2022 Information Technology

Program CIP: 11.0101 – Computer and Information Sciences, General

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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 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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Standards

Standards and alignment crosswalks are referenced in the appendix. 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 IT is aligned to the following standards:

National Business Education Association – Information Technology Standards
The National Business Education Association (NBEA) is the nation's leading professional organization, which recognizes that business education is essential for every student in today's rapidly changing society. Therefore, the NBEA strives to serve individuals and organizations involved in the instruction, administration, and deliverance of business education, standards, and materials. The NBEA recognizes that all students will take part in the economic system, encounter a diverse business environment, and use technology to manage information in some fashion during their lifetime. Thus, a curriculum focused on enabling students to become responsible citizens, capable of making wise economic decisions, will positively impact their personal and professional lives. *NBEA Business Education Library* (2020).
nbea.org

International Society for Technology in Education Standards (ISTE)
Reprinted with permission from *ISTE Standards for Students* (2016). All rights reserved. Permission does not constitute an endorsement by ISTE.
iste.org

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 and 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. 21 *Framework Definitions* (2019).
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 at the RCU's website, under Professional Learning.

Should you need additional instructions, call the RCU at 662.325.2510.

Executive Summary

Pathway Description

The IT pathway is designed to provide the foundation, skills, and knowledge for computer networking, applications, and support. Students will develop the skills necessary to prepare for certification exams and will learn how to develop, support, and integrate computing systems. They will acquire network-planning and -management skills and the ability to provide technical support. The program will provide hands-on experience in computer systems support and skill in network setup and maintenance.

College, Career, and Certifications

Program competencies are designed to prepare students for TestOut IT Fundamentals Pro certification and TestOut Network Pro certification by integrating certification skills throughout the curriculum along with the National Business Education Association standards for Information Technology to assist in student preparation for IT careers.

Grade Level and Class Size Recommendations

It is recommended that students enter this program as a 10th grader. Exceptions to this are a district-level decision based on class size, enrollment numbers, student maturity, and method of CTE delivery. A maximum of 15 students is recommended for this program, with only one class with a 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 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/curriculumdownload.

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 of the training sessions provided, please contact the RCU at 662.325.2510.

Course Outlines

Option 1—Four 1-Carnegie Unit Courses

This curriculum consists of four 1-credit courses that should be completed in the following sequence:

1. **Information Technology Fundamentals I—Course Code: 992208**
2. **Information Technology Fundamentals II—Course Code: 992209**
3. **Information Technology Networking I—Course Code: 992210**
4. **Information Technology Networking II—Course Code: 992211**

Course Description: Information Technology Fundamentals I
This course covers the explanation of technology and computer hardware and software basics, peripheral devices, mobile technology, and compatibility issues associated with computer hardware.

Course Description: Information Technology Fundamentals II
This course is a continuation of topics from Information Technology Fundamentals I and addresses additional technology topics, including functions, introduction to networking, security risks and prevention, Green IT, and preventative maintenance of computers. Students should be prepared to take the TestOut IT Fundamentals Certification exam at the end of the course. This course should be taken only after students successfully pass Information Technology Fundamentals I.

Course Description: Information Technology Networking I
This course covers the basic concepts of network protocols, services, networking, various network operating systems, networking types, standards, and how data is encoded and transmitted. This course should be taken only after students successfully pass Information Technology Fundamentals I and II.

Course Description: Information Technology Networking II
This course is a continuation of topics from Information Technology Networking I and addresses additional networking topics, including routing and switching hardware, telecommunications, and career options. Students should be prepared to take the TestOut: Network Pro at the end of the course. This course should be taken only after students successfully pass Information Technology Networking I.

Information Technology Fundamentals I – Course Code: 992208

Unit	Unit Name	Hours
1	Introduction to Information Technology	15
2	Hardware	40
3	Software	45
4	Networking	40
Total		**140**

Information Technology Fundamentals II – Course Code: 992209

Unit	Unit Name	Hours
5	Database	50
6	Programming and Web Development	45
7	Cybersecurity	45
Total		**140**

Information Technology Networking I – Course Code: 992210

Unit	Unit Name	Hours
8	Networking Fundamentals	40
9	Networking Hardware	50
10	Networking Configuration	50
Total		**140**

Information Technology Networking II – Course Code: 992211

Unit	Unit Name	Hours
11	Managing Networks	50
12	Network Security	50
13	Career Development	40
Total		**140**

Option 2—Two 2-Carnegie Unit Courses

This curriculum consists of two 2-credit courses, which should be completed in the following sequence:

1. **Information Technology I—Course Code: 992206**
2. **Information Technology II—Course Code: 992207**

Course Description: Information Technology I

This course covers the explanation of technology and computer hardware basics, compatibility issues, common errors associated with computer hardware, software installation and functions, security risks and prevention, Green IT, and preventative maintenance of computers. Students should be prepared to take the TestOut IT Pro Fundamentals Certification exam at the end of the course.

Course Description: Information Technology II

This course teaches the basic concepts of networking, network operating systems, networking types, standards, and how data is encoded and transmitted. This course is designed to prepare students for the TestOut Network Pro certification exam. This course should be taken only after students successfully pass Information Technology I.

Information Technology I—Course Code: 992206

Unit	**Unit Name**	**Hours**
1	Introduction to Information Technology	15
2	Hardware	40
3	Software	45
4	Networking	40
5	Database	50
6	Programming and Web Development	45
7	Cybersecurity	45
Total		**280**

Information Technology II—Course Code: 992207

Unit	**Unit Name**	**Hours**
8	Networking Fundamentals	40
9	Networking Hardware	50
10	Networking Configuration	50
11	Managing Networks	50
12	Network Security	50
13	Career Development	40
Total		**280**

Career Pathway Outlook

Overview

The IT career pathway will target careers at the professional and technical levels. Students enrolled in these courses should be better prepared to pursue degrees at the community college and four-year college level.

Needs of the Future Workforce

Current and Projected Job Outlook for IT Careers

Description	Current Jobs (2018)	Projected Jobs (2028)	Change (Number)	Change (Percent)	Median Hourly Earning
Computer and Information Research Scientists	350	350	0	0%	$47.83
Computer Network Support Specialist	1,050	1,170	120	11.4%	$32.57
Information Security Analyst	370	480	110	29.7%	$35.75
Computer Systems Analysts	2,200	2,320	120	5.5%	$32.38
Network and Computer Systems Administrators	1,340	1,360	20	1.5%	$34.00
Software Developers, Applications	950	1,160	210	22.1%	$42.32
Software Developers, Systems Software	980	1010	30	3.1%	$41.32

Source: Mississippi Department of Employment Security; mdes.ms.gov (2021).

Perkins V Requirements and Academic Infusion

The IT curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in IT fields. It also offers students a program of study, including secondary, postsecondary, and institutions of higher learning courses, that will further prepare them for IT careers. Additionally, this curriculum is integrated with academic college- and career-readiness standards. Finally, 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 IT 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 IT curriculum. SkillsUSA, Technology Student Association (TSA), and Future Business Leaders of America (FBLA) are examples of student organizations with many outlets for IT. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of IT careers and scholarship opportunities.

Cooperative Learning

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

Work-Based Learning

Work-based learning is an extension of understanding competencies taught in the IT classroom. This curriculum is designed in a way that necessitates active involvement by the students in the community around them and the global environment. These real-world connections and applications link all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and IT professionals. Thus, supervised collaboration and immersion into the industry around the students are keys to students' success, knowledge, and skills development.

Professional Organizations

Association of Career and Technical Education
acteonline.org

International Society for Technology in Education
iste.org

Mississippi Association for Career and Technical Education
mississippiacte.com

Mississippi Educational Computing Association
ms-meca.org

Student Organizations

Future Business Leaders of America
fbla-pbl.org

SkillsUSA
skillsusa.org

Technology Student Association
tsaweb.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 are 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. Teachers are welcome to teach the competencies in other ways than the listed objectives if it allows for mastery of the competencies. Teachers are also allowed to teach the units and competencies in the order that they prefer, as long as they teach necessary material allotted for that specific course or credit they are teaching at the time.

