

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Course Description

AP Computer Science Principles is a full-year course that meets on a rotating basis for three (3) 55-minute blocks and one (1) 40-minute block for every five (5) day cycle.

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 Principles course introduces students to the foundational concepts of computer science and explores the impact computing and technology have on our society. The course covers a broad range of foundational topics including programming, algorithms, the Internet, big data, digital privacy and security, and the societal impacts of computing. The course content follows the College Board's Advanced Placement curriculum for the AP test in Computer Science Principles.

Course Overview and Pacing Guide

Unit	Topic	Time Frame
1	Computational Thinking	4 Weeks
2	Programming	5 Weeks
3	Data Representation	5 Weeks
4	Digital Media Processing	4 Weeks
	AP Exam Part 1: Create Performance Task	3 Weeks
5	Big Data	5 Weeks
6	Innovative Technologies	5 Weeks
7	AP Exam Review	3 Weeks
8	Data Analysis	4 Weeks

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Computer Science and Design Thinking (Standard 8)	
Core Idea	Performance Expectation
The usability, dependability, security, and accessibility of devices within integrated systems are important considerations in their design as they evolve.	8.1.12.CS.1: Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.
A computing system involves interaction among the user, hardware, application software, and system software.	8.1.12.CS.2: Model interactions between application software, system software, and hardware. 8.1.12.CS.3: Compare the functions of application software, system software, and hardware.
The scalability and reliability of the Internet are enabled by the hierarchy and redundancy in networks. Network topology is determined by many characteristics.	8.1.12.NI.1: Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
Network security depends on a combination of hardware, software, and practices that protect data while it is at rest, in transit, and in use.	8.1.12.NI.2: Evaluate security measures to address various common security threats. 8.1.12.NI.4: Explain how decisions on methods to protect data are influenced by whether the data is at rest, in transit, or in use.
Choices individuals make about how and where data is organized and stored affects cost, speed, reliability, accessibility, privacy, and integrity.	8.1.12.DA.2: Describe the trade-offs in how and where data is organized and stored. 8.1.12.DA.3: Translate between decimal numbers and binary numbers. 8.1.12.DA.4: Explain the relationship between binary numbers and the storage and use of data in a computing device
Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.	8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation.	8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
Programmers choose data structures to manage program complexity based on functionality, storage, and performance trade-offs.	8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.
Complex programs are designed as systems of interacting modules, each with a specific role, coordinating for a common overall purpose. Modules allow for better management of tasks.	8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
Complex programs are developed, tested, and analyzed by teams drawing on the members' diverse strengths using a variety of resources and tools.	8.1.12.AP.7: Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users. 8.1.12.AP.9: Collaboratively document and present design decisions in the development of complex programs

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Career Readiness, Life Literacies, and Key Skills (Standard 9)	
Core Idea	Performance Expectation
There are strategies to improve one's professional value and marketability.	9.2.12.CAP.3: Investigate how continuing education contributes to one's career and personal growth.
Career planning requires purposeful planning based on research, self-knowledge, and informed choices.	9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.
With a growth mindset, failure is an important part of success.	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving
Laws govern many aspects of computing, such as privacy, data, property, information, and identity. These laws can have beneficial and harmful effects, such as expediting or delaying advancements in computing and protecting or infringing upon people's rights.	9.4.12.DC.3: Evaluate the social and economic implications of privacy in the context of safety, law, or ethics 9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users
Laws govern the use of intellectual property and there are legal consequences to utilizing or sharing another's original works without permission or appropriate credit.	9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content
Digital communities influence many aspects of society, especially the workforce. The increased connectivity between people in different cultures and different career fields have changed the nature, content, and responsibilities of many careers.	9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content, and responsibilities of careers, and other aspects of society 9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection
Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems and inform the decision-making.	9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources
Collaborative digital tools can be used to access, record, and share different viewpoints and to collect and tabulate the views of groups of people.	9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments 9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem
Interdisciplinary Connections	
MA.K-12.1-8: Integrate mathematical skills using variables, structure, and reasoning to create computer programs.	

