Harris County High School

AP Computer Science

Course Syllabus

Course Title.....**AP Computer Science** **Term**..... **Semester**

Teacher.....**Mr. Steve Childers, Ed.S.** **Room**..... **# K-1**

Email.....**childers-s@harris.k12.ga.us**

Student Support Hours..... **2:40 - 3:45 Wednesdays**

Course Description

AP Computer Science A is equivalent to a first-semester, college-level course in computer science. The course introduces students to computer science with fundamental topics that include problem solving, design strategies and methodologies, organization of data (data structures), approaches to processing data (algorithms), analysis of potential solutions, and the ethical and social implications of computing. The course emphasizes both object-oriented and imperative problem solving and design using Java language. These techniques represent proven approaches for developing solutions that can scale up from small, simple problems to large, complex problems. The AP Computer Science A course curriculum is compatible with many CS1 courses in colleges and universities.

At the culmination of this course, students will be prepared to take the AP Computer Science Exam to earn college credit. Students will also be ready for their End of Pathway Assessment (EOPA), the Microsoft Certified Professional exam for Software Development Fundamentals. Successful completion of this EOPA will result in the student being officially certified as a Microsoft Technology Associate.

Prerequisites

Introduction to Digital Technology
Computer Science Principles or AP Computer Science Principles

Instructional Materials and Supplies

Published Materials	Instructional Supplies
All instructional material will be provided in digital format. There is not a hard copy textbook for this course.	paper, pen or pencil, headphones, flash drive

Grading and Assessments

Grade Weights		Grading Scale
Test/Quizzes	24%	A: 90 – 100
Projects	24%	B: 80 – 89
Classwork	12%	C: 70 – 79
Employability Skills	12%	F: 69 or below
Nine Weeks Exam	8%	
End of Pathway Assessment	20%	

ACCEPTABLE USE POLICY

All students and a parent/guardian must agree to the acceptable use policy before using computer technology at Harris County High School. The "Harris County Schools Cybersafety Use Agreement" outlines the rules and responsibilities related to use of personal and school technology. All violations of the acceptable use policy will result in a disciplinary referral to the Administration of Harris County High School.

CLASS POLICIES:

- Students are expected to be in their seat when the bell rings, otherwise a tardy will be recorded. Detention will be assigned for the second and subsequent tardy each nine weeks. Timeliness is part of each student's Employability Skills grade.
- Due to the presence of electronics, food and drinks are only allowed in the designated area.
- Students requesting a restroom break must have their agenda initialed by the teacher and leave mobile electronics in the classroom at the teacher's desk.
- Make Up Work - Refer to page 20 of the Student Handbook. Unexcused absences will result in an 11% grade reduction for any make up work.
- Students are expected to conform to all rules and regulations as defined in the Harris County High School Student Handbook.
- The classroom is managed like a workplace. Students will be given an "employment contract" and receive an Employability Skills grade based on following the contract.
- Because most assignments require a computer, internet access, or specialized software, students will not be assigned homework. However, make up work due to an absence may require completion outside of normal academic hours.
- Assignments turned in late will receive a 10% grade deduction per school day after the due date.

COMMITMENT AND CONTACT INFORMATION

By signing below, I am stating that I have read, understood, and I will encourage my student to adhere to the class syllabus and behavioral expectations. I also understand that I am encouraged to contact the teacher if I have questions or concerns about my student's performance in this course.

_____
Parent/Guardian Name(s)

_____
Parent/Guardian Signature

_____
Parent/Guardian Preferred Contact Number

_____
Parent/Guardian E-Mail address

_____
Date

By signing below, I am stating that I have read, understood, and I will adhere to the class syllabus and behavioral expectations. I also understand that I am encouraged to check with my teacher if I have questions or concerns about grades or assignments in this course.

_____
Student Name

_____
Student Signature

_____@harriscountyschools.org
Student Google ID

_____ Block

_____
Date

A note to students

I look forward to working with each of you. I encourage you to see me at any time if you have questions or concerns about the course or any of the material. I will always be glad to schedule a time to help you if you are ever struggling with anything in the class. Please do not hesitate to ask for help.

A note to parents/guardians

Please feel free to contact me to discuss any questions or concerns about your student's progress in this class.

I encourage both students and parents/guardians to use Student/Parent Portal. I will work diligently to post grades in a timely manner.

Return this section of the syllabus to Mr. Childers.