Teacher Resources

Teacher resources for this curriculum may be found in multiple places. Many program areas have teacher resource documents that accompany the curriculum and can be downloaded from the same site as the curriculum. The teacher resource document contains references, lesson ideas, websites, teaching and assessment strategies, scenarios, skills to master, and other resources divided by unit. This document could be updated periodically by RCU staff. Please check the entire document, including the entries for each unit, regularly for new information. If you have something you would like to add or have a question about the document, call or email the RCU's instructional design specialist for your program. The teacher resource document can be downloaded at rcu.msstate.edu/curriculum/curriculumdownload.aspx. All teachers should request to be added to the Canvas Resource Guide for their course. This is where all resources will be housed in the future if they are not already. 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. If the IT program is currently using the Mississippi Career Planning and Assessment System (MS-CPAS) as a measure of accountability, the enrichment section of material will not be tested. If this is the case, it is suggested to use the enrichment material when needed or desired by the teacher and if time allows in the class. This material will greatly enhance the learning experiences for students. If, however, the IT program is using a national certification, work-based learning, or other measure of accountability that aligns with Perkins V as a quality indicator, this material could very well be tested 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: Introduction to Information Technology

Competencies and Suggested Objectives
1. Research educational, occupational, and leadership opportunities in IT. DOK2 a. Review student rules and regulations for the local school. b. Compare and contrast local program policies, procedures, and expectations to industry policies, procedures, and expectations. c. Identify and describe leadership opportunities available from CTE student organizations in the school and community. d. Preview the school's technology acceptable use policy.
2. Identify, discuss, and apply safety procedures in the computer classroom and lab. DOK2 1. Discuss the proper classroom and personal safety procedures, including fire extinguishers, electrical, ladders, clothing, jewelry, eye protection, and so forth. 2. Care for and correctly use computer hardware. 3. Identify potential hazards when working with technology equipment. 4. Explore the environmental impact related to technology.
3. Publish and communicate with peers, experts, and other audiences using technology. DOK2 a. Research safety issues related to telecommunications and internet academic standards, if applicable. b. Develop personal safety guidelines that will be used when using telecommunications and the internet. c. Describe the legal implications related to the computer industry, including software copyright issues, software licensing, and internet ethics and policies. d. Use browsers, search engines, and email. e. Communicate via electronic media. f. Research, create, and present a presentation/project on emerging technologies, practices, trends, and issues associated with IT.

Unit 2: Hardware

Competencies and Suggested Objectives
1. Explore motherboard components. DOK2 a. Identify internal components and the purpose of the following: • Processor • Power • Storage • Expansion slots • Cooling • Memory b. Install and upgrade components. c. Troubleshoot common motherboard issues.
2. Examine the basic wired and wireless peripherals, such as input, output, and combination devices and the purpose of each. DOK2 a. Properly connect wired and wireless peripherals. b. Differentiate between the types of cables and connectors. c. Troubleshoot peripherals.
3. Manipulate storage on computer systems. DOK2 a. Classify types of storage. b. Install storage media. c. Create volumes and format drives. d. Perform disk maintenance. e. Troubleshoot storage.
4. Design and troubleshoot a basic workstation. DOK2

Unit 3: Software

Competencies and Suggested Objectives
1. Compare and contrast the functions and features of commonly used computer operating systems (OSs). DOK2 a. Identify the uses and features of common desktop operating systems, such as macOS, Windows, and Linux. b. Install operating systems running in a virtual environment. c. Identify the uses and features of common mobile operating systems. d. Identify the basic features of an operating system. e. Demonstrate the uses of an operating system. f. Explain and utilize other system software such as: BIOS, CMOS, and firmware. g. Utilize device manager.
2. Identify common software applications and the purpose of each. DOK1 a. Demonstrate the proper uses of productivity software, such as Microsoft Office applications, email, and desktop publishing. b. Explain collaboration software, such as online workspaces, cloud storage, screen sharing, videoconferencing software, instant messaging (IM) clients, VoIP, and email. c. Manipulate utility software, such as antimalware, diagnostic software, device drivers, and file compression utilities. d. Examine specialized software, such as computer-aided design (CAD), graphic design, gaming, multimedia, virtualization, and industrial software. e. Identify various software platforms, such as mobile, desktop, and web based. f. Identify common file types, including document, audio, image, video, executables, and compression formats.
3. Demonstrate software management best practices. DOK2 a. Install/uninstall OS features, applications, and drivers. b. Install updates and patches for OS, drivers, applications, and security software. c. Identify the proper versions of software that are compatible with various platforms. d. Define various licensing procedures, such as product keys, site licenses, multiuser licenses, and freeware. e. Perform backup operations. f. Configure local and network printing.
4. Demonstrate file management best practices. DOK2 a. Manage files and folders in the Windows files system. b. Manage file and New Technology File System (NTFS) permissions. c. Use command line utilities. d. Create a virtual machine.
5. Troubleshoot various software issues. DOK3

Unit 4: Networking

Competencies and Suggested Objectives
1. Develop skills to design, deploy, and administer networks. DOK2 a. Identify basic network connectivity concepts. b. Differentiate between network architecture and topologies. c. Identify network hardware infrastructure components.
2. Design and develop network infrastructure. DOK2 a. Compare and contrast network cabling solutions. b. Set up a basic wired network. c. Compare and contrast components of a wireless network. d. Set up a basic wireless network. e. Manage mobile and Bluetooth devices.
3. Describe internet technologies. DOK1 1. Configure browsers for optimal use. 2. Enable and use a proxy server. 3. Describe the Internet of Things and evaluate common IoT devices. 4. Describe various internet communications technologies. 5. Define and describe the uses of cloud computing.
4. Troubleshoot various networking issues. DOK2

Unit 5: Database

Competencies and Suggested Objectives
1. Discuss database concepts. DOK1 a. Describe the advantages of using a database rather than a flat file to store information. b. Explain database design and purpose. c. Describe data access and manipulation.
2. Explore objects of a relational database. DOK2 a. Identify differences between relational and nonrelational databases. b. Create database tables with different types of relationships. c. Create reports to analyze data.
3. Perform basic query's using Structured Query Language (SQL). DOK2 a. Construct SQL commands to retrieve all data from a table. b. Construct SQL commands to retrieve data matching criteria. c. Construct SQL commands to add and delete records.
4. Troubleshoot various database issues. DOK3

Unit 6: Programming and Web Development

Competencies and Suggested Objectives
1. Discuss the various web design languages, such as JavaScript, HTML, and CSS. DOK1
2. Analyze and use various logic and programming techniques along with fundamental data types. DOK2 a. Analyze and use the following: • Pseudocode • Flow charts • Looping and branching • Function • Variables and constants • Stringers, integers, and floats
3. Develop a basic web page using HTML, CSS, and JavaScript. DOK3
4. Troubleshoot various programming and web development issues. DOK3

Enrichment
1. Use and explore other languages, such as Python, C++, and more.

Unit 7: Cybersecurity

Competencies and Suggested Objectives
1. Analyze basic security threats. DOK2
2. Discuss security best practices. DOK2 a. Password management b. Device hardening c. Wi-Fi security d. Antivirus/antimalware software e. Data encryption
3. Describe common threats to data confidentiality, integrity, and availability. DOK1
4. Configure corporate data security. DOK3 a. Differentiate between the different types of authentications including multifactor and single sign-on. b. Plan, develop, and implement authorization through permissions, access control lists (ACLs), and principle of least privilege. c. Install and configure an uninterruptable power supply (UPS). d. Examine various backup strategies.
5. Configure device security. DOK3 a. Configure firewalls for optimal device protection. b. Secure devices on home wireless network. c. Configure a remote wipe on a device.
6. Troubleshoot various cybersecurity issues. DOK3

Unit 8: Networking Fundamentals

Competencies and Suggested Objectives
1. Identify different network classifications. DOK1 a. Differentiate between peer-to-peer and client servers. b. Differentiate between geographical networks, such as local area network (LAN), wide area network (WAN,) and so forth. c. Discuss the differences in intranet, internet, and extranet.
2. Describe the common physical and logical topologies. DOK1
3. Examine devices, services, and protocols within each layer of the Open Systems Interconnection (OSI) model. DOK2
4. Explain protocols and ports within the Transmission Control Protocol/Internet Protocol (TCP/IP) suite. DOK2
5. Examine the various numbering systems used in networking. DOK2 a. Convert decimal to binary. b. Convert decimal to hexadecimal.

Unit 9: Networking Hardware

Competencies and Suggested Objectives
1. Recognize network media types. DOK2 a. Investigate the characteristics of twisted pair cabling in networks. b. Investigate the characteristics of coaxial cabling in networks. c. Investigate the characteristics of fiber-optic cabling in networks. d. Implement and troubleshoot different wiring schemes.
2. Examine network hardware, including layers 1, 2, and 3 devices. DOK2 a. Identify and define hubs, bridges, and switches as layers 1 and 2 network hardware devices. b. Identify and define routers, firewalls, and layer 3 switches as layer 3 network hardware devices. c. Implement wired and wireless devices. d. Troubleshoot physical connectivity.

