard, then print the full name.
<p>Topic: Boolean types and operators (2 days) [C3] [C4]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • the <i>boolean</i> data type, • Boolean operators AND and OR, • precedence of Boolean operations. <p>Reading: <i>Blue Pelican Java</i>, Lesson 8, Appendix H</p>
<p>Topic: The <i>if</i> statement (2 days) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • the syntax of the <i>if-else</i> statement, • uses of the <i>if</i> statement. <p>Reading: <i>Blue Pelican Java</i>, Lesson 9: FOJ 4.5</p> <p>Programs: <i>Even or Odd?</i> Input integers from the keyboard and use modulus to develop an algorithm to determine if even or odd.</p>
<p>Topic: The <i>switch</i> statement, character type (3 days) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • the syntax of the <i>if-else</i> statement, • uses of the <i>if</i> statement. <p>Reading: <i>Blue Pelican Java</i>, Lesson 10</p>

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	<p>Programs: <i>Weight on Other Planets</i> Using the <i>switch</i> statement, develop an algorithm to determine and respond to input from a screen menu.</p>
<p>Topic: The <i>for</i> loop (3 days) [C3] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> the syntax of a <i>for</i> loop, breaking out of a loop and the <i>continue</i> statement, variable scope relative to a loop. <p>Reading: <i>Blue Pelican Java</i>, Lesson 11: FOJ 4.7</p> <p>Programs: <i>Name Reversal</i> Input names from the keyboard. Use a loop to print the name in reverse order.</p>
<p>Topic: <i>while</i> and <i>do-while</i> loops (3 days) [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> the syntax of a <i>while</i> loop, the syntax of a <i>do-while</i> loop, the advantages of each and comparison to a <i>for</i> loop. <p>Reading: <i>Blue Pelican Java</i>, Lesson 12: FOJ 4.6</p>
<p>Topic: ASCII codes and advanced <i>Character</i> methods (2 days) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> the uses of ASCII codes, the specific codes for the alphabet and numbers, conversion from <i>String</i> to <i>char</i> and vice versa, advanced methods of the <i>Character</i> class. <p>Reading: <i>Blue Pelican Java</i>, Lesson 13, Appendix D</p>
<p>2nd Six Weeks (number systems, creating classes & objects, advanced <i>String</i> methods, advanced array concepts, static methods and variables, wrapper classes)</p>	
<p>Topic: Binary, hex, octal number systems (2 days) [C3] [C4] [C5] [C8]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> the basic structure of a number system, conversions to and from binary, hex, and decimal numbers, arithmetic operation in binary, hex, and decimal. <p>Reading: <i>Blue Pelican Java</i>, Lesson 14, Appendices G and Y</p> <p>Programs: <i>Basically Speaking</i> Develop and algorithm that prints a table that gives the equivalent numbers in decimal, binary, hex, and octal.</p>
<p>Topic: Fundamentals of classes and objects (6 days) [C4] [C5] [C6]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> the structure of the signature of a class, instantiating objects, creating a class with a constructor, various public, methods, private methods, and state variables. emphasis of object oriented design, reusable code, top-down design, pre and post conditions for methods. <p>Reading: <i>Blue Pelican Java</i>, Lesson 15, 16: FOJ 5</p>

