



# SCHOOL DISTRICT OF THE CHATHAMS CURRICULUM PROFILE TEMPLATE



**CONTENT AREA(S):** Design & Technology

**GRADE LEVEL(S):** 10-12th

**COURSE:** Advanced Placement Computer Science Principles

**TIME FRAME:** Full Year

## **I. Course Overview**

In this course, students will be learning about programming concepts, using block based language (MIT App Inventor) eliminating the need to deal with syntax. The major focus of this class is to discuss computing concepts in an approachable way, how computing is a creative process, how we use abstraction to model real world behavior and how to write algorithms to program those abstractions. In addition, a major component of the class is to talk about the internet, from the functional to the ethical as well as other general computing innovations and their global impact.

## **II. Units of Study**

Unit 1: Intro, Mobile Computers and Mobile Apps

Unit 2: Graphics and Drawing

Unit 3: Animation, Simulation and Modeling

Unit 4: Algorithms and Procedural Abstraction

Unit 5: Using and Analyzing Data and Information

Unit 6: The Internet

Unit 7: CS Exploration

## **III. Essential Questions** *(The open-ended, provocative questions that help frame inquiry)*

**Unit 1:** Intro, Mobile Computers and Mobile Apps

- What are Mazes, Algorithms and Programs?
- How do we set up a portfolio?
- What is App Inventor and how do we use it?
- What is Blown to Bits about?
- What are some of the App Inventor controls?
- What are applications?
- What are devices?
- What is abstraction?
- What are binary numbers?
- How is the digital explosion affecting us?
- What are hardware and software abstractions?

**Unit 2:** Graphics and Drawing

- What is a bit?
- How do we represent information (images, text, etc) as bits?
- How do we transform an algorithm into one that is more flexible?
- How do we detect transmission errors?

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- What is parity? What is a hamming code?
- How do we make data persist from one application session to another?

## **Unit 3:** Animation, Simulation and Modeling

- What are the limits and expectations of privacy when using the internet?
- What is randomness?
- How do computers model randomness?
- How can randomness be applied to model real world problems?
- How does a CPU function?
- How is abstraction applied in the function of a CPU?

## **Unit 4:** Algorithms and Procedural Abstraction

- How does searching the web work?
- What is a search algorithms?
- What is a sort algorithms?
- How do we analyze the efficiency of search and sort algorithms?
- What are the limits of what algorithms can do?

## **Unit 5:** Using and Analyzing Data and Information

- What is a data set?
- How has data collection evolved?
- How can lines of communication create problems in programming?
- How are more complex data structures created and worked with?

## **Unit 6:** The Internet

- What are the core components of the Internet?
- How does the Internet function?
- What is cryptography?
- How does cryptography work?
- How is the government involved in cryptography?

## **Unit 7:** CS Exploration

- Why is this topic important (to the student)?
- What is the student's goal in the time available?
- What has the student accomplished towards meeting that goal on a weekly basis?



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## **IV. Learning Objectives**

Objectives align with the NJSLS Standard 8.2 Strand E. It incorporates concepts of mathematical processes of problem solving in Mathematics and the content areas of Technological Literacy and 21st Century Life and Careers. The curriculum is based on the content mastery expectations of the College Board.

## **V. Instructional Materials**

- Blown to Bits by: Abelson, Ledeen, Lewis
- Program or Be Programmed by: Douglas Rushkoff

## **Supplementary Materials**

- Online documentation for MIT App Inventor

## **VI. Key Performance and Benchmark Tasks**

### **Unit 1: Intro, Mobile Computers and Mobile Apps**

- Understand the difference between a maze, algorithm and program.
- Setup and configure a portfolio.
- Understand the relevance of reading Blown to Bits
- Become familiar with App Inventor controls
- Understand the difference between applications and devices
- Recognize abstraction
- Understand the binary number system
- Recognize the effect of the digital explosion
- Understand hardware and software abstractions
- Understand the function of logic gates

### **Unit 2: Graphics and Drawing**

- Understand binary digital images representation
- Understand image compression techniques
- Recognize encoding manipulation
- Understand how binary errors can be detected simply or using parity

### **Unit 3: Animation, Simulation and Modeling**

- Create models of scenarios
- Implement a simulation to test theories
- Identify the uses and limitations of pseudo randomness
- Reflect on privacy issues and their effect on society

### **Unit 4: Algorithms and Procedural Abstraction**

- Understand the three basic control structures of algorithms
- Familiarize with various search algorithm methodology
- Familiarize with various sort algorithm methodology
- Analyze algorithm efficiency
- Reflect on the effect of search engines on society

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## **Unit 5: Using and Analyzing Data and Information**

- Understand the role of data in computer programs
- Understand the development and current role of big data
- Understand the difference between synchronous and asynchronous communication and the problems that can arise
- Understand the complexity of creating and working with data sets

## **Unit 6: The Internet**

- Recognize the differences between the world wide web and the internet
- Understand how the world wide web and internet interact
- Understand cloud computing
- Understand the client/server model
- Recognize the structure of the internet (packets, TCP/IP)
- Implement basic cryptography methods
- Reflect on ethical use of the internet

## **Unit 7: CS Exploration**

- This unit will be an investigation, post AP exam
- Students will select a computer science topic of their choosing to investigate beyond the scope of the course. Topics can include (but are not limited to)
  - Learning a new programming language
  - Animation/Graphics programming
  - CyberSecurity