Unit 10: Networking Configuration

Competencies and Suggested Objectives
1. Recognize the internet protocol (IP) addressing scheme. DOK2 a. Define common IP concepts, including IPv4, IPv6, APIPA, and subnetting. b. Differentiate between classful and classless IP addresses. c. Configure IPv4 addresses d. Configure IPv6 addresses. e. Troubleshoot IP addresses.
2. Configure routers and switches. DOK2 a. Configure ports and virtual local area networks (VLANs). b. Implement Spanning Tree. c. Implement Quality of Service (QoS). d. Troubleshoot routers and switches.
3. Configure wireless and Voice over Internet Protocol (VoIP.) DOK2 a. Connect smart and mobile devices. b. Configure trunking. c. Troubleshoot wireless and VoIP.

Unit 11: Managing Networks

Competencies and Suggested Objectives
1. Explore dynamic host configuration protocol (DHCP) services. DOK2 a. Define common DHCP concepts, including discover; offer; request; acknowledge (DORA), scope, relay agent, reservations, and exclusions. b. Implement a DHCP server. c. Configure DHCP options, snooping, and relay agent. d. Troubleshoot DHCP services.
2. Explore domain name system (DNS) services. DOK2 a. Define common DNS concepts including fully qualified domain name (FQDN), DNS zones, different types of records, and DNS lookup. b. Configure DNS addresses. c. Create standard DNS zones. d. Troubleshoot name resolutions.
3. Explore network segmentation. DOK2 a. Scan for Internet of Things (IoT) devices. b. Scan networks for vulnerabilities, exploits, attacks, and threats. c. Create and configure VLANs d. Troubleshoot VLANs.
4. Explore various types of backup systems and restore tasks. DOK2 a. Backup and restore file history. b. Backup and restore network configuration. c. Verify and troubleshoot backup systems.

Unit 12: Network Security

Competencies and Suggested Objectives
1. Implement firewalls and security appliances. DOK2 a. Configure a host and perimeter firewall. b. Configure a demilitarized zone (DMZ). c. Configure a network security appliance, such as an antivirus-scanning device, content-filtering device, and so forth. d. Troubleshoot firewalls and security appliances.
2. Implement security on switches and wireless networks. DOK2 a. Configure the wireless network for optimal security. b. Configure switches for optimal security including disabling ports. c. Troubleshoot security on switches and wireless networks.
3. Apply security standards to passwords and network services. DOK2 a. Disable traffic permissions. b. Implement strong password policies, such as multifactor authentications. c. Explore Linux account services. d. Troubleshoot security standards to passwords and network services.
4. Create remote connections and virtual private networks (VPNs). DOK2 a. Configure remote access VPNs. b. Configure mobile devices' VPN connections. c. Troubleshoot remote connections and VPNs.
5. Analyze network exploits. DOK2 a. Implement an intrusion prevention system (IPS). b. Mitigate cybersecurity attacks. c. Implement a physical cybersecurity strategies. d. Troubleshoot network exploits.

Unit 13: Career Development

Competencies and Suggested Objectives
1. Investigate and demonstrate career development skills. DOK1 a. Investigate career opportunities and emerging technologies in IT. b. Locate resources for a job opening in an IT career field. c. Prepare, in an acceptable format, a cover letter, a résumé, and a follow-up letter using word-processing software. d. Complete a job application. e. Demonstrate appropriate job interview skills in a real or mock interview.
2. Use appropriate communication skills and professional behavior when communicating with clients and coworkers. DOK1 a. Practice appropriate communication skills, including speaking clearly and concisely, using tact and discretion, avoiding jargon, asking pertinent questions, and exercising listening skills. b. Practice appropriate professional behavior, including maintaining a positive attitude and tone of voice, avoiding arguments or defensiveness, and respecting clients' privacy and property. c. Discuss the impact of social media profiles.
3. Research opportunities related to IT and participate in field experiences or simulations. DOK3 a. Investigate educational opportunities related to IT. b. Describe national standards and certification/licensing procedures related to IT. c. Describe the role of trade organizations, associations, and unions related to IT. d. Participate in a school-to-careers activity (e.g., shadowing, mentoring, simulations, career fair, etc.). e. Visit an industry/computer center and, analyze hardware and software usage and needs, educational training for personnel, tasks performed by personnel, and the future outlook for those jobs.
4. Research and identify the benefits of industry certifications for various information technology careers. DOK2 a. Compare and contrast entry-level and career-level certifications.

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: Introduction to Information Technology		
	1.	Research educational, occupational, and leadership opportunities in IT.
	2.	Identify, discuss, and apply safety procedures in the computer classroom and lab.
	3.	Publish and communicate with peers, experts, and other audiences using technology.
Unit 2: Hardware		
	1.	Explore motherboard components.
	2.	Examine the basic wired and wireless peripherals, such as input, output, and combination devices and the purpose of each.
	3.	Manipulate storage on computer systems.
	4.	Design and troubleshoot a basic workstation.
Unit 3: Software		
	1.	Compare and contrast the functions and features of commonly used computer operating systems (OSs).
	2.	Identify common software applications and the purpose of each.
	3.	Demonstrate software management best practices.
	4.	Demonstrate file management best practices.
	5.	Troubleshoot various software issues.
Unit 4: Networking		
	1.	Develop skills to design, deploy, and administer networks.
	2.	Design and develop network infrastructure.
	3.	Describe internet technologies.
	4.	Troubleshoot various networking issues.

Unit 5: Database		
	1.	Discuss database concepts.
	2.	Explore objects of a relational database.
	3.	Perform basic query's using Structured Query Language (SQL).
	4.	Troubleshoot various database issues.
Unit 6: Programming and Web Development		
	1.	Discuss the various web design languages such as JavaScript, HTML, and CSS.
	2.	Analyze and use various logic and programming techniques along with fundamental data types.
	3.	Develop a basic web page using HTML, CSS, and JavaScript.
	4.	Troubleshoot various programming and web development issues.
Unit 7: Cybersecurity		
	1.	Analyze basic security threats.
	2.	Discuss security best practices.
	3.	Describe common threats to data confidentiality, integrity, and availability.
	4.	Configure corporate data security.
	5.	Configure device security.
	6.	Troubleshoot various cybersecurity issues.
Unit 8: Networking Fundamentals		
	1.	Identify different network classifications.
	2.	Describe the common physical and logical topologies.
	3.	Examine devices, services, and protocols within each layer of the Open Systems Interconnection (OSI) model.
	4.	Explain protocols and ports within the Transmission Control Protocol/Internet Protocol (TCP/IP) suite.
	5.	Examine the various numbering systems used in networking.
Unit 9: Networking Hardware		
	1.	Recognize network media types.
	2.	Examine network hardware, including layers 1, 2, and 3 devices.
Unit 10: Networking Configuration		
	1.	Recognize the internet protocol (IP) addressing scheme.
	2.	Configure routers and switches.
	3.	Configure wireless and Voice over Internet Protocol (VoIP).

~~Unit 11: Managing Networks~~		
	~~1.~~	~~Explore dynamic host configuration protocol (DHCP) services.~~
	~~2.~~	~~Explore domain name system (DNS) services.~~
	~~3.~~	~~Explore network segmentation.~~
	~~4.~~	~~Explore various types of backup systems and restore tasks.~~
~~Unit 12: Network Security~~		
	~~1.~~	~~Implement firewalls and security appliances.~~
	~~2.~~	~~Implement security on switches and wireless networks.~~
	~~3.~~	~~Apply security standards to passwords and network services.~~
	~~4.~~	~~Create remote connections and virtual private networks (VPNs).~~
	~~5.~~	~~Analyze network exploits.~~
~~Unit 13: Career Development~~		
	~~1.~~	~~Investigate and demonstrate career development skills.~~
	~~2.~~	~~Use appropriate communication skills and professional behavior when communicating with clients and coworkers.~~
	~~3.~~	~~Research opportunities related to IT and participate in field experiences or simulations.~~
	~~4.~~	~~Research and identify the benefits of industry certifications for various information technology careers.~~

Appendix A: Industry Standards

National Business Education Association: Information Technology Standards

	Units	1	2	3	4	5	6	7	8	9	10	11	12	13
Standards														
II		X												X
III		X												X
IV			X											
V				X										
VI				X										
VII				X										
X						X								
XII							X							
XIII					X				X	X	X	X		
XV								X					X	
XVI		X												X
XVIII														X

II – Information Literacy

Achievement Standard: Gather, evaluate, synthesize, use, cite, and disseminated information from technology sources.

III – Digital Citizenship

Achievement Standard: Demonstrate respectful, responsible, inclusive, and ethical behavior in a digital world.

IV – Devices and Components

Achievement Standard: Describe current and emerging devices and components; configure, install, and upgrade equipment; diagnose problems; and repair hardware.