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	<p>Programs:</p> <ul style="list-style-type: none"> • <i>What's that diameter?:</i> Create a <i>Circle</i> class with a constructor and a <i>diameter</i> method. • <i>Overdrawn at the Bank:</i> Create a <i>BankAccount</i> class having a balance state variable, and with <i>withdraw</i> & <i>deposit</i> methods. Create objects from within the <i>main</i> method of a different class. • <i>Gas Mileage:</i> Create an <i>Automobile</i> class into which we can assignment fuel consumption, miles driven, and a gas tank variable that can be "filled".
<p>Topic: Advanced <i>String</i> methods (3 days) [C3] [C4] [C5] [C6]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • the <i>compareTo</i>, <i>indexOf</i>, <i>charAt</i>, <i>replace</i>, and <i>trim</i> methods, • parsing <i>Strings</i> using the <i>Scanner</i> class <p>Reading: <i>Blue Pelican Java</i>, Lesson 17, Appendix AC</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Add 'em Up:</i> Use <i>Scanner</i> to parse and arithmetic expression and then evaluate • <i>Encryption/Decryption:</i> Use the <i>Scanner</i> class to encrypt and decrypt secret messages.
<p>Topic: Singly dimensioned arrays (7 days) [C3] [C4] [C5]</p>	<p>Objectives: The student will review...</p> <ul style="list-style-type: none"> • declaring and initializing an array, • determining the length of an array, • usage of the <i>split</i> method, • references to an array, • the methods of the <i>Arrays</i> class, • command line arguments, • the enhanced <i>for-loop</i>. <p>Reading: <i>Blue Pelican Java</i>, Lesson 18, 19, Appendix AC; <i>FOJ</i> 8.1 – 8.6</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Count 'em Right:</i> Use <i>split</i> to count occurrences. • <i>Array of Hope:</i> Use loops to fill a character array • <i>Sorting a String Array:</i> Uses <i>Arrays.sort</i> • <i>Two Orders for the Price of One</i>
<p>Topic: Using <i>static</i> state variables and methods (2 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • uses and applications of <i>static</i> methods and variables, • <i>static</i> imports. <p>Reading: <i>Blue Pelican Java</i>, Lesson 20, Appendix I</p> <p>Programs: <i>How far to the Line:</i> Develop an algorithm to calculate distance from a point to a line using static state variables.</p>
<p>Topic: Wrapper classes (2 days)</p>	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • converting primitives to objects and vice versa,

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[C3] [C6]	<ul style="list-style-type: none"> • auto-boxing and unboxing, • the methods <i>parseInt</i>, <i>parseDouble</i>, <i>toHexString</i>, <i>toOctalString</i>, <i>toBinaryString</i>, and <i>toString</i>. <p>Reading: <i>Blue Pelican Java</i>, Lesson 21, 22, Appendix C</p>
3rd Six Weeks (Input and output from a disk file, formatting text, bitwise operators, random numbers, <i>StringBuffer</i> , Boolean algebra)	
Topic: Processing file input (6 days) [C3] [C4] [C5] [C6]	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • using the <i>Scanner</i> class to read a disk file, • using <i>throws IOException</i>. <p>Reading: <i>Blue Pelican Java</i>, Lesson 21, 22, 27</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Reading Files:</i> The basics of reading in a file and then printing it to the screen • <i>Get Rid of that Plus Sign:</i> Input math problems and parse according to arithmetic operations • <i>Student averages:</i> Input student grade data and compute average grades • <i>Gymnastics:</i> Input data from Olympic judges and computer scores
Topic: Writing to a text file (1 day) [C3] [C4] [C5] [C6]	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • the methods necessary to create and send output to a text file, • appending to an existing text file. <p>Reading: <i>Blue Pelican Java</i>, Lesson 26, Appendices E and F</p> <p>Programs: <i>Write Student Averages:</i> Input student grade data and write the computer averages to a different text file.</p>
Topic: Formatting text (2 days) [C3] [C6]	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • using the <i>NumberFormat</i> class, • using the <i>Formatter</i> class and <i>printf</i>. <p>Reading: <i>Blue Pelican Java</i>, Lesson 27, Appendices Z and AD.</p>
Topic: Bitwise operators (3 days) [C3] [C4] [C5] [C8]	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • uses of bitwise AND, OR, and exclusive-OR, • the sign bit, most significant bit, and negative numbers, • the “shifting” operators, • short-circuiting. <p>Reading: <i>Blue Pelican Java</i>, Lesson 28, 29, Appendix H</p> <p>Programs: <i>Tweaking for speed:</i> Using shifting to make a program run faster.</p>
Topic: Random numbers	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • how to create a <i>Random</i> object and then create ranges of