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Modifications, Accommodations, and Differentiation			
English Language Learners	IEP / 504	At Risk Students	Gifted and Talented
Scaffolding Word walls Sentence/paragraph frames Bilingual dictionaries/translation Think alouds Read alouds Highlight key vocabulary Annotation guides Think-pair- share Visual aides Modeling In-Class-Support Graphic Organizers Note-taking guides Clarify assignments, directions and instructions Extended time Collaboration between ESL and mainstream classroom teachers	Word walls Visual aides Graphic organizers Multimedia Leveled readers Assistive technology Notes/summaries Extended time Answer masking Answer eliminator Highlighter Color contrast In-Class-Support Provide Study Guides Establish Timelines Clarify Assignments, directions and instructions Parent/teacher communication Assist students with steps to complete assignments Provide student with clear expectations and grading criteria Establish procedures for accommodations /modifications for assessments	Teacher tutoring Peer tutoring Study guides Graphic organizers Extended time Parent communication Modified assignments Counseling Verbal reminders Check student independent work Assist student with planning of assignments Provide student with clear expectations and grading criteria Restate and clarify directions and questions	Challenge assignments Enrichment activities Independent research/inquiry Collaborative teamwork Higher level questioning Critical/Analytical thinking tasks Self-directed activities Open forums and debates in the classroom regarding controversial issues

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 1 - Computational Thinking	Time Frame - 4 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Computational Thinking	
This unit introduces students to the basics of programming and the common features of algorithms, including sequencing, selection, and repetition.	
Core Idea	Performance Expectation (Standard)
Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation	8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms
A computing system involves interaction among the user, hardware, application software, and system software.	8.1.12.CS.2: Model interactions between application software, system software, and hardware. 8.1.12.CS.3: Compare the functions of application software, system software, and hardware.
Collaborative digital tools can be used to access, record, and share different viewpoints and to collect and tabulate the views of groups of people.	9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem
With a growth mindset, failure is an important part of success.	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Identify the elements of clear communication, including well-specified grammar, vocabulary, and syntax	Lesson 1 - The Iterative Development Process Lesson 2 - Algorithms Lesson 3 - Languages	Classroom Assignments and Activities, Programming Labs, Unit 1 Quiz, Unit 1 Test
Utilize a graphical editor to read, construct, and execute dynamic programs	Lesson 4 - Idea to Execution Lesson 5 - Getting Started in Scratch	Classroom Assignments and Activities, Programming Labs, Unit 1 Quiz, Unit 1 Test
Compare high-level languages with low-level languages	Lesson 6 - Programming with Blocks Lesson 7 - User Input and Storage	Classroom Assignments and Activities, Programming Labs, Unit 1 Quiz, Unit 1 Test
Write programs that incorporate dynamic, user-driven, keyboard controls and input.	Lesson 8 - Defining Variables Lesson 9 - Applying Variables	Classroom Assignments and Activities, Programming Labs, Unit 1 Quiz, Unit 1 Test

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 2 - Programming	Time Frame - 5 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Programming

This unit focuses on the three main control structures utilized within algorithms and programs: sequencing, selection, and iteration.

Core Idea	Performance Expectation (Standard)
Programmers choose data structures to manage program complexity based on functionality, storage, and performance trade-offs	8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables
Complex programs are designed as systems of interacting modules, each with a specific role, coordinating for a common overall purpose.	8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
Laws govern many aspects of computing, such as privacy, data, property, information, and identity. These laws can have beneficial and harmful effects, such as expediting or delaying advancements in computing and protecting or infringing upon people's rights.	9.4.12.DC.4: Explain the privacy concerns related to the collection of data (e.g., cookies) and generation of data through automated processes that may not be evident to users
Career planning requires purposeful planning based on research, self-knowledge, and informed choices.	9.2.12.CAP.6: Identify transferable skills in career choices and design alternative career plans based on those skills.

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Identify common features of algorithms, including sequencing, selection, and repetition	Lesson 1 - Defining Sequencing Lesson 2 - Applying Sequencing	Classroom Assignments and Activities, Programming Labs, Unit 2 Quiz, Unit 2 Test, Password Project
Combine sequencing, selection, and repetition structures alongside programming constructs like user input and variables to create computational artifacts	Lesson 3 - Pseudocode Lesson 4 - Defining Selection Lesson 5 - Applying Selection Lesson 6 - Defining Iteration Lesson 7 - Applying Iteration	Classroom Assignments and Activities, Programming Labs, Unit 2 Quiz, Unit 2 Test, Password Project
Read, execute, and construct algorithms in AP-style pseudocode	Lesson 8 - Procedures Lesson 9 - Solvability & Performance	Classroom Assignments and Activities, Programming Labs, Unit 2 Quiz, Unit 2 Test, Password Project
Identify which problems can and cannot always be solved by an algorithm.	Lesson 10 - Logic Gates & Hardware	Classroom Assignments and Activities, Programming Labs, Unit 2 Quiz, Unit 2 Test, Password Project

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 3 - Data Representation	Time Frame - 5 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Data Representation

In this unit, students explore the different ways digital information can be represented, stored, and manipulated on a computer.

