2025 Cyber Foundations II

Program CIP: 11.0701 — Computer Science

Direct inquiries to:

Project Manager
Research and Curriculum Unit
P.O. Drawer DX
Mississippi State, MS 39762
662.325.2510
helpdesk@rcu.msstate.edu

Program Supervisor
Office of Career and Technical Education
Mississippi Department of Education
P.O. Box 771
Jackson, MS 39205
601.359.3974

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Research and Curriculum Unit
Mississippi State University
Mississippi State, MS 39762

The Research and Curriculum Unit (RCU), located in Starkville, as part of Mississippi State University (MSU), was established to foster educational enhancements and innovations. In keeping with the land-grant mission of MSU, the RCU is dedicated to improving the quality of life for Mississippians. The RCU enhances the intellectual and professional development of Mississippi students and educators while applying knowledge and educational research to the lives of the people of the state. The RCU works within the contexts of curriculum development and revision, research, assessment, professional development, and industrial training.

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Acknowledgments

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Dr. Lance Evans, State Superintendent of Education, Executive Secretary
Mr. Glen V. East, Chair
Mr. Matt Miller, Vice-Chair
Dr. Ronnie L. McGehee
Mr. Bill Jacobs
Mr. Mike Pruitt
Ms. Mary Werner
Dr. Wendi Barrett
Ms. Billye Jean Stroud
Mr. Matt Mayo
Ms. Kate Riddle, Student Representative
Mr. Crosby Parker, Student Representative

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Standards

Standards and alignment crosswalks are referenced in the appendices. Depending on the curriculum, these crosswalks should identify alignment to the standards mentioned below, as well as possible related academic topics as required in the Subject Area Testing Program in Algebra I, Biology I, English II, and U.S. History from 1877, which could be integrated into the content of the units. Mississippi's CTE Cyber Foundations II is aligned to the following standards:

2018 Mississippi College- and Career-Readiness Standards for Computer Science
In an effort to closely align instruction for students who are progressing toward postsecondary study and the workforce, the *2018 Mississippi College- and Career-Readiness Standards (MS CCRS) for Computer Science* includes grade- and course-specific standards for K-12 computer science. Mississippi has adapted these standards from the nationally developed *Computer Science Teachers Association K-12 Computer Science Standards, Revised 2017*.

International Society for Technology in Education Standards (ISTE)

College- and Career-Readiness Standards
College- and career-readiness standards emphasize critical thinking, teamwork, and problem-solving skills. Students will learn the skills and abilities demanded by the workforce of today and the future. Mississippi adopted Mississippi College- and Career-Readiness Standards (MCCRS) to provide a consistent, clear understanding of what students are expected to learn so teachers and parents know what they need to do to help them.
mdek12.org/oae/college-and-career-readiness-standards

Framework for 21st Century Learning
In defining 21st-century learning, the Partnership for 21st Century Skills has embraced key themes and skill areas that represent the essential knowledge for the 21st century: global awareness; financial, economic, business, and entrepreneurial literacy; civic literacy; health literacy; environmental literacy; learning and innovation skills; information, media, and technology skills; and life and career skills.
battelleforkids.org/networks/p21/frameworks-resources

Preface

Secondary CTE programs in Mississippi face many challenges resulting from sweeping educational reforms at the national and state levels. Schools and teachers are increasingly being held accountable for providing applied learning activities to every student in the classroom. This accountability is measured through increased requirements for mastery and attainment of competency as documented through both formative and summative assessments. This document provides information, tools, and solutions that will aid students, teachers, and schools in creating and implementing applied, interactive, and innovative lessons. Through best practices, alignment with national standards and certifications, community partnerships, and a hands-on, student-centered concept, educators will be able to truly engage students in meaningful and collaborative learning opportunities.

The courses in this document reflect the statutory requirements as found in Section 37-3-49, *Mississippi Code of 1972*, as amended (Section 37-3-46). In addition, this curriculum reflects guidelines imposed by federal and state mandates (Laws, 1988, Ch. 487, §14; Laws, 1991, Ch. 423, §1; Laws, 1992, Ch. 519, §4 eff. from and after July 1, 1992; Strengthening Career and Technical Education for the 21st Century Act, 2019 [Perkins V]; and Every Student Succeeds Act, 2015).

Mississippi Teacher Professional Resources

The following are resources for Mississippi teachers:

Curriculum, Assessment, Professional Learning
: Program resources can be found at the RCU's website, rcu.msstate.edu.

Learning Management System: An Online Resource
: Learning management system information can be found on the RCU's website, under Professional Learning.

Should you need additional instructions, contact the RCU at 662.325.2510 or helpdesk@rcu.msstate.edu.

Executive Summary

Pathway Description
Cyber Foundations II is a foundational computer science course. This program is designed to provide students with essential skills in computer science, digital literacy, and cybersecurity, laying the groundwork for more advanced studies in the IT field. Students will explore topics such as problem-solving, programming, online safety, and the basics of computer hardware and software.

College, Career, and Certifications
This course aligns with college and career readiness standards, preparing students for further education in computer science and related fields. It provides a foundational understanding that is essential for certifications in areas such as IT Fundamentals, CompTIA, and others related to cybersecurity and digital literacy.

Grade Level and Class Size Recommendations
It is recommended that students enter this program as 6th, 7th, or 8th graders. Exceptions to this are district-level decisions based on class size, enrollment numbers, student maturity, and CTE delivery method. This is a classroom-based course. Therefore, a maximum of 25 students is recommended for each class, and only one class with the teacher at a time.

Student Prerequisites
For students to experience success in the program, the following student prerequisites are suggested:

1. C or higher in English (the previous year)
2. C or higher in high school-level math (last course taken or the instructor can specify the level of math instruction needed)
3. Instructor approval and Test of Adult Basic Education (TABE) reading score (eighth grade or higher)

or

1. TABE reading and math score (eighth grade or higher)
2. Instructor approval

or

1. Instructor approval

Assessment
The latest assessment blueprint for the curriculum can be found at rcu.msstate.edu/curriculum.

Applied Academic Credit
The latest academic credit information can be found at mdek12.org/ese/approved-course-for-the-secondary-schools.

Teacher Licensure
The latest teacher licensure information can be found at mdek12.org/oel/apply-for-an-educator-license.

Professional Learning
If you have specific questions about the content of any training sessions provided, please contact the RCU at 662.325.2510 or helpdesk@rcu.msstate.edu.

Course Outline

This curriculum consists of one 1-credit course.