V – Operating Systems

Achievement Standard: Identify, evaluate, select, install, use, upgrade, and customize operating systems. Diagnose and solve problem with various types of operating system utilities.

VI – Input Technologies

Achievement Standard: Use various input technologies to enter and manipulate information appropriately.

VII – Applications

Achievement Standard: Identify, evaluate, select, install, use, upgrade, troubleshoot, and customize applications.

X – Database Management Systems

Achievement Standard: Use, plan, develop, and maintain database management systems.

~~XII – Programming and Application Development~~

~~Achievement Standard: Design, develop, test, and implement programs and applications.~~

~~XIII – Data and Networking Infrastructures~~

~~Achievement Standard: Develop the skills to design, deploy, and administer networks and telecommunications systems.~~

~~XV – Security and Risk Management~~

~~Achievement Standard: Design and implement security and risk management policies and procedures for information technology.~~

~~XVI – End-User Support and Training~~

~~Achievement Standard: Develop the technical and interpersonal skills and knowledge to train and support a diverse user community.~~

~~XVIII – Information Technology Careers~~

~~Achievement Standard: Explore career opportunities in information technology.~~

TestOut IT Fundamentals Pro Content Standards

	Units	1	2	3	4	5	6	7	8	9	10	11	12	13
Standards														
TITF1			X											
TITF2				X										
TITF3				X										
TITF4					X									
TITF5						X								
TITF6							X							
TITF7								X						

TITF1 – Hardware

TITF2 – Software

TITF3 – Operating Systems

TITF4 – Networking

TITF5 – Databases

TITF6 – Programming

TITF7 – Security

TestOut IT Networking Pro Content Standards

	Units	1	2	3	4	5	6	7	8	9	10	11	12	13
Standards														
TNP1									X	X				
TNP2											X			
TNP3												X		
TNP4													X	
TNP5			X	X	X	X	X	X	X	X	X	X	X	

TNP1 – Hardware

TNP2 – Configuration

TNP3 – Management

TNP4 – Security

TNP5 – Troubleshooting

2026 Information Technology– Networking

Program CIP: 11.0101 — Computer and Information Sciences, General

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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 context 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. Matt Miller, Southern Supreme Court District Representative, Chair
Mr. Matt Mayo, Central Supreme Court District Representative, Vice-Chair
Dr. Wendi Barrett, Teacher Representative
Mr. Glen East, Administrator Representative
Mr. Bill Jacobs, At-Large Representative
Dr. Ronnie McGehee, At-Large Representative
Mr. Mike Pruitt, At-Large Representative
Mrs. Billye Jean Stroud, Northern Supreme Court District Representative
Mrs. Mary Werner, At-Large Representative
Mr. Crosby Parker, Senior Student Representative
Ms. Michelle Xie, Junior 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, and English II, which could be integrated into the content of the units. Mississippi's CTE Information Technology—Networking curriculum is aligned to the following standards:

CompTIA CertMaster Learn Network+
CertMaster Learn standards validate essential networking knowledge of tools and concepts. They ensure assessment of network connectivity abilities regarding documentation, service configuration, data centers, cloud, virtual networking, monitoring, troubleshooting, and security hardening. These standards prepare students for jobs in technical support, network operations, and system administration.
comptia.org

International Society for Technology in Education Standards (ISTE)

iste.org

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.
mdek12.org/academiceducation/mississipp-college-and-career-readiness-standards/

Career and Technical Student Organizations (CTSOs)
Mississippi's Career and Technical Education (CTE) curricula are aligned with the programs, activities, and competitive events offered through Career and Technical Student Organizations (CTSOs). These organizations provide students with opportunities to apply classroom knowledge in real-world contexts, develop leadership and employability skills, and connect with industry and community partners. Each pathway includes an appendix identifying the CTSOs most closely connected to the curriculum, ensuring that students' classroom learning is reinforced through co-curricular experiences that prepare them for success in both post-secondary education and the workforce.
mdek12.org/cte/so/

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 at 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
Information Technology is a pathway within the Digital Technology career cluster that provides the foundation, skills, and knowledge necessary for computer networking, applications, and support. Students will develop the skills necessary to prepare for certification exams and will learn how to develop, support, and integrate computing systems while also acquiring knowledge of network planning, management skills, and the ability to provide technical support. The program will provide hands-on experiences that are focused on skills related to computer system support, network setup, and system maintenance.

College, Career, and Certifications
For the most updated certification and assessment information regarding this pathway, review the blueprint located on the RCU's curriculum page.

Grade Level and Class Size Recommendations
It is recommended that students enter this program as sophomores, juniors, or seniors. Exceptions to this are a district-level decision based on class size, enrollment numbers, student maturity, and CTE delivery method. This is a hands-on, lab- or shop-based course. Therefore, a maximum of 15 students is recommended per class with 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

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/secondaryeducation/approved-courses.

Educator Licensure
The latest educator licensure information can be found at mdek12.org/licensure.

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 Outlines

Option 1—Two 1-Carnegie Unit Courses

This curriculum consists of two 1-credit courses that should be completed in the following sequence:

1. **Information Technology Networking I—Course Code: 992210**
2. **Information Technology Networking II —Course Code: 992211**

Course Description: Information Technology Networking I
Students will investigate networking, safety protocols, and digital citizenship. Other topics covered in this course include introductory elements of IT such as AI prompt engineering, IP addressing, network types and topologies, OSI model layers, and protocols. Students will use IT industry-standard tools and techniques as they gain a technical understanding of hands-on networking hardware, including cabling and the configuration techniques of routers and switches.

Course Description: Information Technology Networking II
This course focuses on modern networks, including advanced technologies, management, and security. Students will investigate backup systems, DHCP and DNS services, disaster recovery, and segmentation. Importance is placed on access control, intrusion prevention, securing network infrastructure through firewalls, and VPNs. Students will also investigate cloud computing models, virtualization, and software-defined networking (SDN). The course ends with a unit on career development, preparing students for entry-level roles, industry certifications, and post-secondary opportunities in IT.

Information Technology Networking I—Course Code: 992210

Unit	Title	Hours
1	Orientation to Networking	20
2	Networking Fundamentals	30
3	Networking Hardware	30
4	Switches	30
5	Routers	30
Total		**140**

Information Technology Networking II—Course Code: 992211

Unit	Title	Hours
6	Network Configuration	30
7	Managing Networks	30
8	Network Security	30
9	Cloud Technologies	30
10	Career Development	20
Total		**140**

Option 2—One 2-Carnegie Unit Course

This curriculum consists of one 2-credit course that should be completed following the Information Technology Core curriculum:

1. **Information Technology Networking—Course Code: 992207**

Course Description: Information Technology Networking

Throughout this course, students will apply critical thinking, develop problem-solving skills in practical scenarios, and explore current IT trends. They will use command-line and graphical tools as they troubleshoot network configurations. Students will investigate networking, safety protocols, and digital citizenship. Other topics covered in this course include introductory elements of IT such as AI prompt engineering, IP addressing, network types and topologies, OSI model layers, and protocols. Students will use IT industry standard tools and techniques as they develop hands-on, networking hardware skills, including cabling and configuration techniques of routers and switches. This course focuses on modern networks, including advanced technologies, management, and security. Students will investigate backup systems, dynamic host configuration protocol (DHCP), and domain name system (DNS) services, disaster recovery, and segmentation. Importance is placed on access control, intrusion prevention, and securing network infrastructure using firewalls and virtual private networks (VPNs). Students will also investigate cloud computing models, virtualization, and software-defined networking (SDN). The course ends with a unit on career development, preparing students for entry-level roles, industry certifications, and postsecondary opportunities in IT.

Information Technology Networking—Course Code: 992207

Unit	Title	Hours
1	Orientation to Networking	20
2	Networking Fundamentals	30
3	Networking Hardware	30
4	Switches	30
5	Routers	30
6	Network Configuration	30
7	Managing Networks	30
8	Network Security	30
9	Cloud Technologies	30
10	Career Development	20
Total		**280**

Career Pathway Outlook

Overview

The Information Technology (IT) Networking program prepares students for careers as network technicians and systems administrators. Students will develop employability and critical thinking skills while emphasizing and practicing data integrity. They will become proficient in setting up switches and routers, troubleshooting network issues, including outages, employing TCP/IP protocols, and safeguarding networks. Network and computer systems administrators typically install, configure, and maintain organizations' local area networks (LANs), wide area networks (WANs), data communication networks, operating systems, and servers. In 2023, network and computer systems administrators held about 335,400 jobs nationally. Their three largest employers were computer systems design and related services, educational services (state, local, and private), and finance and insurance combined. Their employment percentages in those fields were 16%, 11%, and 10%, respectively. Other employers include manufacturing industries, healthcare providers, and government agencies. Most network and computer systems administrators work full-time, and some work more than 40 hours per week. Administrators may need to work evenings, nights, or weekends to monitor, maintain, or update networks and systems.

