Mississippi CTE

Exploring Computer Science (2025)

Unit 1: Orientation and Ongoing Skills 1.1

1 **Identify school policies and safety procedures related to Exploring Computer Science (ECS).** 1.1

- a Examine the school handbook, acceptable-use policy for technology, and safety procedures. 1.1.A
- b Preview the course outline and its relevance in today's workforce. 1.1.B
- c Recognize appropriate safety measures related to technology in the computer lab and online safety. 1.1.C

2 **Investigate using an online learning management system (LMS). DOK2** 1.2

- a Discover online learning environments and how they operate among teachers and students. 1.2.A
- b Demonstrate proper email etiquette. 1.2.B
- c Participate in online learning methods (discussion boards, student journals, blogs, wikis, and so forth). 1.2.C
- d Collaborate with teachers and peers through an online system. 1.2.D

3 **Recognize opportunities to participate in student organizations related to technology and computer science. DOK1** 1.3

- a Identify student organizations available at the school for technology and computer science. 1.3.A
- b List student competitions available through each organization. 1.3.B

4 **Demonstrate knowledge of 21st-century skills. DOK2** 1.4

- a Demonstrate effective collaboration and teamwork. 1.4.A
- b Demonstrate creativity and imagination. 1.4.B
- c Utilize critical thinking through effective reasoning, making judgments and decisions using journaling. 1.4.C

5 **Demonstrate effective public speaking skills. DOK2** 1.5

- a Demonstrate effective communication in groups. 1.5.A
- b Demonstrate presentation skills. 1.5.B

6 **Explore career opportunities within computer science in programming, cybersecurity, data science, robotics, artificial intelligence, human-computer interaction, and web development.** 1.6

- a Identify and research career opportunities in programming, cybersecurity, data science, robotics, AI, and human-computer interaction. 1.6.A
- b Describe how career fields use technology in their work. 1.6.B
- c Examine the requirements, skills, wages, education, and employment opportunities in computer science career areas. 1.6.C

7 **Create and maintain a personal portfolio website to showcase work and projects** 1.7

Unit 2: Human-Computer Interaction 2.2

1 **Explain the difference between computers and computing. DOK1** 2.1

- a Identify characteristics of hardware components and their applications. 2.1.A
- b Explain the four characteristics of a computer: input, output, processing, and storage. 2.1.B
- c Explain the differences between tasks that can and cannot be accomplished with a computer. 2.1.C

2 **Evaluate how the internet works and tools/methods used to navigate it. DOK3** 2.2

- a Use appropriate tools and methods to execute internet searches. 2.2.A
- b Evaluate the reliability of websites and AI responses. 2.2.B
- c Define and give examples of the Internet of Things (IoT). 2.2.C

3 **Analyze the effects of computing on society within economic, social, and cultural contexts.** 2.3

- a Discuss legal, ethical, and security concerns raised by computing innovation. 2.3.A
- b Explain the implications of communication as data exchange. 2.3.B
  1. Recognize various forms of communication as data exchange. 2.3.B.1
  2. Describe the implications of data exchange on social interactions. 2.3.B.2
  3. Explain how computers are used for communications. 2.3.B.3
  4. Compare and contrast privacy and access concerns between online versus in-person data exchanges. 2.3.B.4
- c Identify web applications that influence society and education. 2.3.C
- d Identify appropriate and inappropriate use of social websites. 2.3.D

4 **Explain the basic concepts of cloud computing and its applications. DOK2** 2.4

- a Define “the cloud” and its major attributes. 2.4.A
- b Describe the major benefits of cloud computing. 2.4.B

Unit 3: Problem Solving 3.3

1. **Understand the problem-solving process. DOK2** 3.1
   - a Name and explain the steps in the problem-solving process. 3.1.A
   - b Solve various problems using the problem-solving process and document each step. 3.1.B
2. **Design and interpret algorithms. DOK3** 3.2
   - a Define an algorithm and determine its effectiveness. 3.2.A
   - b Determine if a given algorithm successfully solves a stated problem. 3.2.B
   - c Create algorithms that meet specified objectives. 3.2.C
   - d Summarize the behavior of an algorithm. 3.2.D
   - e Compare the tradeoffs between different algorithms for solving the same problem. 3.2.E
   - f Explain the characteristics of problems that an algorithm cannot solve. 3.2.F
3. **Demonstrate an understanding of binary numbers. DOK2** 3.3
   - a Explain the connections between binary numbers and computers. 3.3.A
   - b Count forward and backward in binary. 3.3.B
   - c Use binary digits to code and decode messages. 3.3.C
4. **Understand simple search algorithms. DOK2** 3.4
   - a Illustrate and explain linear and binary search algorithms. 3.4.A
   - b Explain conditions in which each search would be appropriate. 3.4.B
5. **Explain sorting algorithms. DOK2** 3.5
   - a Define sorted and unsorted lists. 3.5.A
   - b Describe various sorting algorithms and compare them. 3.5.B
6. **Describe minimum spanning trees. DOK3** 3.6
   - a Solve minimum spanning tree problems and provide real-world examples (e.g., power grids, gas lines). 3.6.A
   - b Explain how a minimum spanning tree relates to computer science networks. 3.6.B