2025 Cyber Foundations II—Course Code: 000286

Unit	Unit Title	Hours
1	Orientation, Digital Citizenship, and Keyboarding	10
2	Student Organizations, Leadership, and Career Exploration	2
3	21st Century Toolbox	3
4	Block-Based Programming	10
5	Text-Based Programming	30
6	Networking	10
7	Cybersecurity	15
8	Artificial Intelligence (AI)	15
9	Data Science	15
10	Physical Computing	20
11	Ethics	10
Total		**140**

Career Pathway Outlook

Overview
The Cyber Foundations II course is designed to equip students with fundamental skills in computer science, digital literacy, and information technology. This course provides a broad introduction to various aspects of computing, including problem-solving, programming, and understanding the impact of technology on society. Students are prepared for further study in computer science and related fields, as well as for potential careers that leverage these essential skills.

Needs of the Future Workforce
The following data highlights key projected job opportunities in Mississippi from the U.S. Census Bureau, the U.S. Bureau of Labor Statistics (BLS), and the Mississippi Department of Employment Security (MDES):

Table 1.1: Current and Projected Occupation Report

Description	2020 Jobs	Projected 2030 Jobs	Change (Number)	Change (Percent)	Average Hourly Earnings (2024)
Computer Programmers	880	960	80	9.1%	$33.53
Computer Systems Analysts	2,120	2,190	70	3.3%	$42.19
IT Support Specialists	2,440	2,590	150	6.1%	$23.36
Network and Computer Systems Administrators	1,440	1,500	60	4.2%	$38.96
Web Developers	200	210	10	5.0%	$31.34

Source: Mississippi Department of Employment Security; mdes.ms.gov (2024).

Perkins V Requirements and Academic Infusion
The Cyber Foundations II curriculum meets Perkins V requirements by introducing students to foundational concepts in computer science and digital literacy. The curriculum includes classroom instruction and hands-on labs, offering students practical experience that prepares them for further study or entry-level positions in various technology-related fields. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Lastly, it focuses on ongoing and meaningful professional development for teachers as well as relationships with industry.

Transition to Postsecondary Education
The latest articulation information for secondary to postsecondary can be found at the Mississippi Community College Board website, mccb.edu.

Best Practices

Innovative Instructional Technologies

Classrooms should be equipped with tools that will teach today's digital learners through applicable and modern practices. The Cyber Foundations II educator's goal should be to include teaching strategies that incorporate current technology. To make use of the latest online communication tools—wikis, blogs, podcasts, and social media platforms, for example—the classroom teacher is encouraged to use a learning management system that introduces students to education in an online environment and places more of the responsibility of learning on the student.

Differentiated Instruction

Students learn in a variety of ways, and numerous factors—students' background, emotional health, and circumstances, for example—create unique learners. By providing various teaching and assessment strategies, students with various learning preferences can have more opportunities to succeed.

CTE Student Organizations

Teachers should investigate opportunities to sponsor a student organization. There are several here in Mississippi that will foster the types of learning expected from the Cyber Foundations II curriculum. TSA and FBLA are examples of student organizations with many outlets for computer science. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of computer science careers and scholarship opportunities.

Cooperative Learning

Cooperative learning can help students understand topics when independent learning cannot. Therefore, you will see several opportunities for group work in the Cyber Foundations II curriculum. To function in today's workforce, students need to be able to work collaboratively with others and solve problems without excessive conflict. The Cyber Foundations II curriculum provides opportunities for students to work together and help each other complete complex tasks. There are many field experiences within the Cyber Foundations II curriculum that will allow and encourage collaboration with professionals currently in the cyber field.

Professional Organizations

For students:
Future Business Leaders of America (FBLA)
fbla.org

Technology Student Association (TSA)
tsaweb.org

For teachers:
Association for Career and Technical Education (ACTE)
acteonline.org

Mississippi Educational Computing Association (MECA)
ms-meca.org.org

Using This Document

Competencies and Suggested Objectives
A competency represents a general concept or performance that students are expected to master as a requirement for satisfactorily completing a unit. Students will be expected to receive instruction on all competencies. The suggested objectives represent the enabling and supporting knowledge and performances that will indicate mastery of the competency at the course level.

Teacher Resources
All teachers should request to be added to the Canvas Resource Guide for their course. For questions or to be added to the guide, send a Help Desk ticket to the RCU by emailing helpdesk@rcu.msstate.edu.

Perkins V Quality Indicators and Enrichment Material
Some of the units may include an enrichment section at the end. This material will greatly enhance the learning experiences of students. If the Cyber Foundations II program is using a national certification, work-based learning, or another measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be assessed on that quality indicator. It is the responsibility of the teacher to ensure all competencies for the selected quality indicator are covered throughout the year.

Unit 1: Orientation, Digital Citizenship, and Keyboarding

Competencies and Suggested Objectives
1. Understand school policies, program policies, and safety procedures related to Cyber Foundations II. DOK1 a. Review the school handbook, the technology acceptable use policy, and other safety procedures for building-level situations. b. Examine the course outline and discuss its relevance in today's workforce. c. Demonstrate appropriate safety measures related to technology in the computer lab and online environments. d. Ensure students master the safety test with 100% proficiency.
2. Explore social and ethical issues related to digital citizenship, social media, and artificial intelligence (AI). DOK2 a. Analyze personal media habits and evaluate how much time is spent with different forms of media. b. Debate the pros and cons of social media when used personally, educationally, and professionally. c. Assess user responsibilities to respect others' creative work. d. Develop strategies to determine inappropriate contact and foster positive interactions when collaborating online. e. Reflect on the outcomes of creating different online personalities. f. Investigate cyberbullying behaviors and their impact on individuals and communities. g. Discuss the ethical use of AI in digital interactions and its impact on society. h. Conduct in-depth analysis and discussion on complex social media issues, focusing on ethical and legal implications. i. Examine and debate the ethical considerations and ramifications of AI technologies in digital communications. j. Formulate and promote strategies for fostering positive online interactions and addressing cyberbullying effectively.
3. Facilitate effective collaboration using learning management systems (LMS). DOK3 a. Engage in online learning methodologies, including collaborative projects and peer evaluations. b. Improve professional digital communication skills, ensuring clarity, etiquette, and effectiveness in virtual interactions.
4. Enhance and evaluate keyboarding skills. DOK2 a. Develop touch typing techniques to increase accuracy and speed. b. Demonstrate proper posture and hand placement for effective typing. c. Practice typing regularly to improve proficiency. d. Utilize keyboard shortcuts to enhance productivity. e. Master advanced typing techniques and utilize efficient keyboard shortcuts to improve productivity. f. Implement regular assessments to monitor and enhance typing speed and accuracy.

5. Investigate and correlate career opportunities with digital skills across CTE career pathways. DOK3
   a. Conduct comprehensive research and present detailed analyses on career paths within various Mississippi career clusters.
   b. Explore the integration of digital skills in diverse industries, illustrating the relevance and application of these competencies in real-world CTE career pathways.

Note: Safety is to be taught as an ongoing part of the program. Students are required to complete a written safety test with 100% accuracy before entering the shop for lab simulations and projects. This test should be documented in each student's file.