Most careers in networking require at least a bachelor's degree, although careers with the highest earning potential—senior or enterprise-level network architects and postsecondary teachers, for example—may require advanced degrees (e.g., Master of Business Administration (MBA), Doctor of Philosophy (PhD) in computer science, etc.).

Needs of the Future Workforce

According to the U.S. Bureau of Labor Statistics, the projected growth for computer network architects is 13% from 2023 to 2033. This is much faster than the average for all occupations. In terms of networking, two of the fastest-growing occupations nationally are information security analysts and data scientists. Their growth rates are 33% and 36%, respectively. Information security analysts monitor organizational networks, maintain software to protect sensitive information, and check for vulnerabilities in network systems.

Table 1.1: Current and Projected Occupation Report

Description	Jobs, 2022	Projected Jobs, 2032	Change (Number)	Change (Percent)	Average Hourly Earnings, 2025
Computer and Information Systems Managers	1,380	1,650	270	19.6%	$38.87
Computer Hardware Engineers	170	200	30	17.6%	$29.15
Computer Network Architects	300	310	10	3.3%	$29.70
Computer Network Support Specialists	1,020	1,140	120	11.8%	$17.37
Computer Science Teachers, Postsecondary	160	180	20	12.5%	$20.67
Computer Systems Analysts	1,790	1,970	180	10.1%	$26.38
Computer User Support Specialists	2,800	3,140	340	12.1%	$15.44

Information Security Analysts	560	830	270	48.2%	$26.63
Network and Computer Systems Administrators	1,610	1,700	90	5.6%	$22.23

Source: Mississippi Department of Employment Security; mdes.ms.gov (2025).

Perkins V Requirements and Academic Infusion

The Information Technology—Networking curriculum meets Perkins V requirements of introducing students to and preparing them for high-skill, high-wage occupations in IT fields. It also offers students a comprehensive program of study, including secondary, postsecondary, and higher learning courses, designed to prepare them for careers in networking. 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 Information Technology—Networking 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. Mississippi offers CTSOs that will foster the types of learning expected from the Information Technology—Networking curriculum, such as SkillsUSA and TSA. Student organizations provide participants and members with growth opportunities and competitive events. They also open the doors to the world of information technology careers and scholarship opportunities.

Cooperative Learning

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

Work-Based Learning

Work-based learning is an extension of understanding competencies taught in the information technology classroom. This curriculum is designed to necessitate active involvement by students in their community and the global environment. These real-world connections and applications link all types of students to knowledge, skills, and professional dispositions. Work-based learning should encompass ongoing and increasingly more complex involvement with local companies and networking professionals. Thus, supervised collaboration and immersion into the information technology industry around the students are keys to students' success, knowledge, and skills development.

Professional Organizations

Association for Computing Machinery (ACM)
acm.org

Association for Information Science & Technology (ASIST)
asist.org

Association for Women in Computing (AWC)
awc-hq.org

Computing Technology Industry Association (CompTIA)
comptia.org

Cloud Security Alliance (CSA)
cloudsecurityalliance.org

Institute for Certification of Computing Professionals (ICCP)
iccp.org

Institute of Electrical and Electronics Engineers (IEEE)
ieee.org

Information Systems Audit and Control Association (ISACA)
isaca.org

IT Industry Council (ITI)
itic.org

Information Systems Security Association (ISSA)
issa.org

Network Professional Association (NPA)
npa.org

National Society of High School Scholars (NSHSS)
nshss.org

Society for Information Management (SIM)
simnet.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 Information Technology pathway utilizes a national certification, work-based learning, or another accountability measure that aligns with Perkins V as a quality indicator, this material may be assessed based 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 to Networking

Competencies and Suggested Objectives
1. Research educational, occupational, and leadership opportunities in information technology (IT). DOK2 a. Review student rules and regulations for the local school. b. Compare and contrast local program policies, procedures, and expectations to industry policies, procedures, and expectations. c. Identify and describe leadership opportunities available from CTE student organizations (CTSOs) in the school and community.
2. Identify, discuss, and apply safety procedures in the computer classroom and lab. DOK2 a. Discuss the proper classroom and personal safety procedures, including fire extinguishers, electrical, ladders, clothing, jewelry, eye protection, etc. b. Care for and correctly use computer hardware. c. Identify potential hazards when working with technology equipment. d. Explore the environmental impact related to technology. e. Develop personal safety guidelines for using technology and the internet.
3. Publish and communicate research findings on emerging IT technologies, recent trends, and IT-related issues with peers, experts, and general audiences using technology. DOK3 a. Research, create, and present on emerging IT technologies, best practices, recent trends, and IT-related issues. b. Research safety issues related to technology and internet academic standards, where applicable. c. Define and apply digital citizenship, online safety, and appropriate use best practices, and their importance in IT. d. Outline computer industry-related legal considerations, including software copyright issues and licensing, and internet ethics and policies. e. Review and adhere to the school's technology acceptable-use policy. f. Engage in positive, safe, legal, and ethical behavior when using technology, including social interactions online. g. Utilize online tools and electronic media to communicate effectively.
4. Define computing basics and file management systems. DOK2 a. Demonstrate file management best practices, including creating, organizing, and managing files and folders. b. Utilize a file management system for efficient data organization and retrieval.
5. Explore IT careers and communicate effectively using technology. DOK3 a. Research and present on educational, occupational, and leadership opportunities in IT. b. Review student rules and regulations for the local school and compare them to industry standards.
6. Understand and explore the development of artificial intelligence (AI). DOK2 a. Analyze the influence of AI on IT practices. b. Define and develop effective prompting or prompt engineering. c. Identify and evaluate best practices in using AI. d. Discuss and analyze ethical dilemmas that arise when using AI. e. Explore and assess how AI is currently being utilized in the IT field. f. Compare and contrast a variety of career opportunities within AI.

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.

Mississippi Career Connections
Mississippi's IT workforce relies on strong professional skills. Students should review their school and classroom technology rules, then compare them to the professional expectations of a Mississippi employer (such as C Spire, Ingalls Shipbuilding, Entergy, or a local school district). Students then complete the following tasks: • Identify at least three ways that school rules are similar to workplace policies (attendance, device usage, online behavior, confidentiality, professionalism, etc.). • Explain how classroom safety procedures relate to real IT job tasks. • Connect school acceptable use policy guidelines to industry expectations around data privacy, cybersecurity, ethical software use, and communication standards. • Research an emerging IT or AI trend currently used in Mississippi (fiber networks, cybersecurity, telehealth, manufacturing automation, cloud services, etc.) and identify careers connected to it.

Unit 2: Networking Fundamentals

Competencies and Suggested Objectives
1. Interpret different network classifications. DOK3 a. Compare and contrast types of peer-to-peer and client servers. b. Cite and communicate differences in geographical networks, such as local area network (LAN), wide area network (WAN), and metropolitan area network (MAN). c. Investigate the differences between intranet, internet, and extranet.
2. Identify and describe common physical and logical network topologies, including star, mesh, and other structures. DOK3
3. Define and examine layers of Open Systems Interconnection (OSI). DOK2 a. Identify and describe the major groupings of the OSI model layers. • Layers 1-4 • Upper Layers
4. Analyze protocols and ports within the Transmission Control Protocol/Internet Protocol (TCP/IP) suite. DOK3
5. Distinguish between the OSI model layers as they apply to small office home office (SOHO) networks. DOK2 a. Identify the functions of each OSI model layer within a SOHO environment. • Physical Layer • Data Link Layer • Network Layer • Transport Layer • Upper Layer
6. Analyze the differences among various numbering systems used in SOHO networking. DOK3 a. Demonstrate understanding of numbering systems in networking through conversions. • Convert decimal to binary • Convert decimal to hexadecimal
7. Apply concepts used throughout this course to troubleshoot networking issues. DOK4 a. Identify the problem. b. Identify symptoms of the problem. c. Establish a theory to determine the cause. d. Establish a plan of action. e. Implement the solution. f. Verify the solution. g. Document findings, actions, and outcomes.