Unit 4: Introduction to Programming 4.4

1. **Use appropriate algorithms to solve a problem. DOK3** 4.1
   - a Write steps or flow diagrams to plan solutions to programming problems. 4.1.A
   - b Write code that is properly sequenced to solve problems. 4.1.B

2 **Using a text-based language (i.e., Python, C++), design, code, test, and execute a program corresponding to a set of specifications. DOK2** 4.2

- a Describe an event-driven program. 4.2.A
- b Use industry constructs such as pseudocode and comments to draft a program. 4.2.B
- c Apply programming structures such as variables, conditionals, loops, and input/output to create a program. 4.2.C

3 **Using a text-based language, locate and correct errors in a program. DOK3** 4.3

- a Deconstruct programs into smaller components to isolate problems. 4.3.A
- b Identify and correct errors in a program written by a student and another by a peer (debug). 4.3.B
- c Use AI to create and debug programs. 4.3.C
- d Evaluate the reliability of AI in creating and debugging programs. 4.3.D
- e Discuss the pros, cons, and ethics of using AI in programming. 4.3.E
- f Evaluate a peer's program and provide constructive feedback on accuracy, efficiency, and readability. 4.3.F

4 **Compare/contrast at least three programming languages. DOK3** 4.4

- a Identify the best use of each language and their differences. 4.4.A
- b Compare the syntax of each language for the following structures: variables, conditionals, loops, and input/output. 4.4.B

5 **Use abstraction to reduce complexity.** 4.5

- a Use abstraction to reduce complexity. 4.5.A
- b Explain abstraction and provide examples in everyday life. 4.5.B

Unit 5: Data Science and Computing 5.5

1 **Understand big data and its characteristics. DOK1** 5.1

- a Understand the complexities of collecting, processing, and managing large data sets. 5.1.A
- b Identify real-world applications of big data in various fields. 5.1.B
- c Utilize tools to analyze large data sets. 5.1.C
- d Draw conclusions about the data set selected. 5.1.D
- e Discuss methods of collecting and validating data. 5.1.E
- f Collaborate with others to create artifacts (i.e. surveys). 5.1.F
- g Understand and discuss data bias. 5.1.G

2 **Identify and discuss the considerations that must be made for a large data set to be useful.** 5.2

- a Consider how various data types (numbers, text, dates, etc.) lend themselves to processing. 5.2.A
- b Explain how different representations of data can tell different stories. 5.2.B
- c Collaborate with others to create, manage, and maintain a large data set. 5.2.C

3 **Understand the complexities of collecting, processing, and analyzing data sets. DOK2** 5.3

- a Identify the specific variables needed to analyze the data. 5.3.A
- b Interpret data and draw conclusions to solve problems. 5.3.B
- c Understand the problem-solving process. 5.3.C

4 **Define data analytics. DOK1** 5.4

- a Discuss what data analytics might involve. 5.4.A
- b Compare different analysis techniques and discuss the tradeoffs among them. 5.4.B
- c Understand machine learning and how it works. 5.4.C

Unit 6: Artificial Intelligence (AI) 6.6

1 **Summarize artificial intelligence (AI) terms and concepts. DOK1** 6.1

- a Explain key terminology associated with AI, including weak AI, strong AI, generative AI, artificial general intelligence (AGI), rule-based AI, and context-aware AI. 6.1.A
- b Develop an understanding of AI images and narratives. 6.1.B
- c Explore the concept of prompt engineering in AI. 6.1.C

2 **Explore AI tools and their impact. DOK3** 6.2

- a Identify the type of AI being used. (e.g., image recognition, speech recognition, translation, etc.) 6.2.A
- b Test various prompts and describe the results. 6.2.B
- c Understand how AI is changing different sectors. (e.g., medicine, agriculture, etc.) 6.2.C
- d Explore and explain the impact of AI on our society. 6.2.D
- e Recognize that future work is changing. 6.2.E

3 **Recognize and understand AI data and bias. DOK3** 6.3

- a Judge algorithmic bias and the effect of bias on individuals and society. 6.3.A
- b Examine issues involving privacy and the collection of data. 6.3.B

4 **Develop skills in prompt engineering for AI applications. DOK2** 6.4

- a Understand the basics of prompt engineering and its importance in AI. 6.4.A
- b Create effective prompts for AI models to achieve desired outcomes. 6.4.B
- c Evaluate the effectiveness of different prompts and refine them for better results 6.4.C

Unit 7a: Physical Computing—Robotics 7A.7A

1 **Identify the criteria that describe a robot and determine if something is a robot.** 7A.1

- a Describe how the design of a robot's body affects its behavior. 7A.1.A
- b Identify the parts and features of a robot (motors, sensors, batteries, buttons/switches, etc.). 7A.1.B

2 **Build, code, and test a robot that solves a stated problem.** 7A.2

- a Navigate the programming environment to build and code a robot that performs specific tasks. 7A.2.A
- b Implement Boolean operators, loops, conditionals, and waits in robot programming to control behavior. 7A.2.B
- c Debug coding of the robot by testing, identifying, and fixing errors to ensure proper functionality. 7A.2.C