Core Idea	Performance Expectation (Standard)
Choices individuals make about how and where data is organized and stored affects cost, speed, reliability, accessibility, privacy, and integrity.	8.1.12.DA.2: Describe the trade-offs in how and where data is organized and stored. 8.1.12.DA.3: Translate between decimal numbers and binary numbers. 8.1.12.DA.4: Explain the relationship between binary numbers and the storage and use of data in a computing device
Digital communities influence many aspects of society, especially the workforce. The increased connectivity between people in different cultures and different career fields have changed the nature, content, and responsibilities of many careers.	9.4.12.DC.7: Evaluate the influence of digital communities on the nature, content, and responsibilities of careers, and other aspects of society
Collaborative digital tools can be used to access, record, and share different viewpoints and to collect and tabulate the views of groups of people.	9.4.12.TL.3: Analyze the effectiveness of the process and quality of collaborative environments.

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Identify how numerical values are represented using different bases, including decimal and binary	Lesson 1 - Binary Lesson 2 - Base Conversions	Classroom Assignments and Activities, Programming Labs, Unit 3 Quiz, Unit 3 Test, Unintendo Project
Convert values from decimal to binary and binary to decimal	Lesson 3 - ASCII vs. Unicode Lesson 4 - Programming Binary	Classroom Assignments and Activities, Programming Labs, Unit 3 Quiz, Unit 3 Test, Unintendo Project
Identify the differences between discrete and continuous representations of natural phenomena.	Lesson 5 - Digitization Lesson 6 - Analog vs. Digital Data	Classroom Assignments and Activities, Programming Labs, Unit 3 Quiz, Unit 3 Test, Unintendo Project
Utilize common operations for processing elements of a list	Lesson 7 - Making a List Lesson 8 - Processing a List Lesson 9 - Sorting a List Lesson 10 - Lists in Pseudocode	Classroom Assignments and Activities, Programming Labs, Unit 3 Quiz, Unit 3 Test, Unintendo Project

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 4 - Digital Media Processing	Time Frame - 4 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Digital Media Processing

In Unit 4, students will use Python to programmatically manipulate digital images and audio.

Core Idea	Performance Expectation (Standard)
The usability, dependability, security, and accessibility of devices within integrated systems are important considerations in their design as they evolve.	8.1.12.CS.1: Describe ways in which integrated systems hide underlying implementation details to simplify user experiences.
Complex programs are developed, tested, and analyzed by teams drawing on the members' diverse strengths using a variety of resources and tools.	8.1.12.AP.7: Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users.
Laws govern the use of intellectual property and there are legal consequences to utilizing or sharing another's original works without permission or appropriate credit	9.4.12.DC.1: Explain the beneficial and harmful effects that intellectual property laws can have on the creation and sharing of content
Collaborative digital tools can be used to access, record, and share different viewpoints and to collect and tabulate the views of groups of people.	9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem.

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Write code using common programming constructs like conditional if() for selection and while() loops for iteration	Lesson 1 - Introduction to Python Lesson 2 - Python Basics Lesson 3 - Selection Lesson 4 - Iteration	Classroom Assignments and Activities, Programming Labs, Unit 4 Quiz, Unit 4 Test, Image Filter Project
Utilize Boolean, relational and conditional expressions	Lesson 5 - Data Abstraction Lesson 6 - Procedural Abstraction	Classroom Assignments and Activities, Programming Labs, Unit 4 Quiz, Unit 4 Test, Image Filter Project
Design algorithms for modifying the pixels in an image to create custom image filters	Lesson 7 - RGB Color Lesson 8 - Image Manipulation Lesson 9 - Encoding Schemes	Classroom Assignments and Activities, Programming Labs, Unit 4 Quiz, Unit 4 Test, Image Filter Project
Programmatically alter and modify digital audio by adjusting volume, pitch, and sampling rate	Lesson 10 - Digital Manipulation Lesson 11 - Audio Manipulation	Classroom Assignments and Activities, Programming Labs, Unit 4 Quiz, Unit 4 Test, Image Filter Project

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Create Performance Task	Time Frame - 3 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Create Performance Task

This unit serves to fulfill the Performance Task requirements of the AP Computer Science Principles exam. The Create Performance Task will account for 30% of the student's AP exam score.