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

Unit 3: Networking Hardware

Competencies and Suggested Objectives

1. Analyze and apply knowledge of network media types. DOK2
   a. Investigate characteristics and demonstrate correct use of network cabling.
   b. Explore Ethernet applications.
   c. Investigate the characteristics of twisted pair cabling in networks.
      - Compare termination standards T568A & T568B.
      - Compare crossover and straight-through cables.
   d. Investigate the characteristics of coaxial cabling in networks.
   e. Investigate the characteristics of plenum and riser-related cables.
   f. Investigate the characteristics of fiber-optic cabling in networks.
   g. Implement and troubleshoot different wiring schemes.
2. Investigate and apply knowledge of network interface cards (NICs). DOK3
   a. Analyze NIC functions, formats, and types.
   b. Determine the role of frames and the Physical Layer in operating NICs.
   c. Compare network adapter types:
      - Ethernet
      - Fiber
      - Wireless
   d. Examine media access control (MAC) address formatting.
   e. Evaluate the role of modular transceivers in network connectivity.
3. Investigate and apply knowledge of rack systems. DOK2
   a. Explore and identify hardware configurations.
      - Segmentation
      - Uninterrupted Power Supply (UPS)
      - Patch Panel
      - Keyboard, Video, Mouse (KVM) Switch
      - Fiber Panel
      - Networking Tools
        - Punch down tool
        - Crimper
        - Wire strippers
        - Console cable
        - Cable/network tester
   b. Explore and identify installation factors.
      - Network equipment location and spacing
      - Temperature control
      - Telecommunications Industry Association (TIA)/Electronic Industry Alliance (EIA) standards for cabling and infrastructure
      - Power management
      - Fire safety
4. Examine network hardware, including layers 1, 2, and 3 devices in the OSI model. DOK2
   a. Identify and define routers, firewalls, and Layer 3 switches as Layer 3 network hardware devices.
   b. Differentiate and implement wired and wireless devices.

Unit 4: Switches

Competencies and Suggested Objectives
1. Investigate and apply knowledge of switches. DOK3 a. Critique roles, configurations, and features of switches in networking. • Hubs, bridges, and managed/unmanaged switches • Command line interface (CLI) configuration of switches • Link aggregation • EtherChannels • Power over Ethernet (PoE) • Spanning tree protocol
2. Troubleshoot common switch applications. DOK3 a. Apply troubleshooting methods to diagnose and resolve switch-related issues. • Physical Connectivity • MAC Address Tables • PoE Issues • Switch Hardening • Virtual Local Area Network (VLAN)

Unit 5: Routers

Competencies and Suggested Objectives

1. Investigate and apply knowledge of router configurations. DOK3
   a. Analyze Internet Protocol (IP) addressing and apply router configuration methods.
      - IP basics
        - Headers/packets
        - Addressing Resolution Protocol (ARP)
        - Unicast, broadcast, multicast, and anycast addressing
      - IPv4 Addressing
        - Formatting
          - Dotted decimal notation and octets
          - Private versus public address
          - Automatic private IP addressing (APIPA)
          - Loopback address
      - Masks
        - Network mask
        - Subnet mask
          - Class A, B, and C
          - Subnetting
          - Variable length subnet mask (VLSM)
      - Address usage
        - Host address ranges
        - Broadcast addresses
      - Router configuration
        - Windows graphical user interface (GUI)
        - Linux command line interface (CLI)
        - Mobile devices
      - IPv6 Addressing
        - Compare to IPv4
        - Network ID/Prefix
        - Interface ID
      - Unicast, link local, multicast, anycast
      - Network address translation (NAT)

2. Troubleshoot methods for each of the following router applications. DOK3
   a. Resolve common router problems by using troubleshooting tools and analyzing IP issues.
      - Troubleshooting tools
        - Ping
        - Ipconfig (Windows)/ Ifconfig & IP (Linux)
        - Tracert (Windows)/ traceroute (Linux)
        - ARP
      - Resolve IP issues
        - IP configuration issues
        - Duplicate IP and MAC address issues
        - IP forwarding issues
        - Routing table issues

Unit 6: Network Configuration

Competencies and Suggested Objectives
1. Recognize the IP addressing scheme. DOK2 a. Configure IPv4 addresses. b. Configure IPv6 addresses.
2. Configure routers and switches. DOK2 a. Configure ports and VLANs. b. Implement spanning tree protocol (STP). c. Implement quality of service (QoS). d. Configure NAT.
3. Configure wireless networks. DOK2 a. Connect smart and mobile devices. b. Configure and manage wireless access points. c. Configure Internet of Things (IoT) devices for networking. d. Research emerging technologies related to wireless networks.
4. Configure Voice over Internet Protocol (VoIP). DOK2 a. Configure voice and video services within a VoIP network. b. Configure VoIP protocols for proper communication. c. Configure VoIP phones to connect and operate on the network.

Unit 7: Managing Networks

Competencies and Suggested Objectives
1. Explore Dynamic Host Configuration Protocol (DHCP) services. DOK2 a. Define common DHCP concepts, including discover, offer, request, acknowledge (DORA), scope, relay agent, reservations, and exclusions. b. Implement a DHCP server. c. Configure DHCP options, snooping, and relay agent. d. Troubleshoot DHCP services.
2. Explore the Domain Name System (DNS) services. DOK2 a. Define common DNS concepts, including fully qualified domain name (FQDN), DNS zones, different types of records, and DNS lookup. b. Configure DNS addresses. c. Create standard DNS addresses. d. Troubleshoot name resolutions.
3. Explore network segmentations. DOK2 a. Scan for IoT devices. b. Scan networks for vulnerabilities, exploits, attacks, and threats.
4. Explore various types of backup systems and restore tasks. DOK2 a. Backup and restore file history. b. Backup and restore network configuration. c. Verify and troubleshoot backup systems. d. Review disaster recovery procedures. e. Explore emerging technologies in backup systems.

Unit 8: Network Security

Competencies and Suggested Objectives
1. Investigate and implement firewalls and security appliances. DOK3 a. Configure a host and perimeter firewall. b. Configure a demilitarized zone (DMZ). c. Configure a network security appliance (e.g., antivirus-scanning device, content-filtering device). d. Troubleshoot firewalls and security appliances.
2. Investigate and configure security features on switches and wireless networks. DOK3 a. Configure the wireless network for optimal security. b. Configure switches for optimal security, including disabling ports. c. Troubleshoot security on switches and wireless networks.
3. Apply and assess security standards to passwords and network services. DOK3 a. Disable traffic permissions. b. Implement strong password policies, such as multifactor authentication. c. Explore Linux account services. d. Troubleshoot security standards for passwords and network services.
4. Create and troubleshoot remote connections and virtual private networks (VPNs). DOK3 a. Configure remote access VPNs. b. Configure mobile devices' VPN connections. c. Troubleshoot remote connections and VPNs.
5. Analyze and critique network exploits. DOK4 a. Implement an intrusion prevention system (IPS). b. Mitigate cybersecurity attacks. c. Implement a physical cybersecurity strategy. d. Troubleshoot network exploits.

Unit 9: Cloud Technologies

Competencies and Suggested Objectives
1. Analyze and evaluate the effectiveness of different storage solutions and their roles within a storage area network (SAN). DOK3 a. Identify and describe the key components of a data center network design layout and the significance of enhancing performance and dependability. b. Explain spine-and-leaf topology and its function in modern data center architecture. c. Define and describe the operations of a SAN and clarify its purpose in a data center. d. Describe a Fibre Channel (FC) and its importance in storage networking.
2. Communicate findings on cloud models and service offerings, justifying with examples and using proper terminology. DOK4 a. Describe and differentiate between private, public, and hybrid cloud models and evaluate the benefits and drawbacks of each cloud deployment model. b. Specify and explain scalability and elasticity in the framework of cloud computing. c. Differentiate between the three service models: infrastructure as a service (IaaS), platform as a service (PaaS), and software as a service (SaaS), and identify uses for each.
3. Evaluate the benefits or drawbacks of using virtual machines (VMs) versus containers for specific use cases regarding performance, resource allocation, and scalability. DOK3 a. Define and explain the role of VMs in cloud computing. b. Differentiate containers from VMs and describe the advantages of using containers in cloud environments. c. Identify and describe examples of virtual network functions (VNFs) with an emphasis on their flexibility and scalability.
4. Analyze and critique the features of modern network environments, consisting of cloud computing functions, virtualization, and distributed architectures. DOK4 a. Analyze network functions virtualization (NFV) infrastructure mechanisms. b. Show competence in managing and orchestrating cloud technology concepts. c. Analyze the principles of zero trust architecture. d. Understand the concept of software-defined networking (SDN).

Mississippi Career Connections
Mississippi is becoming home to new data centers from companies like NVIDIA and AWS, creating growth opportunities in cloud computing and network technology. To help students see how their skills apply in these environments, have them sketch a basic data-center rack layout and decide what storage system, cloud model, and virtualization approach they would use. This short activity gives students a look at real decisions made by data-center technicians, cloud engineers, and network specialists working in Mississippi's newest technology careers.