HARRIS COUNTY SCHOOLS IMAGE PERMISSION, INTERNET USE AND COMPUTER/INTERNET BASED SYSTEM AGREEMENT

(This form must be completed and returned before student may use computers)

STUDENT: I understand and will abide by the Acceptable Internet Use Policy and any Computer/Internet based system's guidelines for Harris County Schools outlined in the Student-Parent Handbook. I further understand that any violation of these regulations is unethical and may constitute a criminal offense. Should I commit any violation, my access or use privileges may be revoked and school disciplinary action and/or legal action may be taken. While using any Computer/Internet Based system I will NOT alter, disassemble, change or modify any component in the software. I will use Computers or the Computer/Internet Based system in the way the vendor and my teacher intends to gain maximum benefit for these computerized resources. The use of the Internet is a privilege, not a right and inappropriate use will result in a cancellation of those privileges. (Each student who receives a Computer/Interned based system's password shall participate in an orientation with a faculty member pertaining to the proper use of the system).

PARENT: As a parent or guardian of this student, I have read the Acceptable Internet Use Policy and the policies regarding use of computers and Computer/Internet Based system for Harris County Schools outlined in the Student-Parent Handbook. I understand that my signature grants permission for my child's image and/or work to be used as stated in the Use of Student Image and Student Work policy. I understand that the Internet access and Computer/Computer/Internet Based system's use is designed for educational purposes only and that Harris County Schools have taken precautions to eliminate controversial materials. However, I also recognize it is impossible for Harris County Schools to restrict access to all controversial materials, and I will not hold them responsible for materials acquired on the internet. Further, I accept full responsibility for supervision if and when my child's use is not in a school setting. I hereby give permission for my child to use the Internet and the Computer/Computer/Internet Based system. I certify that the information contained on this form is correct. I further understand that an attempt by my adolescent to alter, disassemble, change or modify any component in the software will result in the appropriate disciplinary-actions outlined in the Student-Parent Handbook.

Student Name (Please Print)

_____ _____

(Last) (First)

_____ _____ _____

Student Signature Date Advisor/Homeroom

Parent/Guardian Name (Please Print)

_____ _____

(Last) (First)

_____ _____

Parent/Guardian Signature Date

Return this section of the syllabus to Mr. Childers.

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Syllabus # 2139268v1

Course Syllabus: Advanced Placement® Computer Science A

Computer science embraces problem solving, hardware, algorithms and perspectives that help people utilize computers to solve real-world problems in everyday life. The AP Computer Science A course introduces students to computer science with fundamental topics that include problem solving, design strategies and methodologies, organization of data (data structures), approaches to processing data (algorithms), analysis of potential solutions, and the ethical and social implications of computing. The course emphasizes both object-oriented and imperative problem solving and design. These techniques represent proven approaches for development solutions that can scale up from small, simple problems to large, complex problems.

By the end of this course, students will be able to:

- Design and implement computer-based solutions to problems.
- Use and implement commonly used algorithms and data structures.
- Develop and select appropriate algorithms and data structures to solve new problems.
- Write solutions fluently an object-oriented paradigm
- Write, run, test and debug solutions in the Java programming language
- Read and understand programs consisting of several classes and interacting objects
- Read and understand a description of the design and development process
- Understand the ethical and social implications of computer use.

Edhesive's course is approved by the College Board as an authorized AP® Computer Science A course.

Prerequisites

This course requires a strong foundation in English and mathematics. Students must be comfortable with functions and the concepts found in the uses of functional notation. Prior computer programming experience is not required.

Teaching Strategies

The course will consist of video lectures, daily programming exercises, longer coding assignments, and regular quizzes and exams. Students will also participate in online discussion forums. By the end of the course, students will be well prepared to take the AP® Computer Science A exam.

Each lesson listed below includes practice exercises, including shorter coding problems. Well over 20 hours of instructional time is spent in hands-on coding using the course coding exercises, lab assignments and AP labs. Students participate regularly in a moderated discussion forum that provides support for lesson material and also introduces discussions of the ethical implications of programming, including copyright law, software piracy, intellectual property, privacy, and network reliability.

Textbook

This course will reference a free online textbook.