Core Idea	Performance Expectation (Standard)
Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation.	8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
Programmers choose data structures to manage program complexity based on functionality, storage, and performance trade-offs	8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables
Complex programs are designed as systems of interacting modules, each with a specific role, coordinating for a common overall purpose.	8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
Complex programs are developed, tested, and analyzed by teams drawing on the members' diverse strengths using a variety of resources and tools.	8.1.12.AP.7: Collaboratively design and develop programs and artifacts for broad audiences by incorporating feedback from users. 8.1.12.AP.9: Collaboratively document and present design decisions in the development of complex programs
Collaboration with individuals with diverse experiences can aid in the problem-solving process, particularly for global issues where diverse solutions are needed.	9.4.12.CT.1: Identify problem-solving strategies used in the development of an innovative product or practice 9.4.12.CT.2: Explain the potential benefits of collaborating to enhance critical thinking and problem solving

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Students will individually and/or collaboratively design, implement, and test a program designed to solve a problem of interest to them	Identify Project Ideas Develop, Implement, and Test Program	Create Performance Task
Students will document the functionality of their program and reflect on its development process	Create Video of Program Write Responses on Program Submit "Create" Task Program, Video, and Written Responses	Create Performance Task

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 5 - Big Data	Time Frame - 5 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Big Data

In this unit, students will explore the complete set of processes and techniques that are involved in collecting large volumes of raw data and extracting new and useful information.

Core Idea	Performance Expectation (Standard)
Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.	8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
Network security depends on a combination of hardware, software, and practices that protect data while it is at rest, in transit, and in use.	8.1.12.NI.2: Evaluate security measures to address various common security threats. 8.1.12.NI.4: Explain how decisions on methods to protect data are influenced by whether the data is at rest, in transit, or in use.
Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.	9.4.12.IML.1: Compare search browsers and recognize features that allow for filtering of information. 9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Understand the purposes of various processing tasks: collection, knowledge extraction, and data storage	Lesson 1 - Introduction to Big Data Lesson 2 - Usability and Usefulness of Data Lesson 3 - Collection Lesson 4 - Extraction Lesson 5 - Storage	Classroom Assignments and Activities, Programming Labs, Unit 5 Quiz, Unit 5 Test, Big Data Project
Combine visuals, content knowledge, and interaction to create a dynamic infographic that clearly communicates discrete information about a data set	Lesson 6 - Statistical Analysis	Classroom Assignments and Activities, Programming Labs, Unit 5 Quiz, Unit 5 Test, Big Data Project
Understand the basic features and functionality of relational databases	Lesson 7 - Data Mining	Classroom Assignments and Activities, Programming Labs, Unit 5 Quiz, Unit 5 Test, Big Data Project
Utilize models and simulations to formulate, refine, and test hypotheses	Lesson 8 - Models and Simulations	Classroom Assignments and Activities, Programming Labs, Unit 5 Quiz, Unit 5 Test, Big Data Project

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 6 - Innovative Technologies	Time Frame - 5 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Innovative Technologies

This unit aims to broaden students' awareness of the computing tools they use and rely on every day and to encourage them to start thinking about the decisions and processes that go into the creation of these technologies.

Core Idea	Performance Expectation (Standard)
A computing system involves interaction among the user, hardware, application software, and system software.	8.1.12.CS.2: Model interactions between application software 8.1.12.CS.3: Compare the functions of application software, system software, and hardware.
The scalability and reliability of the Internet are enabled by the hierarchy and redundancy. Network topology is determined by many characteristics.	8.1.12.NI.1: Evaluate the scalability and reliability of networks, by describing the relationship between routers, switches, servers, topology, and addressing.
Laws govern many aspects of computing, such as privacy, data, property, information, and identity. These laws can have beneficial and harmful effects.	9.4.12.DC.3: Evaluate the social and economic implications of privacy in the context of safety, law, or ethics
Digital communities influence many aspects of society, especially the workforce. The increased connectivity between people in different cultures and different career fields have changed the nature, content, and responsibilities of many careers.	9.4.12.DC.8: Explain how increased network connectivity and computing capabilities of everyday objects allow for innovative technological approaches to climate protection