Note: This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

Unit 2: Student Organizations, Leadership, and Career Exploration

Competencies and Suggested Objectives
1. Understand the structure and function of student organizations. DOK3 a. Analyze the various roles and responsibilities of student organizations. b. Discuss the benefits of participation in student organizations for personal and professional development.
2. Develop and apply leadership skills within student organizations. DOK3 a. Demonstrate effective leadership strategies in student organization activities. b. Implement and manage projects or events within student organizations, showcasing leadership and teamwork.
3. Connect participation in student organizations to career pathways. DOK3 a. Investigate how skills developed through student organizations relate to career pathways in Mississippi's CTE clusters. b. Present case studies or examples of professionals who have benefited from their involvement in student organizations.

Note: This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

Unit 3: 21st Century Toolbox

Competencies and Suggested Objectives
1. Master advanced digital tools for organization and productivity. DOK3 a. Utilize advanced features of digital calendars, note-taking apps, and project management tools to enhance organization and productivity. b. Demonstrate the ability to integrate multiple digital tools to streamline workflows and manage tasks efficiently.
2. Develop proficiency in digital collaboration tools. DOK3 a. Explore and apply advanced functionalities of collaboration tools such as cloud-based platforms, shared documents, and communication apps. b. Engage in collaborative projects using digital tools, showcasing effective teamwork and communication.
3. Enhance digital communication skills. DOK3 a. Practice advanced techniques in digital communication, including email etiquette, professional messaging, and virtual meeting protocols. b. Create and present digital content using various media formats to communicate ideas clearly and effectively.
4. Demonstrate knowledge of 21st-century skills, including ethical AI and data use. DOK3 a. Collaborate effectively with peers on projects and assignments, showcasing teamwork and communication skills. b. Demonstrate creativity and imagination in problem-solving scenarios. c. Utilize critical thinking to analyze and solve complex problems. d. Apply problem-solving techniques to various scenarios, emphasizing ethical considerations in AI and data use.
5. Explore career pathways through career exploration activities. DOK2 a. Research and identify career pathways within various Mississippi career clusters, understanding the required 21st-century skills. b. Discuss the application of these skills to different career paths, emphasizing how they enhance career readiness
6. Update and refine an Individual Success Plan (ISP) to align with career interests and educational goals. DOK2 a. Identify the basic components of the ISP, linking it to the 14 national career clusters and to secondary and postsecondary education. b. Select and print courses that meet graduation requirements and reflect the ISP, ensuring alignment with career goals.

Note: This unit will be ongoing throughout the year. Time allotted for this unit will be distributed over the entire year.

Unit 4: Block-Based Coding

Competencies and Suggested Objectives
1. Reinforce and apply block-based programming concepts. DOK3 a. Review and strengthen understanding of basic and intermediate block-based programming concepts. b. Apply these concepts to develop increasingly complex algorithms and interactive applications.
2. Review, revisit, and remediate key programming concepts. DOK2 a. Conduct thorough reviews of previously covered material to identify and address any gaps in understanding. b. Revisit challenging concepts and provide targeted remediation to ensure mastery.
3. Prepare for transition to text-based programming. DOK2 a. Introduce foundational concepts essential for success in text-based programming. b. Create a seamless transition by demonstrating how block-based concepts translate to text-based coding environments.

Unit 5: Text-Based Programming

Competencies and Suggested Objectives
1. Understand and apply fundamental concepts of text-based programming. DOK3 a. Master the basic concepts and syntax of text-based programming languages. b. Develop and structure code to solve problems effectively.
2. Develop and utilize advanced programming structures. DOK3 a. Create and manipulate variables to store and manage data. b. Implement flow control mechanisms such as conditionals to direct program logic. c. Use loops for repetition and iteration in programs. d. Develop and utilize functions to modularize and simplify code.
3. Enhance debugging and troubleshooting skills. DOK2 a. Identify, diagnose, and fix errors in code. b. Employ debugging techniques to ensure program accuracy and efficiency.
4. Investigate and integrate ethical programming practices. DOK3 a. Explore and discuss ethical considerations in programming. b. Analyze real-world examples of ethical and unethical programming practices and their societal impacts.

Unit 6: Networking

Competencies and Suggested Objectives
1. Define and differentiate types of networks. DOK3 a. Understand and describe the characteristics of various types of networks, including Local Area Network (LAN), Wide Area Network (WAN), and others. b. Explain real-world applications of different network types.
2. Analyze and draw common network topologies. DOK3 a. Identify and illustrate basic network topologies. b. Evaluate the pros and cons of each topology in different scenarios.
3. Identify and explain the functions of key network devices. DOK2 a. Describe the purpose and function of essential network devices such as routers, switches, and hubs. b. Understand the roles of these devices in a network setup.
4. Understand and implement internet protocol (IP) addressing and domain name system (DNS) roles. DOK3 a. Explain the concept of IP addresses and how they are used in networks. b. Describe DNS roles and their importance in network communication.
5. Apply network security measures. DOK3 a. Set up and configure firewalls and antivirus software. b. Practice safe browsing habits and understand the importance of cybersecurity.
6. Organize and troubleshoot networks. DOK4 a. Gain hands-on experience in setting up a network. b. Develop skills in troubleshooting common network issues.
7. Differentiate between the Internet and the World Wide Web (WWW). DOK2 a. Explain the differences between the Internet and the World Wide Web. b. Understand data transfer processes within these systems.

Unit 7: Cybersecurity

Competencies and Suggested Objectives
1. Understand and describe the fundamentals of cybersecurity. DOK2 a. Define cybersecurity and its importance in the digital world. b. Discuss the role of cybersecurity in protecting digital information.
2. Identify and analyze various cyber threats. DOK3 a. Describe different types of cyber threats, such as malware, phishing, and ransomware. b. Analyze real-world examples of cyberattacks and their impacts.
3. Implement safe online practices. DOK3 a. Develop strategies for safe browsing and secure online behavior. b. Explain the importance of antivirus software and firewalls in protecting devices.
4. Understand data privacy and protection measures. DOK2 a. Discuss data privacy principles and the importance of protecting personal information. b. Implement basic data protection techniques.
5. Explore the basics of encryption. DOK2 a. Define encryption and its role in securing digital communications. b. Explain basic encryption methods and their applications.
6. Investigate ethical hacking principles. DOK3 a. Define ethical hacking and its purpose. b. Explore the differences between ethical and unethical hacking practices.
7. Conduct career exploration in cybersecurity. DOK4 a. Research various career paths in cybersecurity. b. Analyze the skills and qualifications required for different roles in the cybersecurity field. c. Explore the relevance of cybersecurity across different industries and CTE career pathways in Mississippi.