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<p>(3 days) [C4] [C5] [C6]</p>	<p>random integers and doubles,</p> <ul style="list-style-type: none"> • applications of random numbers; games, simulations. <p>Reading: <i>Blue Pelican Java</i>, Lesson 30</p> <p>Programs: <i>Monte Carlo Technique:</i> Develop an algorithm using random “rain drops” to produce an estimate of PI.</p>
<p>Topic: <i>StringBuffer</i> class (1 days) [C3] [C4] [C5] [C6]</p>	<p>Objectives: The student will learn and review...</p> <ul style="list-style-type: none"> • the problems caused by repetitive manipulations of <i>Strings</i>, • how to overcome these problems with a <i>StringBuffer</i> object. <p>Reading: <i>Blue Pelican Java</i>, Lesson 31</p> <p>Programs: <i>Concatenations Gone Wild:</i> Use <i>StringBuffer</i> for multiple concatenations</p>
<p>Topic: Boolean algebra (3 days) [C4]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • how to write a Boolean expression as an algebraic expression, • how to manipulate and simplify such an expression • how to construct truth tables, • DeMorgan’s theorem and its uses and applications. <p>Reading: <i>Blue Pelican Java</i>, Lesson 32</p>
<p>Topic: Selection operator (1 day) [C4] [C5]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • how to convert an <i>if-else</i> expression to selection operator syntax • how to convert selection operator syntax to if-else syntax. <p>Reading: <i>Blue Pelican Java</i>, Lesson 33</p>
<p>4th Six Weeks (Selection operator, passing by value and reference, two-dimensional arrays, inheritance, exceptions, interfaces, complexity analysis, recursion)</p>	
<p>Topic: Passing by value and by reference (2 days) [C4] [C5]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • that primitives and strings are passed by value to methods, • that objects are passed by reference to methods. <p>Reading: <i>Blue Pelican Java</i>, Lesson 34</p> <p>Programs: <i>Pass the Gravy, Please:</i> A demonstration of passing primitives and objects to a method.</p>
<p>Topic: Two-dimensional arrays (2 days) [C3] [C4] [C5]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • how to declare and initialize two-dimensional arrays, • using the <i>Arrays</i> class with two-dimensional arrays <p>Reading: <i>Blue Pelican Java</i>, Lesson 35, Appendix AA; <i>FOJ</i></p>

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	8.7 Programs (develop matrix algorithms): <ul style="list-style-type: none"> • <i>Matrix Multiplication</i>: Multiply two matrices • <i>Matrix Multiplication with File Input</i>
Topic: Inheritance (3 days) [C6]	Objectives: The student will learn... <ul style="list-style-type: none"> • to create a class that inherits another, • to distinguish between <i>abstract</i>, <i>final</i>, overriding, and shadowing as applied to classes and methods. Reading: <i>Blue Pelican Java</i> , Lesson 36; <i>FOJ 9.5</i>
Topic: Exceptions (2 days) [C3] [C4] [C5]	Objectives: The student will learn... <ul style="list-style-type: none"> • two type of exceptions: checked and unchecked • two ways to handle exceptions: with <i>throws</i> and with <i>try-catch-finally</i>. Reading: <i>Blue Pelican Java</i> , Lesson 37, Appendix K; <i>FOJ 9.9</i> Programs: <i>Keep Trying</i> Uses a loop to keep trying a task if an error is detected.
Topic: Interfaces (1 day) [C3] [C4] [C5]	Objectives: The student will learn... <ul style="list-style-type: none"> • to distinguish between the implementation and object perspectives, • to create a class that implements an interface, • how to use <i>instanceOf</i>. Reading: <i>Blue Pelican Java</i> , Lesson 38, Appendix L; <i>FOJ 9.2</i> Programs: <i>Linear Function</i> Create a class that implements an interface and returns information about a linear function.
Topic: Complexity analysis (2 day) [C3] [C4] [C5]	Objectives: The student will learn... generally how to determine a Big O value for an algorithm. Reading: <i>Blue Pelican Java</i> , Lesson 39; <i>FOJ 11.2</i>
Topic: Recursion (3 days) [C3] [C4] [C5]	Objectives: The student will learn... <ul style="list-style-type: none"> • the basic principles of recursion, • how to generate factorials with recursion, • how to generate a Fibonacci sequence with recursion. Reading: <i>Blue Pelican Java</i> , Lesson 40; <i>FOJ 11.2</i> Programs: <i>Fibonacci</i> .
5th Six Weeks (Sorting routines, <i>List</i> interface, <i>ArrayList</i> , <i>Iterator/ListIterator</i> , <i>Comparable/Comparator</i> , <i>HashSet/TreeSet</i> , <i>HashMap/TreeMap</i> , Flow Charts, <i>LinkedList</i> , binary search)	
Topic: Sorting (6 days) [C3] [C4] [C5] [C6]	Objectives: The student will learn... Selection, Insertion, Quick, and Merge Sorts.