Unit 10: Career Development

Competencies and Suggested Objectives
1. Synthesize and demonstrate career readiness skills through real-world applications. DOK4 a. Investigate career opportunities and emerging technologies in IT. b. Locate resources for a job opening in an IT career field. c. Prepare, in an acceptable format, a cover letter, résumé, and follow-up letter using word-processing software. d. Complete a job application. e. Demonstrate appropriate job interview skills in a real or mock interview.
2. Analyze appropriate communication skills and professional behavior when communicating with clients and coworkers. DOK4 a. Practice appropriate communication skills, including speaking clearly and concisely, using tact and discretion, avoiding jargon, asking pertinent questions, and exercising listening skills. b. Practice appropriate professional behavior, including maintaining a positive attitude and tone of voice, avoiding arguments or defensiveness, and respecting clients' privacy and property. c. Discuss the impact of social media profiles.
3. Research opportunities and apply concepts related to IT, and participate in field experiences or simulations. DOK4 a. Investigate educational opportunities related to IT. b. Describe national standards and certification/licensing procedures related to IT. c. Describe the role of trade organizations, associations, and unions related to IT. d. Participate in a school-to-careers activity (e.g., shadowing, mentoring, simulations, career fair, etc.). e. Visit an industry/computer center and analyze hardware and software usage and needs, educational training for personnel, and tasks performed by personnel. f. Research trends and projected growth of various jobs in the IT industry.
4. Research and critique the benefits of industry certifications for various information technology careers. DOK4 a. Compare and contrast entry-level and career-level certifications.

Mississippi Career Connections
Students will choose an in-demand IT career in Mississippi, such as a help desk technician, network specialist, or cloud support technician, and create a career-readiness assignment based on the skills covered in this unit. To complete this assignment, students should research the job, prepare application materials, and practice professional communication. If possible, invite local industry partners to review students' work and offer feedback, so they can better understand what employers are looking for in the IT field.

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 (MM/DD/YY) on which the student mastered the competency.

Unit 1: Orientation to Networking		
	1.	Research educational, occupational, and leadership opportunities in information technology (IT).
	2.	Identify, discuss, and apply safety procedures in the computer classroom and lab.
	3.	Publish and communicate research findings on emerging IT technologies, recent trends, and IT-related issues with peers, experts, and general audiences using technology.
	4.	Define computing basics and file management systems.
	5.	Explore IT careers and communicate effectively using technology.
	6.	Understand and explore the development of artificial intelligence (AI).
Unit 2: Networking Fundamentals		
	1.	Interpret different network classifications.
	2.	Identify and describe common physical and logical network topologies, including star, mesh, and other structures.
	3.	Define and examine layers of Open System Interconnection (OSI).
	4.	Analyze protocols and ports within the Transmission Control Protocol/Internet Protocol (TCP/IP) suite.
	5.	Distinguish between the OSI model layers as they apply to small office home office (SOHO) networks.
	6.	Analyze the differences among various numbering systems used in SOHO networking.
	7.	Apply concepts used throughout this course to troubleshoot networking issues.
Unit 3: Hardware		
	1.	Analyze and apply knowledge of network media types.
	2.	Investigate and apply knowledge of network interface cards (NICs).
	3.	Investigate and apply knowledge of rack systems.
	4.	Examine network hardware, including layers 1, 2, and 3 devices in the OSI model.
Unit 4: Switches		
	1.	Investigate and apply knowledge of switches.
	2.	Troubleshoot common switch applications.
Unit 5: Routers		
	1.	Investigate and apply knowledge of router configurations.
	2.	Troubleshoot methods for each of the following router applications.

Unit 6: Network Configuration		
	1.	Recognize the IP addressing scheme.
	2.	Configure routers and switches.
	3.	Configure wireless networks.
	4.	Configure Voice over Internet Protocol (VoIP).
Unit 7: Managing Networks		
	1.	Explore Dynamic Host Configuration Protocol (DHCP) services.
	2.	Explore the Domain Name System (DNS) services.
	3.	Explore network segmentations.
	4.	Explore various types of backup systems and restore tasks.
Unit 8: Network Security		
	1.	Investigate and implement firewalls and security appliances.
	2.	Investigate and implement security on switches and wireless networks.
	3.	Apply and assess security standards to passwords and network services.
	4.	Create and troubleshoot remote connections and virtual private networks (VPNs).
	5.	Analyze and critique network exploits.
Unit 9: Cloud Technologies		
	1.	Analyze and evaluate the effectiveness of different storage solutions and their roles within a storage area network (SAN).
	2.	Communicate findings on cloud models and service offerings, justifying with examples and using proper terminology.
	3.	Evaluate the benefits or drawbacks of using virtual machines (VMs) versus containers for specific use cases regarding performance, resource allocation, and scalability.
	4.	Analyze and critique the features of modern network environments, consisting of cloud computing functions, virtualization, and distributed architectures.
Unit 10: Career Development		
	1.	Synthesize and demonstrate career readiness skills through real-world applications.
	2.	Analyze appropriate communication skills and professional behavior when communicating with clients and coworkers.
	3.	Research opportunities and apply concepts related to IT and participate in field experiences or simulations.
	4.	Research and critique the benefits of industry certifications for various information technology careers.

Appendix A: CCR-English II Standards

	Units									
Standards	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
RI.10.1	X	X	X	X	X	X	X	X	X	X
RI.10.2		X	X	X	X		X	X	X	X
RI.10.3	X	X	X	X	X		X	X	X	
RI.10.4		X					X			
RI.10.5	X		X							
RI.10.6	X									
W.10.2	X	X	X	X	X	X	X	X	X	X
W.10.4		X	X	X	X	X	X	X	X	X
W.10.6	X	X								
W.10.7	X		X			X	X	X	X	X
W.10.8							X			X
W.10.9								X	X	
W.10.10		X								X
SL.10.1	X	X		X	X			X		X
SL.10.4	X	X	X	X	X	X	X	X	X	X
SL.10.5	X		X				X	X		
SL.10.6										X
L.10.1	X	X	X	X	X	X	X	X		X
L.10.2										X
L.10.3	X									X
L.10.4	X	X	X	X	X	X	X	X	X	X
L.10.6	X	X	X	X	X	X	X	X	X	X

Reading Standards for Informational Text- College and Career Readiness Anchor Standards for Informational Text

Key Ideas and Details

1. Cite strong and thorough textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.
2. Determine the central idea(s) of a text and analyze in detail the development over the course of the text, including how details of a text interact and build on one another to shape and refine the central idea(s); provide an accurate summary of the text based upon this analysis.
3. Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Craft and Structure

4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the cumulative impact of specific word choices on meaning and tone (e.g., how the language of a court opinion differs from that of a newspaper).
5. Analyze in detail how an author's ideas or claims are developed and refined by particular sentences, paragraphs, or larger portions of a text (e.g., a section or chapter).
6. Determine an author's point of view or purpose in a text and analyze how an author uses rhetoric to advance that point of view or purpose.

College and Career Readiness Anchor Standards for Writing

Text Types and Purposes

1. Write informative/explanatory texts to examine and convey complex ideas, concepts, and information clearly and accurately through the effective selection, organization, and analysis of content.
   a. Introduce a topic; organize complex ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
   b. Develop the topic with well-chosen, relevant, and sufficient facts, extended definitions, concrete details, quotations, or other information and examples appropriate to the audience's knowledge of the topic.
   c. Use appropriate and varied transitions to link the major sections of the text, create cohesion, and clarify the relationships among complex ideas and concepts.
   d. Use precise language and domain-specific vocabulary to manage the complexity of the topic.
   e. Establish and maintain a formal style and objective tone while attending to the norms and conventions of the discipline in which they are writing.
   f. Provide a concluding statement or section that follows from and supports the information or explanation presented (e.g., articulating implications or the significance of the topic).

Production and Distribution of Writing

4. Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience. (Grade-specific expectations for writing types are defined in standards 1–3 above.)
6. Use technology, including the Internet, to produce, publish, and update individual or shared writing products, taking advantage of technology's capacity to link to other information and to display information flexibly and dynamically.

Research to Build and Present Knowledge

7. Conduct short as well as more sustained research projects to answer a question (including a self-generated question) or solve a problem; narrow or broaden the inquiry when appropriate; synthesize multiple sources on the subject, demonstrating understanding of the subject under investigation.
8. Gather relevant information from multiple authoritative print and digital sources, using advanced searches effectively; assess the usefulness of each source in answering the research question; integrate information into the text selectively to maintain the flow of ideas, avoiding plagiarism and following a standard format for citation.
9. Draw evidence from literary or informational texts to support analysis, reflection, and research.
   a. Apply grades 9–10 Reading standards to literature (e.g., "Analyze how an author draws on and transforms source material in a specific work [e.g., how Shakespeare treats a theme or topic from Ovid or the Bible or how a later author draws on a play by Shakespeare]").
   b. Apply grades 9–10 Reading standards to literary nonfiction and/or informational texts (e.g., "Delineate and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and fallacious reasoning").