Unit 8: Artificial Intelligence (AI)

Competencies and Suggested Objectives
1. Understand and describe the fundamentals of artificial intelligence. DOK2 a. Define AI and explain its importance in modern technology. b. Discuss various types of AI (narrow AI, general AI, superintelligent AI) and their applications.
2. Explore machine learning and its applications. DOK3 a. Explain the basic principles of machine learning, including supervised and unsupervised learning. b. Investigate real-world applications of machine learning in fields such as healthcare, finance, and entertainment.
3. Analyze AI in daily life and ethical considerations. DOK4 a. Identify and discuss how AI is integrated into everyday life through virtual assistants, recommendation systems, and more. b. Critically examine AI's ethical considerations and societal impacts, including bias, privacy, and job displacement.
4. Investigate future trends in AI. DOK3 a. Research emerging trends and advancements in AI technology, such as autonomous vehicles, AI in medicine, and AI in creative arts. b. Analyze the potential future impact of AI on various industries and how it may transform career paths.
5. Complete an AI project. DOK4 a. Design and implement a comprehensive AI project that integrates concepts from the unit. b. Present the project, highlighting the AI concepts applied, the challenges faced, and the outcomes achieved.

Unit 9: Data Science

Competencies and Suggested Objectives
1. Understand and describe the basics of data science. DOK2 a. Define data science and explain its significance in today's data-driven world. b. Identify real-world data science applications across healthcare, finance, and marketing industries.
2. Collect and manage data effectively. DOK3 a. Explain different data collection methods, including surveys, web scraping, and sensors. b. Organize and manage data using tools such as spreadsheets, databases, or cloud-based platforms.
3. Analyze data types and structures DOK3 a. Differentiate between various data types (e.g., categorical, numerical) and structures (e.g., tables, arrays). b. Explore how data is structured and stored in databases, including relational databases.
4. Visualize data using advanced tools. DOK4 a. Create data visualizations, such as charts, graphs, and dashboards, to represent information clearly and effectively. b. Utilize software tools like Excel, Google Sheets, Tableau, or Python libraries (Matplotlib, Seaborn) to generate visualizations.
5. Apply statistical concepts in data analysis. DOK3 a. Explain basic statistical concepts (mean, median, mode, standard deviation) and their relevance to data science. b. Conduct statistical analysis to derive meaningful insights from datasets.
6. Clean and prepare data for analysis. DOK4 a. Demonstrate techniques for cleaning and preparing data, including handling missing values, removing duplicates, and correcting errors. b. Address common data issues such as outliers and inconsistencies.
7. Conduct basic data analysis and interpret results. DOK4 a. Perform basic data analysis using statistical and computational methods. b. Interpret and communicate the results of data analysis through written reports, presentations, or visualizations.
8. Examine ethical considerations in data science. DOK3 a. Discuss ethical issues related to data privacy, security, and usage. b. Reflect on real-world examples of ethical and unethical practices in data science, including data breaches and bias in algorithms.

Unit 10: Physical Computing

Competencies and Suggested Objectives
1. Understand and apply the basics of physical computing. DOK2 a. Introduce the fundamentals of physical computing and its applications. b. Identify and explain the functions of various physical computing devices, including microcontrollers and sensors.
2. Utilize and program physical computing devices. DOK3 a. Explore device usage, including microcontrollers (e.g., Arduino, Micro), sensors, and VEX VR. b. Develop algorithms to program physical devices to perform specific tasks, such as monitoring environmental conditions or controlling actuators.
3. Implement and debug robotics projects. DOK4 a. Program and control robots to perform complex tasks using platforms like VEX Robotics or LEGO Mindstorms. b. Diagnose and troubleshoot issues in physical computing and robotics projects, refining code and hardware as needed.
4. Enhance functions with physical computing devices. DOK4 a. Improve and expand the functionality of physical computing devices through advanced programming and hardware integration. b. Apply practical skills to solve real-world problems, such as designing a smart home system or automated greenhouse.
5. Examine ethical considerations in physical computing. DOK3 a. Discuss the ethical implications of physical computing and robotics, such as privacy concerns and the impact on employment. b. Reflect on real-world examples of ethical and unethical practices in the field.
6. Explore virtual reality (VR) applications. DOK3 a. Understand the basics of virtual reality and its various use cases in fields like education, healthcare, and entertainment. b. Engage in online VR applications and explore their potential through interactive experiences.
7. Investigate career opportunities related to physical computing. DOK4 a. Research and present on careers that involve physical computing, robotics, and VR. b. Connect physical computing skills to real-world applications in various industries, such as automation, manufacturing, and game development

Unit 11: Ethics

Competencies and Suggested Objectives
1. Comprehend and apply ethical principles in computer science. DOK3 a. Understand the importance of ethics in technology and its expansive role within the computer science umbrella. b. Discuss and analyze various ethical theories and principles as they apply to computer science, including deontology, utilitarianism, and virtue ethics.
2. Conduct in-depth ethical analyses. DOK4 a. Examine real-world ethical dilemmas in technology through case studies, such as data privacy, AI bias, and cybersecurity breaches. b. Reflect on the ethical implications of emerging technologies and digital practices, considering both short-term and long-term societal impacts.
3. Develop and implement ethical standards. DOK4 a. Create an ethical code of conduct for computer science professionals that addresses issues like data protection, user consent, and transparency. b. Propose solutions to ethical challenges encountered in different technology sectors, such as social media, artificial intelligence, and cybersecurity.
4. Engage in comprehensive research and scenario analysis. DOK4 a. Conduct research on multiple ethical scenarios in various fields of technology, such as autonomous vehicles, facial recognition, and social media algorithms.

Enhancement Unit: Advanced Computing Concepts

Competencies and Suggested Objectives
1. Advanced Programming Techniques DOK4 a. Develop complex algorithms and implement them using text-based programming languages. b. Explore advanced programming structures such as recursion, data structures, and object-oriented programming.
2. Cybersecurity Challenges DOK4 a. Simulate and defend against advanced cyber threats in a controlled environment. b. Develop and implement comprehensive cybersecurity strategies that address real-world scenarios.
3. Data Science and Analytics DOK4 a. Conduct advanced data analysis using statistical software, focusing on predictive analytics and data visualization techniques. b. Develop machine learning models to analyze large datasets, applying AI techniques to derive insights and make data-driven decisions.
4. Ethical Computing Practices DOK4 a. Investigate the ethical implications of emerging technologies, such as AI, machine learning, and big data. b. Develop and propose ethical guidelines for technology use in various sectors, focusing on privacy, equity, and transparency.
5. Advanced Networking and Internet Concepts DOK4 a. Design and implement scalable network solutions using advanced networking protocols and architectures. b. Analyze and address network security vulnerabilities using industry-standard tools and practices.