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	<p>Reading: <i>Blue Pelican Java</i>, Lesson 41: FOJ 11.4</p> <p>Programs: <i>Multiple Key Sorting</i> :Write a sort routine sorting first by name and then by age..</p>
<p>Topic: List interface (1 day) [C3] [C4] [C5] [C6]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> the methods of the <i>List</i> interface, the classes that implement this interface. <p>Reading: <i>Blue Pelican Java</i>, Lesson 42: FOJ 16.1</p>
<p>Topic: <i>ArrayList</i> (3 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn... how to use and apply the <i>ArrayList</i>.</p> <p>Reading: <i>Blue Pelican Java</i>, Lesson 43</p> <p>Programs: <i>Big Bucks in the Bank</i>: Use an <i>ArrayList</i> object to hold <i>BankAccount</i> objects</p>
<p>Topic: <i>Iterator</i>, <i>ListIterator</i> (4 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> the methods of both the <i>Iterator</i> and the <i>ListIterator</i> how to use iterators to access the elements of a list. <p>Reading: <i>Blue Pelican Java</i>, Lesson 44</p> <p>Programs: <i>Big Buck Revisited</i>: Access the objects in a list using an iterator.</p>
<p>Topic: <i>Comparable</i>, <i>Comparator</i> (3 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> how to compare objects with <i>Comparable</i>, how to compare objects with <i>Comparator</i> <p>Reading: <i>Blue Pelican Java</i>, Lesson 45</p> <p>Programs:</p> <ul style="list-style-type: none"> <i>Bank Account Objects Using Comparator</i> <i>Sorting Bank Account Objects Alphabetically</i> <i>Sorting Bank Account Objects Alphabetically using Comparator</i>
<p>Topic: <i>Sets</i> (2 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> how to implement classes using the <i>Set</i> interface, how to use iterators with <i>Set</i> objects, how to solve problems using <i>HashSet</i> & <i>TreeSet</i>. <p>Reading: <i>Blue Pelican Java</i>, Lesson 46: Appendix W; FOJ 17</p> <p>Programs:</p> <ul style="list-style-type: none"> <i>HashSet Intersection</i>; Find the intersection of sets. <i>HashSet Union</i>; Find the union of sets.
<p>Topic: <i>Maps</i> (3 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> the meaning and uses of keys and values as applied to <i>HashMap</i> & <i>TreeMap</i>,

