Standard: Technology Literacy (2009)

8.1: Education Technology: All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

8.2: Technology Education, Engineering, and Design: All students will develop an understanding of the nature and impact of technology, engineering, technology design, and the designed world, as they relate to the individual, global, and the environment.

9.1: 21st Century Life and Career Skills: All students will demonstrate the creativity, critical thinking, collaboration, and problem-solving skills needed to function successfully as both global citizens and workers in diverse ethnic and organizational cultures.

Strand:

8.1.A: Technology Operations and Concepts
8.1.F: Critical Thinking, Problem Solving, and Decision Making

8.2.B: Design: Critical Thinking, Problem Solving, and Decision Making
8.2.F: Resources for a Technological World
8.2.G: The Designed World

9.1.A: Critical Thinking and Problem Solving
9.2.E: Communication and Media Fluency
9.2.F: Accountability, Productivity, and Ethics

Curriculum aligned with: 2009 New Jersey Core Curriculum Content Standards for 21st Century Skills (9.1 A-F)

21st Century Theme: *Global Awareness ☐,Financial, economic, business and entrepreneurial literacy ☐ Civic literacy ☐,Health literacy ☐Environmental Literacy X*

AP Computer Science Principles Unit 2 | 30 – 35 Days
Established 14-15
Revised 20-21
Revised August 2023

21st Century Skills: *Critical Thinking & Problem Solving ☐,Creativity and Innovation ☐,Collaboration, Teamwork and Leadership ☐,Cross-Cultural Understanding and Interpersonal Communications X Communication and Media Fluency ☐, Accountability, Productivity and Ethics ☐*

Interdisciplinary Connection: Math=MA, English=ELA, Science=SCI, Social Studies=SS, Physical Education=PE, Art=ART, Music=MU, Technology=TECH, World Language=WL Business = BU

Essential Questions	Enduring Understandings	Activities, Investigation, and Student Experiences
• Is the internet for everyone? • What is addressing? • What are the addressing protocol? • How to invent an addressing protocol? • What are Routers and Redundancy? • How to make a reliable internet? • What are Algorithms Detours? • How do routers learn? • How to crack codes? • What are keys and passwords?	*Students will understand….* • The internet is for everyone • The need for addressing • How to invent an addressing protocol • Routers and Redundancy • Packets and Making a Reliable Internet • Algorithms Detour- Minimum Spanning Tree • Algorithms Detour – Shortest Path • How Routers learn • The need for DNS • DNS in the real world • HTTP and abstraction on the internet • Global impacts of the internet • The need for encryption • Keys and passwords	• Lab 1: Questions about the IETF, RFCs and “The Internet is for Everyone” in Code Studio • Lab 2: Battle Ship Activity • Lab 3: Research with articles describing DNS and the vulnerability of this system • Lab 4: Difference between Wifi and Lan • Lab 5: Crack the Code • Lab 6: Mini Project - Practice PT - Global Impacts of the Internet This lesson is a capstone to the first half of the Internet unit. Students will complete an abbreviated version of the Explore Performance Task. Students will practice synthesizing information, writing a short opinion essay, and presenting their learning in a flash talk. **Spot Light On:** *Use random response strategies.*

• What are Encryptions? • What are Cups and Beans? • What are Public Key Cryptography? •	• Wifi hotspot problems • Cups and Beans • Public key cryptography • Security and hacking in the real world • the benefits and security concerns associated with the use of a routed system of sending packets. • students identify the similarities between DNS and the postal service, focusing on their hierarchical structure. • properties that make for a good key when using the Vigenère Cipher.	**<u>Unit Project:</u>** SS • Lab 7: Cyber threats are all around us as criminals exploit the Internet to commit cyber crimes. In this lesson, students will create a visual artifact to inform others about a cybersecurity topic of their choice. They will then examine it with a critical eye to demonstrate a deep understanding of the issue, its functionality, and its impact or potential for impact on people and society. **Modifications and/or Accommodations:** • **Special Education:** Utilize a multi-sensory (VAKT) approach during instruction, provide alternate presentations of skills by varying the method (repetition, simple explanations, additional examples, modeling, etc.), modify test content and/or format, allow students to retake test for additional credit, provide additional times and preferential seating as needed, review, restate and repeat directions, provide study guides, and/or break assignments into segments of shorter tasks. • **English Language Learners:** Extend time requirements, preferred seating, positive reinforcement, check often for understanding/review, oral/visual directions/prompts when necessary, supplemental materials including use of online bilingual dictionary, and modified assessment and/or rubric. • **Students at Risk of School Failure:** Deliver instruction utilizing varied learning styles including audio, visual, and tactile/kinesthetic, provide individual instruction as needed, modify assessments and/or rubrics, repeat instructions as needed. **Gifted Students:** Create an enhanced set of introductory activities, integrate active teaching/learning opportunities, incorporate authentic components, propose interest-based extension activities, and connect student to related talent development opportunities.
Content Statements	**Cumulative Progress Indicators**	