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Understand computing innovations and consider their impact on the economy, society, culture and environment	Lesson 1 - Global Impact Lesson 2 - Impact of Internet Access Lesson 3 - Cloud Computing Lesson 4 - Internet in Action	Classroom Assignments and Activities, Programming Labs, Unit 6 Quiz, Unit 6 Test, Computing Project
Create their own protocol to implement on the network	Lesson 5 - Communication Protocols Lesson 6 - Internet Protocols	Classroom Assignments and Activities, Programming Labs, Unit 6 Quiz, Unit 6 Test, Computing Project
Discuss ways in which malware can be prevented	Lesson 7 - Encryption Lesson 8 - Cybersecurity	Classroom Assignments and Activities, Programming Labs, Unit 6 Quiz, Unit 6 Test, Computing Project
Explain a beneficial or harmful effect that an innovation may have on economy, society or culture	Lesson 9 - Ethics of Autonomous Technology Lesson 10 - Internet of Things	Classroom Assignments and Activities, Programming Labs, Unit 6 Quiz, Unit 6 Test, Computing Project

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 7 - AP Exam Review	Time Frame - 3 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: AP Exam Review

This unit provides preparation resources for all components of the AP exam. Students review the design of the assessment and work through a practice multiple choice sequence taken from the College Board’s AP Computer Science Principles Course & Exam Description document. Students also have access to resources that support the completion and submission of the Performance Task requirements. As students practice and prepare for the exam with this module and other past curricular content, they should consider each of the five big ideas and six computational thinking practices central to this course.

Core Idea	Performance Expectation (Standard)
Individuals evaluate and select algorithms based on performance, reusability, and ease of implementation.	8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.
Programmers choose data structures to manage program complexity based on functionality, storage, and performance trade-offs	8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables
Complex programs are designed as systems of interacting modules, each with a specific role, coordinating for a common overall purpose.	8.1.12.AP.5: Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.
Digital tools such as artificial intelligence, image enhancement and analysis, and sophisticated computer modeling and simulation create new types of information that may have profound effects on society. These new types of information must be evaluated carefully.	9.4.12.IML.3: Analyze data using tools and models to make valid and reliable claims, or to determine optimal design solutions. 9.4.12.IML.4: Assess and critique the appropriateness and impact of existing data visualizations for an intended audience.
There are strategies to improve one’s professional value and marketability.	9.2.12.CAP.3: Investigate how continuing education contributes to one’s career and personal growth.

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Computational Thinking Programming Data Representation Digital Media Processing Big Data Innovative Technologies	Review Computational Thinking Review Programming Review Data Representation Review Digital Media Processing Review Big Data Review Innovative Technologies	Practice Assessments, AP Exam

Carlstadt-East Rutherford Regional School District
Career and Technology Education Department
AP Computer Science Principles Curriculum

Unit Name	Unit 8 - Data Analysis	Time Frame - 4 Weeks
Instructional Materials and Resources	Project Stem AP CSP Platform, AP Classroom (collegeboard.org), Replit.com (online IDE), Scratch, Chromebooks, Video Tutorials/Demonstrations, Classwork Exercises, Software Applications, Internet Research and Activities.	

Disciplinary Concept: Data Analysis

In this data analysis unit, students will work together to select and analyze a large data set, then develop a TED-style presentation to present the implications of that data.

Core Idea	Performance Expectation (Standard)
Large data sets can be transformed, generalized, simplified, and presented in different ways to influence how individuals interpret and understand the underlying information.	8.1.12.DA.5: Create data visualizations from large data sets to summarize, communicate, and support different interpretations of real-world phenomena.
Advanced search techniques can be used with digital and media resources to locate information and to check the credibility and the expertise of sources to answer questions, solve problems, and inform the decision-making.	9.4.12.IML.2: Evaluate digital sources for timeliness, accuracy, perspective, credibility of the source, and relevance of information, in media, data, or other resources
With a growth mindset, failure is an important part of success.	9.4.12.CI.1: Demonstrate the ability to reflect, analyze, and use creative skills and ideas
Collaborative digital tools can be used to access, record, and share different viewpoints and to collect and tabulate the views of groups of people.	9.4.12.TL.4: Collaborate in online learning communities or social networks or virtual worlds to analyze and propose a resolution to a real-world problem

Student Learning Objectives (Knowledge and Skills)	Suggested Tasks/Activities	Evidence of Learning (Assessments)
Evaluate and justify the appropriateness of the chosen data set	Milestone 1 Topics, Big Data Sets	TEDxKinda Project
Construct informative and aesthetically pleasing data visualizations	Milestone 2 Data Visualizations Milestone 3 Data Mining	TEDxKinda Project
Write a script and prepare speaker notes for a formal presentation of the finding	Milestone 4 Summarization	TEDxKinda Project
Deliver a TED-style presentation discussing the data analysis and findings using appropriate terminology	Milestone 5 Final Project Submission	TEDxKinda Project