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	<ul style="list-style-type: none"> • how to implement classes using the <i>Map</i> interface, • how to use iterators with <i>Map</i> objects. <p>Reading: <i>Blue Pelican Java</i>, Lesson 47; <i>FOJ</i> 17</p> <p>Programs (develop algorithms to implement the following):</p> <ul style="list-style-type: none"> • <i>Mapping BankAccount</i> objects • <i>Code Talker</i>; Mapping words to a coded version. • <i>Histogram</i>; Mapping words to a frequency count. • <i>Student Classification</i>; Mapping names to a grade.
<p>Topic: The <i>LinkedList</i> class, stacks (3 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • the methods of the <i>LinkedList</i> class (<i>push</i>, <i>pop</i>, etc) • how to use <i>LinkedList</i> to build a <i>Stack</i> class <p>Reading: <i>Blue Pelican Java</i>, Lesson 50</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>StackLL Class</i>; Creating a stack class using <i>LinkedList</i> • <i>Stack Calculator</i>; Create a stack calculator class
<p>Topic: Binary search (3 days) [C3] [C4] [C5] [C6]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • to do an iterative search of an ordered array, • to do a recursive search of an ordered array, • to use the <i>Arrays</i> class to sort and do binary a search. <p>Reading: <i>Blue Pelican Java</i>, Lesson 51</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Bnary Search, Reverse Order</i> • <i>Binary Search with Objects</i>
<p>6th Six Weeks (Binary search trees, queues, heaps, priority queues, lookup tables & hashing, Grid World case study)</p>	
<p>Topic: Binary search trees (BST) (3 days) [C4] [C5] [C6]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • to create and use the methods of a BST class, • become familiar with preorder, inorder, postorder, and level order traversals, • to create and interpret expression trees. <p>Reading: <i>Blue Pelican Java</i>, Lesson 52; Appendix W; <i>FOJ</i> 18</p> <p>Programs: <i>BST find Method</i>; Search a BST</p>
<p>Topic: Queues (2 days) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • the basic nature of a FIFO, • how to implement a <i>LinkedList</i> queue, • how to implement an <i>ArrayList</i> queue. <p>Reading: <i>Blue Pelican Java</i>, Lesson 53</p> <p>Programs:</p>

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	<ul style="list-style-type: none"> • <i>Who's Next</i>; Use a queue to calculate wait-time in a customer queue. • <i>Shifting Marquee</i>; Use a queue to shift characters in a marquee.
Topic: Heaps (3 days) [C3] [C4] [C5] [C6] [C7]	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • the fundamentals of heap terminology, • how to add and delete heap nodes, • uses and applications of heaps. <p>Reading: <i>Blue Pelican Java</i>, Lesson 55, Appendix AB; <i>FOJ</i> 18.5</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Printing a Heap</i>; Print the contents of a heap by rows. • <i>A Heap of Trouble</i>; Access and print the nodes of a heap so as to make a “pictorially correct” tree.
Topic: Priority Queues (3 days) [C3] [C4] [C5] [C6] [C7]	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • how to implement a priority queue using a heap, • how to implement a priority queue using an array, • uses and applications of priority queues. <p>Reading: <i>Blue Pelican Java</i>, Lesson 56; <i>FOJ</i> 18.6</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>Who Has Highest Priority</i>; Write code for various methods of a priority queue. • <i>Smile for the Camera</i>; Print a “snapshot” of a priority queue.
Topic: Lookup Tables and Hashing (3 days) [C3] [C4] [C5] [C6] [C7]	<p>Objectives: The student will learn...</p> <ul style="list-style-type: none"> • how to create and use a simple lookup table, • the various techniques for creating a hash function, • how to handle collisions, • uses and applications of hashing. <p>Reading: <i>Blue Pelican Java</i>, Lesson 57; <i>FOJ</i> 17.3</p> <p>Programs:</p> <ul style="list-style-type: none"> • <i>A taste of Hash</i>; Create and use a simple hash function using modulus. • <i>Hashing Abraham Lincoln</i>; Create a more complex hash function using Presidents’ names as keys.
Topic: Grid World Case Study (10 days) [C3] [C4] [C5] [C6] [C7]	<p>Objectives: The student will use the Grid World case study to...</p> <ul style="list-style-type: none"> • write several alternative implementations using lists, arrays, binary search trees, and maps, • answer appropriate free-response questions, • answer appropriate multiple-choice questions. <p>Reading: Grid World case study on the College Board web site.</p>

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	<p>Programs: Create algorithms that are appropriate for gaming strategies in which a grid is used.</p>
<p>Topic: Team projects (remainder of semester) [C3] [C4] [C5] [C6] [C7]</p>	<p>Objectives: The student will work in teams ...</p> <ul style="list-style-type: none"> • in order to learn to work cooperatively with others, • choosing their own approved project. <p>Reading: <i>Blue Pelican Java</i>, Case study, page CS-1.</p>

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