Student Competency Profile

Student's Name: _____

This record is intended to serve as a method of noting student achievement of the competencies in each unit. It can be duplicated for each student, and it can serve as a cumulative record of competencies achieved in the course.

In the blank before each competency, place the date on which the student mastered the competency.

Unit 1: Orientation, Digital Citizenship, and Keyboarding		
	1.	Understand school policies, program policies, and safety procedures related to Cyber Foundations II.
	2.	Explore social and ethical issues related to Digital Citizenship, Social Media, and artificial intelligence (AI).
	3.	Facilitate effective collaboration using learning management systems (LMS).
	4.	Develop and maintain keyboarding skills.
	5.	Investigate and correlate career opportunities with digital skills across CTE career pathways.
Unit 2: Student Organizations, Leadership, and Career Exploration		
	1.	Understand the structure and function of student organizations.
	2.	Develop and apply leadership skills within student organizations.
	3.	Connect participation in student organizations to career pathways.
Unit 3: 21st Century Toolbox		
	1.	Master advanced digital tools for organization and productivity.
	2.	Develop proficiency in digital collaboration tools.
	3.	Enhance digital communication skills.
	4.	Demonstrate knowledge of 21st-century skills, including ethical AI and data use.
	5.	Explore career pathways through career exploration activities.
	6.	Update and refine an Individual Success Plan (ISP) to align with career interests and educational goals.
Unit 4: Block-Based Programming		
	1.	Reinforce and apply block-based programming concepts.
	2.	Review, revisit, and remediate key programming concepts.
	3.	Prepare for transition to text-based programming.
Unit 5: Text-Based Programming		
	1.	Understand and apply fundamental concepts of text-based programming.

	2.	Develop and utilize advanced programming structures.
	3.	Enhance debugging and troubleshooting skills.
	4.	Investigate and integrate ethical programming practices.
Unit 6: Networking		
	1.	Define and differentiate types of networks.
	2.	Analyze and draw common network topologies.
	3.	Identify and explain the functions of key network devices.
	4.	Understand and implement internet protocol (IP) addressing and domain name system (DNS) roles.
	5.	Apply network security measures.
	6.	Organize and troubleshoot networks.
	7.	Differentiate between the Internet and the World Wide Web. (WWW)
Unit 7: Cybersecurity		
	1.	Understand and describe the fundamentals of cybersecurity.
	2.	Identify and analyze various cyber threats.
	3.	Implement safe online practices.
	4.	Understand data privacy and protection measures.
	5.	Explore the basics of encryption.
	6.	Investigate ethical hacking principles.
	7.	Conduct career exploration in cybersecurity.
Unit 8: Artificial Intelligence (AI)		
	1.	Understand and describe the fundamentals of artificial intelligence.
	2.	Explore machine learning and its applications.
	3.	Analyze AI in daily life and ethical considerations.
	4.	Investigate future trends in AI.
	5.	Complete an AI project.
Unit 9: Data Science		
	1.	Understand and describe the basics of data science.
	2.	Collect and manage data effectively.
	3.	Analyze data types and structures.
	4.	Visualize data using advanced tools.
	5.	Apply statistical concepts in data analysis.
	6.	Clean and prepare data for analysis.
	7.	Conduct basic data analysis and interpret results.

	8.	Examine ethical considerations in data science.
Unit 10: Physical Computing		
	1.	Understand and apply the basics of physical computing.
	2.	Utilize and program physical computing devices.
	3.	Implement and debug robotics projects.
	4.	Enhance functions with physical computing devices.
	5.	Examine ethical considerations in physical computing.
	6.	Explore virtual reality (VR) applications.
	7.	Investigate career opportunities related to physical computing.
Unit 11: Ethics		
	1.	Comprehend and apply ethical principles in computer science.
	2.	Conduct in-depth ethical analyses.
	3.	Develop and implement ethical standards.
	4.	Engage in comprehensive research and scenario analysis.

Appendix A: Industry Standards

	Units	1	2	3	4	5	6	7	8	9	10	11
Standards												
CS1		X	X								X	
CS2		X										
CS3		X	X								X	
CS4		X										
CS5										X		
CS6		X		X			X					
CS7		X				X			X	X		
CS8		X			X							
CS9		X					X		X	X		
CS10									X	X		
CS11		X		X	X	X	X	X				
CS12			X	X						X		
CS13			X									
CS14			X	X							X	
CS15			X		X						X	X
CS16		X					X	X		X	X	

CSS1-21st Century Themes

CS1 Global Awareness

1. Using 21st-century skills to understand and address global issues
2. Learning from and working collaboratively with individuals representing diverse cultures, religions, and lifestyles in a spirit of mutual respect and open dialogue in personal, work, and community contexts
3. Understanding other nations and cultures, including the use of non-English languages

CS2 Financial, Economic, Business, and Entrepreneurial Literacy

1. Knowing how to make appropriate personal economic choices
2. Understanding the role of the economy in society
3. Using entrepreneurial skills to enhance workplace productivity and career options

CS3 Civic Literacy

1. Participating effectively in civic life through knowing how to stay informed and understanding governmental processes
2. Exercising the rights and obligations of citizenship at local, state, national, and global levels
3. Understanding the local and global implications of civic decisions

CS4 Health Literacy

1. Obtaining, interpreting, and understanding basic health information and services and using such information and services in ways that enhance health
2. Understanding preventive physical and mental health measures, including proper diet, nutrition, exercise, risk avoidance, and stress reduction
3. Using available information to make appropriate health-related decisions
4. Establishing and monitoring personal and family health goals
5. Understanding national and international public health and safety issues

CS5 Environmental Literacy

1. Demonstrating knowledge and understanding of the environment and the circumstances and conditions affecting it, particularly as relates to air, climate, land, food, energy, water, and ecosystems
2. Demonstrating knowledge and understanding of society's impact on the natural world (e.g., population growth, population development, resource consumption rate, etc.)
3. Investigating and analyzing environmental issues and making accurate conclusions about effective solutions
4. Taking individual and collective action toward addressing environmental challenges (e.g., participating in global actions, designing solutions that inspire action on environmental issues)

CSS2-Learning and Innovation Skills

CS6 Creativity and Innovation
1. Think creatively
2. Work creatively with others
3. Implement innovations

CS7 Critical Thinking and Problem Solving
1. Reason effectively
2. Use systems thinking
3. Make judgments and decisions
4. Solve problems

CS8 Communication and Collaboration
1. Communicate clearly
2. Collaborate with others

CSS3-Information, Media, and Technology Skills

CS9 Information Literacy
1. Access and evaluate information
2. Use and manage information

CS10 Media Literacy
1. Analyze media
2. Create media products

CS11 ICT Literacy
1. Apply technology effectively

CSS4-Life and Career Skills

CS12 Flexibility and Adaptability
1. Adapt to change
2. Be flexible

CS13 Initiative and Self-Direction
1. Manage goals and time
2. Work independently
3. Be self-directed learners

