

Montclair High School

Course Syllabus

Department: Math

Course: AP Computer Science Principles

Level: Advanced Placement

Credits: 5

Course Description:

AP Computer Science Principles introduces students to the central ideas of computer science, instilling the ideas and practices of computational thinking, and inviting students to understand how computing changes the world. Students develop innovative computational artifacts using the same creative processes artists, writers, computer scientists, and engineers use to bring ideas to life.

This course emphasizes the vital impact advances in computing have on people and society. The course goes beyond the study of machines and systems and gives students the opportunity to investigate computing innovations that span a variety of interests and to examine the ethical implications of these new technologies.

This course is designed to be equivalent to a first-semester introductory college computing course and meets all of the requirements specified by the College Board.

Curriculum:

The curriculum for this course has been adapted from the Mobile CSP program. It is a cloud-based program which employs a combination of video tutorials, self-directed programming activities, small group explorations and class discussions. As a result, this course allows students to work at their own pace, learn collaboratively and develop projects that meet their own interests and abilities. It also supports learning outside of the classroom for students who are absent.

This program includes the use of MIT's App Inventor, a software development tool which allows students to build apps for Android tablets and phones. Students will also have the option to develop programs using the Java and Python programming languages.

Anchor Text: N/A

Supplemental materials

- Blown to Bits: Your Life, Liberty, and Happiness After the Digital Explosion
- Articles from technical journals and websites

Units of Study:

The major areas of study are organized around seven “big Ideas”

Big Idea	Essential Questions	Key Topics
1 Creativity	What role does creativity play in the creation of computational solutions? How can computers foster creativity and extend traditional forms of human expression?	<ul style="list-style-type: none">• Creating digital artifacts
2 Abstraction	How are data, mathematical & logical concepts and hardware represented to make it easier to write programs and solve problems? How can computational models and simulations help generate new understanding and knowledge?	<ul style="list-style-type: none">• Binary and hexadecimal number systems• How computers represent data• How a CPU works• Logic gates and circuits• Machine code to high-level languages• Using real world models and simulations
3 Data and Information	How do computers help people process and explore data to gain insight and knowledge? How can data be manipulated?	<ul style="list-style-type: none">• Organizing data (intro to databases)• Visualizing and using data• Encryption, compression, error correction
4 Algorithms	What are algorithms and how do we implement, analyze and evaluate them?	<ul style="list-style-type: none">• Pseudocode, flow diagrams• Common algorithms such as search and sort• Tracing, analyzing and evaluating techniques
5 Programming	How are programs developed to help people, organizations, or society solve problems?	<ul style="list-style-type: none">• Software development lifecycle• Basic coding constructs• Event handlers and timers• Graphics, drawing and animation• Using objects, libraries and APIs
6 The Internet	What is the Internet? How is it built? How does it function? How is cybersecurity impacting number of users?	<ul style="list-style-type: none">• Internet architecture and devices• Messaging, protocols, addressing and DNS• Packets, metadata and routing• Error detection and fault tolerance• Threats and cybersecurity• Open standards and design considerations
7 Global Impact	How does computing enhance human interaction and enable innovation? What are some beneficial and harmful effects?	<ul style="list-style-type: none">• Social, economic and cultural implications• Responsible use and ethical issues• Risks and benefits of computing innovations

Evaluation & Assessment:

This is a project-based course which emphasizes collaboration and performance based tasks. In particular, two projects are required as part of the AP Exam: (1) Explore Performance Task (a research project) and (2) Create Performance Task (a programming project). Both projects will also be included in the course grade and are therefore required even if a student chooses not to take the AP Exam.

Grade Category	Assignments	Weight
Portfolio	Responses to questions, activities, programming tasks	30%
Assessments	Short quizzes which assess learning progress	30%
Performance Tasks	AP Tasks, digital artifacts, innovation analyses	40%

The Final Grade: marking period grades (22.5% each), the midterm project (5%) and the final exam project (5%)