Unit 7b: Physical Computing—Microcontrollers 7B.7B

1 **Identify common microcontroller terms. DOK1** 7B.1

- a Communicate microcontroller terms using multiple formats (e.g., verbally, textually, graphically). 7B.1.A
- b Identify and label the components of a hands-on or simulation microcontroller from the list below: 7B.1.B
  1. Power sources 7B.1.B.1
  2. Inputs 7B.1.B.2
  3. Switches 7B.1.B.3
  4. Push buttons 7B.1.B.4
  5. Sensors 7B.1.B.5
  6. Joysticks and remotes 7B.1.B.6
  7. Outputs 7B.1.B.7
  8. Buzzers 7B.1.B.8
  9. LEDs 7B.1.B.9
  10. LCD modules 7B.1.B.10

2 **Use programming to manipulate microcontroller inputs and outputs. DOK2** 7B.2

- a Incorporate the following methods/concepts in the programming: 7B.2.A
  - 1 Different languages (e.g., Scratch, SNAP, Python, etc.) 7B.2.A.1
  - 2 Logic statements (e.g., if, and, or, not, etc.) 7B.2.A.2
  - 3 Loops (e.g., for, if, while, etc.) 7B.2.A.3

3 **Use a microcontroller for a specified purpose. DOK2** 7B.3

- a Demonstrate the proper use of a microcontroller for a specified purpose. 7B.3.A
- b Explain how microcontrollers are used to manipulate a robotic system. 7B.3.B

4 **Add microcontrollers and troubleshooting. DOK3** 7B.4

- a Describe the use of microcontrollers in physical computing. 7B.4.A

Unit 7c: Physical Computing—E-Textiles 7C.7C

1 **Design, interpret, and evaluate simple circuit diagrams with key components. DOK2** 7C.1

- a Draw a circuit diagram with a simple circuit. 7C.1.A
- b Identify necessary components of a simple circuit system (power, components, polarity, etc.) 7C.1.B
- c Peer review one another's circuit diagrams according to a rubric. 7C.1.C
- d Create a paper greeting card with electronic components (including designing it, crafting it, debugging it, and sharing it with classmates). 7C.1.D

2 **Construct parallel circuits using conductive materials and switches while applying an iterative design process.** 7C.2

- a Use conductive thread to sew electronic components. 7C.2.A
- b Design and create a working parallel circuit with three lights. 7C.2.B
- c Demonstrate how a switch works to turn electricity flow on and off. 7C.2.C
- d Use an iterative design process. 7C.2.D

3 **Implement computational circuits with pre-programmed mini-computers and understand common grounding. DOK3** 7C.3

- a Design a computational circuit using a pre-programmed mini-computer. 7C.3.A
- b Understand the role of a common ground. 7C.3.B

Unit 7d: Physical Computing—Networking 7D.7D

1. **Explore fundamental networking concepts. DOK2** 7D.1
   - a Define what a computer network is and explain its purpose. 7D.1.A
   - b Identify different types of networks (LAN, WAN, WLAN) and their characteristics. 7D.1.B
   - c Explain the concept of IP addresses and their role in networking. 7D.1.C
   - d Describe the basic functions of networking devices such as servers, routers, and switches. 7D.1.D
   - e Demonstrate the ability to set up a simple local network and connect devices on paper, in a virtual setting, or with actual hardware. 7D.1.E
   - f Understand basic network security principles and identify common threats. 7D.1.F

Unit 7e: Physical Computing—VR System 7E.7E

1. **Investigate the process of developing virtual environments. DOK2** 7E.1
   - a Create programs using virtual engines such as Unreal (visual) or Unity (text). 7E.1.A
   - b Demonstrate knowledge of key terms such as levels, worlds, scenes, assets, viewport, camera, etc. 7E.1.B
   - c Import assets for use in programming projects. 7E.1.C
   - d Script assets to perform designated tasks within a project. 7E.1.D
   - e Compile and publish completed projects for testing or as finished products. 7E.1.E

Unit 8: Cybersecurity 8.8

1. **Define cybersecurity and its importance. DOK 1** 8.1
   - a Differentiate between attackers and defenders. 8.1.A
   - b Describe types of hacking and the CIA triad (Confidentiality, Integrity, Availability). 8.1.B
   - c Discuss ethics in cybersecurity. 8.1.C
2. **Discuss confidentiality in cybersecurity.** 8.2
   - a Explain encryption, passwords, and multifactor authentication. 8.2.A
   - b Analyze case studies of data breaches. 8.2.B
3. **Explain integrity and hashing. DOK2** 8.3
   - a Describe hashing and its role in maintaining data integrity. 8.3.A
4. **Discuss availability considerations. DOK3** 8.4
   - a Explain backups, DoS (denial-of-service) attacks, disaster plans, and redundancy. 8.4.A
5. **Analyze adversary thinking and social engineering. DOK4** 8.5
   - a Evaluate phishing, insider/outsider threats, and ransomware tactics. 8.5.A