Eck, David J. "Introduction to Programming Using Java." Hobart and Williams Smith Colleges, 17 May

2013. Web. 09 July 2013.

Curricular Requirements		Page(s)
CR1	The course teaches students to design and implement computer-based solutions to problems.	3 - 11
CR2a	The course teaches students to use and implement commonly used algorithms.	5, 6, 9, 10
CR2b	The course teaches students to use commonly used data structures.	5 - 10
CR3	The course teaches students to select appropriate algorithms and data structures to solve problems.	5, 6, 9, 10
CR4	The course teaches students to code fluently in an object-oriented paradigm using the programming language Java.	3 - 11
CR5	The course teaches students to use elements of the standard Java library from the AP Java subset in Appendix A of the AP Computer Science A Course Description.	3 - 11
CR6	The course includes a structured lab component comprised of a minimum of 20 hours of hands-on lab experiences.	3 - 11
CR7	The course teaches students to recognize the ethical and social implications of computer use.	1

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Syllabus # 2139268v1

Course Outline

Unit 1: Introduction to Java

This unit introduces students to the basics of programming in Java. Emphasis is on correct programming style and formatting.

Duration:

10 days

Objectives and Topics:

- Basic Input and Output
- Variables
- Number Operations including +, -, *, /, % and the AMth.java functions: static int abs(int x), static double abs(double x), static double pow(double base, double exponent), static double sqrt(double x), static double random() // returns a double in the range [0.0, 1.0)
- Data Types
- Comments and Program Design
- Error Correction

Lessons:

- Lesson 1: Output in Java
- Lesson 2: Escape Characters
- Lesson 3: User Input and Variables
- Lesson 4: Data Types
- Lesson 5: Number Calculations
- Lesson 6: Numeric Casts
- Lesson 7: Modular Division
- Lesson 8: String and Number Output
- Lesson 9: Math Functions
- Lesson 10: Round-off Error

Assessments and Programming Labs:

- Assignment 1: Movie Ratings
- Assignment 2: Time Converter
- Quiz 1 and Exam 1

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Syllabus # 2139268v1

Unit 2: Conditionals and Loops

This unit introduces some of the basic constructs of programming, including conditionals and loops. In addition, students are introduced to debugging techniques and tracing code.

Duration:

7 days

Objectives and Topics:

- If Statements
- Boolean Operations
- DeMorgan's Law
- Short Circuit Evaluation
- While Loops
- Java constants Integer.MIN_VALUE and Integer.MAX_VALUE

Lessons:

- Lesson 11: Simple if's
- Lesson 12: If's - Making Decisions
- Lesson 13: Else
- Lesson 14: Booleans and Truth Tables
- Lesson 15: Short Circuit Evaluation
- Lesson 16: DeMorgan's Law
- Lesson 17: While Loops
- Lesson 18: Tracing Code and Counting Iterations
- Lesson 19: More Loops
- Lesson 20: Flag Variables

Assessments and Programming Labs:

- Assignment 3: Crack the Code!
- Quiz 2 and Exam 2

Unit 3: Strings and One-Dimensional Arrays

In this unit students shift from acquiring programming techniques to working with classes and algorithms. String and arrays are used as examples of object data types. Some of the standard algorithms on data structures are introduced, such as finding a max and min, and transversals, insertion and deletion with arrays.

Duration:

12 days

Objectives and Topics:

- Constructors
- Concatenation
- For Loops
- String methods: equals (), charAt( ), toUpperCase(), substring( )
- One-Dimensional Arrays
- Transversals, Insertion and Deletion with Arrays
- Arrays of Objects

Lessons:

- Lesson 21: Strings as Class Types
- Lesson 22: String functions
- Lesson 23: 1-D Arrays
- Lesson 24: The for loop
- Lesson 25: Algorithms
- Lesson 26: Algorithms on Arrays
- Lesson 27: Algorithms - Searching
- Lesson 28: Arrays of Strings
- Lesson 29: Arrays of Strings accessing Methods
- Lesson 30: Process Array of Strings
- Lesson 1011: Binary

Assessments and Programming Labs:

- Assignment 4: Alien Message Board
- Assignment 5: Pivot Strings
- Assignment 6: Merge Arrays
- Quiz 3 and Exam 3

Unit 4: Methods

In this unit students begin to write their own methods. An emphasis is placed on testing and program design. Recursion is introduced and direct comparisons between iteration and recursion are made.