Students will know… ● why it is important for everyone to know how the Internet works. ● about societal challenges of the Internet and relate to personal experiences. ● browsing the Internet entails computers sending each other requests and sending back data to satisfy those requests. ● why messages need to contain addressing information (sender/recipient identification). ● How to invent a communication protocol and describe its binary encoding ● the benefits and security concerns associated with the use of a routed system of sending packets.	● Tests ● Quizzes ● Practice problems for homework ● Projects ● Worksheets ● In-class programs ● Labs	

Desired Results	
● Read about societal challenges of the Internet and relate to personal experiences. ● Explain why it is important for everyone to know how the Internet works. ● Explain one challenge related to the Internet being open and free for all. ● Recall that browsing the Internet entails computers sending each other requests and sending back data to satisfy those requests. ● Invent an informal addressing protocol for use in the Battleship game. ● Explain why messages need to contain addressing information (sender/recipient identification). ● Construct a binary communication protocol for playing Battleship using the Internet Simulator. ● Identify necessary information to include in a binary communication protocol and how to order the bits. ● Connect choices about the Battleship protocol with choices made for real IP addresses and IPv4 packets. ● Explain properties of IP addresses and IPv4 packets. ● Explain the difference between IPv4 versus IPv6. ● Describe the redundancy of routing between two points on the Internet. ● Send messages using a numeric addressing protocol with the Internet Simulator. ● Evaluate the benefits and security concerns associated with the use of a routed system of sending packets.	

● Explain why protocols are necessary to overcome the underlying unreliability of the Internet. ● Develop a protocol for reliable communication on the Internet. ● Justify the need for acknowledgements and packet numbering in TCP. ● Describe how a system of DNS servers supports IP lookups. ● Explain that DNS is a hierarchical system that supports growth and change. ● Explain reasons why people crack codes. ● Use frequency analysis to crack a message encrypted with random substitution. ● Explain how and why the Vigenère cipher is a stronger form of encryption than plain substitution. ● Explain properties that make for a good key when using the Vigenère Cipher.	
Standards for Mathematical Practices	Teacher Resources
1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively. 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics. 5. Use appropriate tools strategically. 6. Attend to precision. 7. Look for and make use of structure.	https://learnzillion.com https://www.khanacademy.org/ https://www.desmos.com/

8. Look for and express regularity in repeated reasoning.	

LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*

Neil Devine

The mission is to ensure that every student is able to see themselves in our rich and diverse history.

Social and Emotional Learning: ***Competencies***	**Social and Emotional Learning:** ***Sub-Competencies***
Self-Awareness Social Awareness Self-Management Relationship Skills Responsible Decision-Making	• Recognizing the importance of self-confidence in handling daily tasks and challenges. • Demonstrate an awareness of the expectations for social interactions in a variety of ways. • Demonstrate an understanding of the need for mutual respect when viewpoints differ. • Recognize the skills needed to establish and achieve personal and educational goals. • Utilize positive communication and social skills to interact effectively with others. • Develop, implement, and model effective problem solving and critical thinking skills.

New Jersey Legislative Statutes and Administrative Code (place an "X" before each law/statute if/when present within the curriculum map)									
	Amistad Law: *N.J.S.A. 18A 52:16A-88*		Holocaust Law: *N.J.S.A. 18A:35-28*	**x**	LGBT and Disabilities Law: *N.J.S.A. 18A:35-4.35*	**x**	Diversity & Inclusion: *N.J.S.A. 18A:35-4.36a*		Standards in Action: *Climate Change*