CS14 Social and Cross-Cultural Skills
1. Interact effectively with others

2. Work effectively in diverse teams

CS15 Productivity and Accountability

1. Manage projects
2. Produce results

CS16 Leadership and Responsibility

- Guide and lead others
- Be responsible to others

Appendix B: ISTE Standards

	Units	1	2	3	4	5	6	7	8	9	10	11
Standards												
T1		X		X		X			X		X	X
T2			X						X	X		X
T3			X	X	X		X		X		X	
T4					X	X	X				X	
T5					X				X		X	
T6						X		X				X
T7				X		X						X

International Society for Technology in Education (ISTE)

T1 Empowered Learner

Students leverage technology to take an active role in choosing, achieving, and demonstrating competency in their learning goals, as informed by the learning sciences.

a. Articulate and set personal learning goals, develop strategies leveraging technology to achieve them, and reflect on the learning process itself to improve learning outcomes.
b. Build networks and customize their learning environments to support the learning process.
c. Use technology to seek feedback that informs and improves their practice and to demonstrate their learning in various ways.
d. Understand the fundamental concepts of technology operations, demonstrate the ability to choose, use, and troubleshoot current technologies, and can transfer their knowledge to explore emerging technologies.

T2 Digital Citizen

Students recognize the rights, responsibilities, and opportunities of living, learning, and working in an interconnected digital world. . They act and model in safe, legal, and ethical ways.

a. Cultivate and manage their digital identity and reputation and are aware of the permanence of their actions in the digital world.
b. Engage in positive, safe, legal, and ethical behavior when using technology, including social interactions online or networked devices.
c. Demonstrate an understanding of and respect for the rights and obligations of using and sharing intellectual property.
d. Manage their personal data to maintain digital privacy and security and are aware of data-collection technology used to track their navigation online.

T3 Knowledge Constructor

Students critically curate a variety of resources using digital tools to construct knowledge, produce creative artifacts, and make meaningful learning experiences for themselves and others.

a. Plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.
b. Evaluate the accuracy, perspective, credibility, and relevance of information, media, data, or other resources.

c. Curate information from digital resources using various tools and methods to create collections of artifacts that demonstrate meaningful connections or conclusions.
d. Build knowledge by actively exploring real-world issues and problems, developing ideas and theories, and pursuing answers and solutions.

T4 Innovative Designer

Students use a variety of technologies within a design process to identify and solve problems by creating new, useful, or imaginative solutions.

a. Know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts, or solving authentic problems.
b. Select and use digital tools to plan and manage a design process that considers design constraints and calculated risks.
c. Develop, test, and refine prototypes as part of a cyclical design process.
d. Exhibit a tolerance for ambiguity, perseverance, and the capacity to work with open-ended problems.

T5 Computational Thinker

Students develop and employ strategies for understanding and solving problems in ways that leverage the power of technological methods to develop and test solutions.

a. Formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models, and algorithmic thinking in exploring and finding solutions.
b. Collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making.
c. Break problems into component parts, extract key information, and develop descriptive models to understand complex systems or facilitate problem-solving.
d. Understand how automation works and use algorithmic thinking to develop a sequence of steps to create and test automated solutions.

T6 Creative Communicator

Students communicate clearly and express themselves creatively for a variety of purposes using the platforms, tools, styles, formats, and digital media appropriate to their goals.

a. Choose the appropriate platforms and tools for meeting the desired objectives of their creation or communication.
b. Create original works or responsibly repurpose or remix digital resources into new creations.
c. Communicate complex ideas clearly and effectively by creating or using a variety of digital objects such as visualizations, models, or simulations.
d. Publish or present content that customizes the message and medium for their intended audiences.

T7 Global Collaborator

Students use digital tools to broaden their perspectives and enrich their learning by collaborating with others and working effectively in teams locally and globally.

a. Use digital tools to connect with learners from various backgrounds and cultures, engaging with them in ways that broaden mutual understanding and learning.
b. Use collaborative technologies to work with others, including peers, experts, or community members, to examine issues and problems from multiple viewpoints.

c. Contribute constructively to project teams, assuming various roles and responsibilities to work effectively toward a common goal.
d. Explore local and global issues and use collaborative technologies to work with others to investigate solutions.

Appendix C: Mississippi College- and Career-Readiness Standards for Computer Science (MS CCRS)

	Unit	1	2	3	4	5	6	7	8	9	10	11
Standards												
CS.2.1		X	X									
CS.2.2							X			X		
CS.2.3					X							
NI.2.1			X			X						X
NI.2.2					X	X						
NI.2.3				X						X		
DA.2.1		X							X			
DA.2.2				X					X			X
DA.2.3					X						X	
AP.2.1			X							X		
AP.2.2							X					
AP.2.3				X								
AP.2.4			X									
AP.2.5				X				X				
AP.2.6				X					X			
AP.2.7				X								
AP.2.8					X		X					X
AP.2.9			X									
AP.2.10				X			X		X			
IC.2.1					X							X
IC.2.2					X			X				
IC.2.3		X										
IC.2.4					X							X

Mississippi College- and Career-Readiness Standards for Computer Science (MS CCRS)
Level 2: GRADES 6-8 - Computing Systems (CS)

CS.2 Computing Systems

Conceptual understanding: People interact with a wide variety of computing devices that collect, store, analyze, and act upon information in ways that can affect human capabilities both positively and negatively. The physical components (hardware) and instructions (software) that make up a computing system communicate and process information in digital form. An understanding of hardware and software is useful when troubleshooting a computing system that does not work as intended.

2.1 Recommend improvements to the design of computing devices based on an analysis of how users interact with the devices. [DEVICES] (P3.3)

The study of human-computer interaction (HCI) can improve the design of devices, including both hardware and software.

a. Students should make recommendations for existing devices (e.g., a laptop, phone, or tablet) or design their own components or interface (e.g., create their own controllers). Teachers can guide students to consider usability through several lenses, including accessibility, ergonomics, and learnability. For example, assistive devices provide capabilities such as scanning written information and converting it to speech.

2.2 Design projects that combine hardware and software components to collect and exchange data. [HARDWARE & SOFTWARE] (P5.1)

Collecting and exchanging data involves input, output, storage, and processing. When possible, students should select the hardware and software components for their project designs by considering factors such as functionality, cost, size, speed, accessibility, and aesthetics.

a. Students will design projects that use both hardware and software to collect and exchange data. For example, components for a mobile app could include an accelerometer, GPS, and speech recognition. The choice of a device that connects wirelessly through a Bluetooth connection versus a physical USB connection involves a tradeoff between mobility and the need for an additional power source for the wireless device.