Duration:

10 days

Objectives and Topics:

- Void Methods
- Methods that Return a Single Value
- Overloading Methods
- Parameter Passing
- Primitive vs. Object Parameters
- Recursion

Lessons:

- Lesson 31: Void Methods
- Lesson 32: Parameters
- Lesson 33: Parameters - Primitive vs Class
- Lesson 34: Return Methods
- Lesson 35: Overloaded Methods
- Lesson 36: Recursion - Part 1
- Lesson 37: Recursion - Part 2

Assessments and Programming Labs:

- Assignment 7: Methods Sample Platter
- Quiz 4 and Exam 4

Unit 5: User-Defined Classes

This unit begins the second term. Students transition from using classes and objects to designing and coding their own classes. This unit is also structured to serve as a review of the topics from Unit 1 as all of the programming techniques used in Term 1. In particular, basic arrays and ArrayLists are compared and contrasted. This unit also introduces the first of the AP Labs: Magpie that facilitates a discussion and reflection of the social, cultural and ethical implications of chatbots and artificial intelligence.

For the coding exercises students transition to creating classes and data structures from scratch, a skill that is assessed in the lab assignments.

Duration:

10 days

Objectives and Topics:

- ArrayList Class
- java.util.List interface
- Constructors
- Encapsulation via private variables and accessor and mutator methods
- Private/Public
- Writing equals() toString() methods
- Static Variables and Methods
- Wrapper Classes

Lessons:

- Lesson 1: ArrayList
- Lesson 2: The for each Loop
- Lesson 3: Classes - The Basics and Encapsulation
- Lesson 4: Constructors
- Lesson 5: Static vs. Instance
- Lesson 7: Inheritance
- Lesson 6: AP Exam Review

Assessments and Programming Labs:

- Assignment 1: Dashboard
- Assignment 2: Boxcar & Freight Train
- AP Lab: Magpie
- Quiz 1 and Exam 1

Unit 6: Advanced Classes

In this unit students continue to work with class design by covering the more advanced topics including polymorphism, inheritance, abstraction and interfaces. Students also continue working with the AP Labs by working through the Elevens student guide.

Duration:

10 days

Objectives and Topics:

- Inheritance
- This vs. Super
- Abstract Classes
- Interfaces including the List and Comparable Interface

Lessons:

- Lesson 7: Inheritance
- Lesson 8: Inheritance Overriding Methods
- Lesson 9: Abstract Classes
- Lesson 10: Is-A and Has-A Relationships
- Lesson 11: Interfaces
- Lesson 12: Wrapper Classes

Assessments and Programming Labs:

- Assignment 3: Ultimate Frisbee
- Assignment 4: Dashboard Comparable
- AP Lab: Elevens
- Quiz 2 and Exam 2

Unit 7: Algorithms - Searching and Sorting

This unit is designed to thoroughly cover the standard algorithms required on the AP Exam along with reviewing some of the topics from Term 1 related to arrays. Searching algorithms are performed on both ordered and unordered lists.

Duration:

7 days

Objectives and Topics:

- Sequential and Binary Searches
- Selection, Insertion and Merge sort

Lessons:

- Lesson 13: Algorithms
- Lesson 14: Linear Search
- Lesson 15: Selection Sort
- Lesson 16: Insertion Sort
- Lesson 17: Binary Search
- Lesson 18: Merge Sort

Assessments and Programming Labs:

- Assignment 5: Game Wheel
- Assignment 6: Sort Team Directory
- Quiz 3 and Exam 3

Unit 8: Two-Dimensional Arrays

This unit covers two-dimensional arrays and covers the AP Lab: Pictures.

Duration:

5 days

Objectives and Topics:

- Two-Dimensional Arrays
- Algorithms on Two-Dimensional Arrays

Lessons:

- Lesson 19: 2-D Arrays
- Lesson 20: 2-D Array Algorithms
- Lesson 21: Tracing Code

Assessments and Programming Labs:

- Assignment 7: Checkers
- AP Lab: Picture
- Quiz 4 and Exam 4

Unit 9: AP Exam Review

Students will be given a diagnostic exam and practice AP problems to prepare them to take the AP Computer Science exam. A series of review videos are provided covering the major topics on the AP Exam. The goal of the unit is to allow students to synthesize the material covered throughout the year and review any areas that could use strengthening.

Duration:

7 days

Objectives and Topics:

- AP Exam Review

Review Lessons:

- Programming Fundamentals
- Data Structures
- Logic
- Algorithms
- Object-Oriented Programming
- Recursion
- Software Engineering

Assessments and Programming Labs:

- Diagnostic Exam
- Released AP Exam Free-Response problems