2.3 Systematically identify and fix problems with computing devices and their components. [TROUBLESHOOTING] (P6.2)

Since a computing device may interact with interconnected devices within a system, problems may not be due to the specific computing device itself but to devices connected to it.

a. Students will use a structured process to troubleshoot problems with computing systems and ensure that potential solutions are not overlooked. Examples of troubleshooting strategies include following a troubleshooting flow diagram, making changes to the software to see if the hardware will work, checking connections and settings, and swapping in working components.

Level 2: GRADES 6-8 - Networks and the Internet

NI.2 Networks and the Internet

Conceptual Understanding: Computing devices typically do not operate in isolation. Networks connect computing devices to share information and resources and are an increasingly integral part of computing. Networks and communication systems provide greater connectivity in the computing world by providing fast, secure communication, and facilitating innovation.

2.1 Model the role of protocols in transmitting data across networks and the Internet. [NETWORK COMMUNICATION & ORGANIZATION] (P4.4)

Protocols are rules that define how messages between computers are sent. They determine how quickly and securely information is transmitted across networks and the Internet, as well as how to handle errors in transmission.

a. Students should model how data is sent using protocols to choose the fastest path, to deal with missing information, and to deliver sensitive data securely. For example, students could devise a plan for resending lost information or for interpreting a picture that has missing pieces. The priority at this grade level is understanding the purpose of protocols and how they enable secure and errorless communication. Knowledge of the details of how specific protocols work is not expected.

2.2 Explain how physical and digital security measures protect electronic information. [CYBERSECURITY] (P7.2)

Information that is stored online is vulnerable to unwanted access. Examples of physical security measures to protect data include keeping passwords hidden, locking doors, making backup copies on external storage devices, and erasing a storage

device before it is reused. Examples of digital security measures include secure router admin passwords, firewalls that limit access to private networks, and the use of a protocol, such as HTTPS, to ensure secure data transmission.

a. Students will explain how physical and digital security measures protect electronic information.

2.3 Apply multiple methods of encryption to model the secure transmission of information. [CYBERSECURITY] (P4.4)

Encryption can be as simple as letter substitution or as complicated as modern methods used to secure networks and the Internet.

a. Students should encode and decode messages using a variety of encryption methods, and they should understand the different levels of complexity used to hide or secure information. For example, students could secure messages using methods like Caesar cyphers or steganography (i.e., hiding messages inside a picture or other data). They can also model more complicated methods, such as public key encryption, through unplugged activities.

Level 2: GRADES 6-8 - Data and Analysis

DA.2 Data and Analysis

Conceptual Understanding: Computing systems exist to process data. The amount of digital data generated in the world is rapidly expanding, so the need to process data effectively is increasingly important. Data is collected and stored so that it can be analyzed to better understand the world and make more accurate predictions.

2.1 Represent data using multiple encoding schemes. [STORAGE] (P4.0)

Data representations occur at multiple levels of abstraction, from the physical storage of bits to the arrangement of information into organized formats (e.g., tables).

a. Students should represent the same data in multiple ways. For example, students could represent the same color using binary, RGB values, hex codes (low-level representations), as well as forms understandable by people, including words, symbols, and digital displays of the color (high-level representations).

2.2 Collect data using computational tools and transform the data to make it more useful and reliable. [COLLECTION, VISUALIZATION, & TRANSFORMATION] (P6.3)

As students continue to build on their ability to organize and present data visually to support a claim, they will need to understand when and how to transform data for this purpose.

a. Students should transform data to remove errors, highlight or expose relationships, and/or make it easier for computers to process. The cleaning of data is an important transformation for ensuring consistent format and reducing noise and errors (e.g., removing irrelevant responses in a survey). An example of a transformation that highlights a relationship is representing males and females as percentages of a whole instead of as individual counts.

2.3 Refine computational models based on the data they have generated. [INFERENCE & MODELS] (P5.3, P4.4)

A model may be a programmed simulation of events or a representation of how various data are related.

a. Students will refine computational models by considering which data points are relevant, how data points relate to each other, and if the data is accurate. For

example, students may make a prediction about how far a ball will travel based on a table of data related to the height and angle of a track. The students could then test and refine their model by comparing predicted versus actual results and considering whether other factors are relevant (e.g., size and mass of the ball). Additionally, students could refine game mechanics based on test outcomes in order to make the game more balanced or fair.

Level 2: GRADES 6-8 - Algorithms and Programming

AP.2 Algorithms and Programming

Conceptual understanding: An algorithm is a sequence of steps designed to accomplish a specific task. Algorithms are translated into programs, or code, to provide instructions for computing devices. Algorithms and programming control all computing systems, empowering people to communicate with the world in new ways and solve compelling problems. The development process to create meaningful and efficient programs involves choosing which information to use and how to process and store it, breaking apart large problems into smaller ones, recombining existing solutions, and analyzing different solutions.

2.1 Use flowcharts and/or pseudocode to address complex problems as algorithms. [ALGORITHMS] (P4.4, P4.1)

Complex problems are problems that would be difficult for students to solve computationally.

a. Students will use pseudocode and/or flowcharts to organize and sequence an algorithm that addresses a complex problem, even though they may not actually program the solutions. For example, students might express an algorithm that produces a recommendation for purchasing sneakers based on inputs such as size, colors, brand, comfort, and cost. Testing the algorithm with a wide range of inputs and users allows students to refine their recommendation algorithm and to identify other inputs they may have initially excluded.

2.2 Create clearly named variables that represent different data types and perform operations on their values. [VARIABLES] (P5.1, P5.2)

A variable is like a container with a name, in which the contents may change, but the name (identifier) does not.

a. When planning and developing programs, students should decide when and how to declare and name new variables. Examples of operations include adding points to the score, combining user input with words to make a sentence, changing the size of a picture, or adding a name to a list of people.
b. Students should use naming conventions to improve program readability.

2.3 Design and iteratively develop programs that combine control structures, including nested loops and compound conditionals. [CONTROL] (P5.1, P5.2)

Control structures can be combined in many ways. Nested loops are loops placed within loops. Compound conditionals combine two or more conditions in a logical relationship (e.g., using AND, OR, and NOT), and nesting conditionals within one another allows the result of one conditional to lead to another.

a. Students will design and develop programs that combine control structures. For example, when programming an interactive story, students could use a compound conditional within a loop to unlock a door only if a character has a key AND is touching the door.

2.4 Decompose problems and subproblems into parts to facilitate the design, implementation, and review of programs. [MODULARITY] (P3.2)

Decomposition facilitates aspects of program development by allowing students to focus on one piece at a time (e.g., getting input from the user, processing the data, and displaying the result to the user). Decomposition also enables different students to work on different parts at the same time.

a. Students should break down problems into subproblems, which can be further broken down into smaller parts. For example, animations can be decomposed into multiple scenes, which can be developed independently.

2.5 Create procedures with parameters to organize code and make it easier to reuse. [MODULARITY] (P4.1, P4.3)

a. Students will create procedures and/or functions that are used multiple times within a program to repeat groups of instructions. These procedures can be generalized by defining parameters that create different outputs for a wide range of inputs. For example, a procedure to draw a circle involves many instructions, but all of them can be invoked with one instruction, such as "drawCircle." By adding a radius parameter, the user can easily draw circles of different sizes.

2.6 Seek and incorporate feedback from team members and users to refine a solution that meets user needs. [PROGRAM DEVELOPMENT] (P2.3, P1.1)

Development teams that employ user-centered design create solutions (e.g., programs and devices) that can have a large societal impact, such as an app that allows people with speech difficulties to translate hard-to-understand pronunciation into understandable language.

a. Students should begin to seek diverse perspectives throughout the design process to improve their computational artifacts. Considerations of the end user may include usability, accessibility, age-appropriate content, respectful language, user perspective, pronoun use, color contrast, and ease of use.

2.7 Incorporate existing code, media, and libraries into original programs and give attribution. [PROGRAM DEVELOPMENT] (P4.2, P5.2, P7.3)

Building on the work of others enables students to produce more interesting and powerful creations.

a. Students should use portions of code, algorithms, and/or digital media in their own programs and websites. At this level, they may also import libraries and connect to web application program interfaces (APIs). For example, when creating side-scrolling games, students may incorporate portions of code that create a realistic jump movement from another person's game, and they may also import Creative Commons-lessened images to use in the background.
b. Students should give attribution to the original creator's contributions.

2.8 Systematically test and refine programs using a range of test cases. [PROGRAM DEVELOPMENT] (P6.1)

Test cases are created and analyzed to better meet the needs of users and to evaluate whether programs function as intended. At this level, testing should become a deliberate process that is more iterative, systematic, and proactive than at lower levels.

a. Students will test programs by considering potential errors, such as what will happen if a user enters invalid input (e.g., negative numbers and zero instead of positive numbers).

2.9 Distribute tasks and maintain a project timeline when collaboratively developing computational artifacts. [PROGRAM DEVELOPMENT] (P2.2)

Collaboration is a common and crucial practice in programming development. Often, individuals and groups work together on the interdependent parts of a project.

a. Students will work collaboratively in groups.
b. Students should assume predefined roles within their teams and manage the project workflow using structured timelines. With teacher guidance, they will begin to create collective goals, expectations, and equitable workloads. For example, students may divide the design stage of a game into planning the storyboard, flowchart, and different parts of the game mechanics. They can then distribute tasks and roles among members of the team and assign deadlines.
c. Students should give attribution to the original creators to acknowledge their contributions.

2.10 Document programs in order to make them easier to follow, test, and debug. [PROGRAM DEVELOPMENT] (P7.2)

Documentation allows creators and others to more easily use and understand a program.

a. Students should provide documentation for end users that explains their artifacts and how they function. For example, students could provide a project overview and clear user instructions.
b. Students should incorporate comments in their product (comments in the code).
c. Students should communicate their process using design documents, flowcharts, and presentations.

Level 2: GRADES 6-8 - Impacts of Computing

IC.2 Impacts of Computing

Conceptual understanding: Computing affects many aspects of the world in both positive and negative ways at local, national, and global levels. Individuals and communities influence computing through their behaviors and cultural and social interactions, and in turn, computing influences new cultural practices. An informed and responsible person should understand the social implications of the digital world, including equity and access to computing.

2.1 Compare tradeoffs associated with computing technologies that affect people's everyday activities and career options. [CULTURE] (P7.2)

Advancements in computer technology are neither wholly positive nor negative; however, the ways that people use computing technologies have tradeoffs.

a. Students should consider current events related to broad ideas, including privacy, communication, and automation. For example, driverless cars can increase convenience and reduce accidents, but they are also susceptible to hacking. The emerging industry will not only reduce the number of taxi and shared-ride drivers but also create more software engineering and cybersecurity jobs.

2.2 Discuss issues of bias and accessibility in the design of existing technologies. [CULTURE] (P1.2)

a. Students should test and discuss the usability of various technology tools (e.g., apps, games, and devices) with the teacher's guidance. For example, facial recognition software that works better for lighter skin tones was likely developed with a homogeneous testing group and could be improved by sampling a more diverse population. When discussing accessibility, students may notice that allowing a user to change font sizes and colors will not only make an interface usable for people with low vision but also benefits users in various situations, such as in bright daylight or a dark room.

2.3 Collaborate with many contributors through strategies such as crowdsourcing or surveys when creating a computational artifact. [SOCIAL INTERACTIONS] (P2.4, P5.2)

Crowdsourcing is gathering services, ideas, or content from a large group of people, especially from the online community. It can be done at the local level (e.g., classroom or school) or global level (e.g., age-appropriate online communities, like Scratch and Minecraft).

a. Students should collaborate with many contributors. For example, a group of students could combine animations to create a digital community mosaic. They could also solicit feedback from many people through the use of online communities and electronic surveys.

2.4 Describe tradeoffs between allowing information to be public and keeping information private and secure. [SAFETY, LAW, & ETHICS] (P7.2)

Sharing information online can help establish, maintain, and strengthen connections between people. For example, it allows artists and designers to display their talents and reach a broad audience; however, security attacks often start with personal information that is publicly available online. Social engineering is based on tricking people into revealing sensitive information, which can be thwarted by being wary of attacks, such as phishing and spoofing.

a. Students should discuss and describe the benefits and dangers of allowing information to be public or kept private and secure.

Appendix D: 21st Century Learning

	Unit	1	2	3	4	5	6	7	8	9	.10	11
Standards												
CS		X	X	X			X				X	X
4C		X	X	X	X	X		X			X	
IMTS		X			X	X	X	X	X	X		
LCS			X	X			X		X			X

21st Century Learning - Framework Elements

CS **Core Subjects and 21st Century Themes**:
Incorporation in Units: Units that emphasize the importance of core academic subjects (like digital literacy in Unit 1) and integrate 21st-century themes such as global awareness, civic literacy, and environmental literacy.

4C **Learning and Innovation Skills (4Cs)**:
Critical thinking, Communication, Collaboration, and Creativity: Units like Unit 3 (21st Century Toolbox) and Unit 5 (Block-Based Programming) heavily focus on these skills, as they require students to collaborate, think critically, and communicate their ideas effectively.

IMTS **Information, Media, and Technology Skills**:
Application in Units: Units focused on digital design, cybersecurity, and data analysis (Units 4, 6, 7, 8, and 9) emphasize the ability to effectively use technology and manage information.

LCS **Life and Career Skills**:
Integration: These skills, such as leadership, initiative, and flexibility, are core to Units 2 (Student Organizations and Leadership) and Unit 8 (App Design).