Range of Writing

10. Write routinely over extended time frames (time for research, reflection, and revision) and shorter time frames (a single sitting or a day or two) for a range of tasks, purposes, and audiences.

College and Career Readiness Anchor Standards for Speaking and Listening

Comprehension and Collaboration

1. Initiate and participate effectively in a range of collaborative discussions (one- on-one, in groups, and teacher-led) with diverse partners on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.
   a. Come to discussions prepared, having read and researched material under study; explicitly draw on that preparation by referring to evidence from texts and other research on the topic or issue to stimulate a thoughtful, well-reasoned exchange of ideas.
   b. Work with peers to set rules for collegial discussions and decision-making (e.g., informal consensus, taking votes on key issues, presentation of alternate views), clear goals and deadlines, and individual roles as needed.

c. Propel conversations by posing and responding to questions that relate the current discussion to broader themes or larger ideas; actively incorporate others into the discussion; and clarify, verify, or challenge ideas and conclusions.
d. Respond thoughtfully to diverse perspectives, summarize points of agreement and disagreement, and, when warranted, qualify or justify their own views and understanding and make new connections in light of the evidence and reasoning presented.

Presentation of Knowledge and Ideas

4. Present information, findings, and supporting evidence clearly, concisely, and logically such that listeners can follow the line of reasoning and the organization, development, substance, and style are appropriate to purpose, audience, and task.
5. Make strategic use of digital media (e.g., textual, graphical, audio, visual, and interactive elements) in presentations to enhance understanding of findings, reasoning, and evidence and to add interest.
6. Adapt speech to a variety of contexts and tasks, demonstrating command of formal English when indicated or appropriate. (See grades 9–10 Language standards 1 and 3 for specific expectations.)

College and Career Readiness Anchor Standards for Language

Conventions of Standard English

1. Demonstrate command of the conventions of standard English grammar and usage when writing or speaking.
   a. Use parallel structure.
   b. Use various types of phrases (noun, verb, adjectival, adverbial, participial, adverbial) to convey specific meanings and add variety and interest to writing or presentations.
2. Demonstrate command of the conventions of standard English capitalization, punctuation, and spelling when writing.
   a. Use a semicolon (and perhaps a conjunctive adverb) to link two or more closely related independent clauses.
   b. Use a colon to introduce a list or quotation.
   c. Spell correctly.

Knowledge of Language

3. Apply knowledge of language to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
   a. Write and edit work so that it conforms to the guidelines in a style manual (e.g., MLA Handbook, Turabian's Manual for Writers) appropriate for the discipline and writing type.

Vocabulary Acquisition and Use

4. Determine or clarify the meaning of unknown and multiple-meaning words and phrases based on grades 9–10 reading and content, choosing flexibly from a range of strategies.
   a. Use context (e.g., the overall meaning of a sentence, paragraph, or text; a word's position or function in a sentence) as a clue to the meaning of a word or phrase.
   b. Identify and correctly use patterns of word changes that indicate different meanings or parts of speech (e.g., analyze, analysis, analytical; advocate, advocacy).
   c. Consult general and specialized reference materials (e.g., dictionaries, glossaries, thesauruses), both print and digital, to find the pronunciation of a word or determine or clarify its precise meaning, its part of speech, or its etymology.
   d. Verify the preliminary determination of the meaning of a word or phrase (e.g., by checking the inferred meaning in context or in a dictionary).
6. Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.

Appendix B: NBEA - Information Technology Standards

	Units									
Standards	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
IT1: Impact	X						X		X	X
IT2: Literacy	X	X	X	X	X	X	X	X	X	X
IT3: Citizenship	X							X		
IT4: Devices		X	X	X	X	X	X			
IT5: Operating Systems	X				X	X	X		X	
IT6: Input	X		X							
IT7: Applications	X				X	X	X		X	
IT8: Digital Media	X								X	X
IT9: Web Design	X									
IT10: Databases	X						X			
IT11: Project Mgmt.		X					X		X	X
IT13: Networking		X	X	X	X	X	X	X	X	
IT14: Planning	X					X	X		X	X
IT15: Security	X			X			X	X	X	
IT16: Support	X	X					X			X
IT17: Business	X						X		X	X
IT18: Careers	X	X	X	X	X	X	X	X	X	X

National Business Education Association (NBEA): Information Technology Standards

I. IMPACT ON SOCIETY: Achievement Standard - Assess the impact of information technology in a diverse global society.

Level 1 Performance Expectations

1. Use technology to achieve academic success and lifelong learning
2. Identify uses of information technology in the home, school, workplace, and globally diverse society
3. Explain how information technologies meet human needs and affect quality of life
4. Describe how information technology impacts government, work, family, school, and other cultures
5. Identify the impact of information technologies on the environment and society—both positive and negative
6. Identify the risks of information technology to personal health, safety, and privacy

Level 2 Performance Expectations

7. Describe the impact of technology on the knowledge and skills needed for success in the workplace
8. Describe how information technology affects worker-management relationships (e.g., outsourcing, communications, and cloud computing)
9. Identify and evaluate how information technology developments change the way users do their work
10. Describe how information technology creates greater interdependence among workers, organizations, and nations
11. Explain how information technology has impacted worker productivity and teamwork
12. Analyze the potential societal effect of widespread reliance on information technology
13. Analyze how human ingenuity and technology satisfy specific human needs
14. Evaluate the cause and effect of technological solutions on society

Level 3–4 Performance Expectations

15. Analyze how developments in information technology affect the supply/demand characteristics of the job market
16. Illustrate how information technology changes organizational structures
17. Examine how information technology changes the breadth and level of worker responsibilities

18. Evaluate how information technology transforms business processes and relationships
19. Assess how information technology changes the manner in which training is offered and implemented
20. Identify emerging trends in information technology and predict influences on business, industry, and the global economy
21. Analyze and compare society's influence on information technology and information technology's influence on our diverse, global society

II. INFORMATION LITERACY: Achievement Standard - Gather, evaluate, synthesize, use, cite, and disseminate information from technology sources.

Level 1 Performance Expectations

1. Use information technology resources to retrieve information
2. Evaluate the credibility, reliability, and bias of information sources
3. Interpret information for use in decision making
4. Cite information sources appropriately
5. Use search procedures appropriate to type of information, nature of source, and nature of query
6. Discuss and follow copyright rules, trademarks, intellectual property, creative commons, and regulations (e.g., images, music, video, software)
7. Explain plagiarism and its consequences

Level 2 Performance Expectations

8. Evaluate the accuracy, relevance, and comprehensiveness of retrieved information
9. Draw conclusions and make generalizations based on information gathered
10. Access, exchange, organize, and synthesize information
11. Analyze the effectiveness of information resources to support collaborative tasks, research, publications, communications, and increased productivity

Level 3–4 Performance Expectations

12. Synthesize information from data sources to formulate decisions across the curriculum
13. Analyze and use mathematical and/or statistical methods to manipulate data into useful information
14. Present analyzed information in a meaningful format

III. DIGITAL CITIZENSHIP: Achievement Standard - Demonstrate respectful, responsible, inclusive, and ethical behavior in a digital world.

Level 1-2 Performance Expectations

1. Identify and explore basic privacy issues associated with technology
2. Explore the risks and dangers of sharing personal information in a digital world (e.g., digital footprint, cyberbullying, cyberstalking, identity theft)
3. Explore the possibilities and perils of digital communications
4. Discuss and apply Internet safety practices
5. Identify how social media is used to learn across the curriculum
6. Explore how technology can be used to address bias and create more inclusive communities
7. Discuss basic issues related to responsible use of technology and describe personal or legal consequences of inappropriate use
8. Demonstrate respectful and responsible use and creation of media and technology
9. Demonstrate the appropriate and legal use of intellectual property
10. Demonstrate legal, inclusive, and ethical behaviors when using information technologies
11. Identify aspects of global connectivity and its implications
12. Demonstrate appropriate etiquette when using information technologies
13. Discuss the process of safely buying and selling online
14. Review acceptable use policies for legal and ethical use of information

Level 3–4 Performance Expectations

15. Recognize the importance of one's digital footprint and manage it professionally
16. Recognize responsible use of digital commerce
17. Recognize how information technology contributes to lifelong learning

18. Implement organizational policies and procedures dealing with legal, ethical, and inclusive issues
19. Compare and contrast various types of license agreements (e.g., open source, creative commons, multiple license agreements, single-user installation, site license)
20. Read, interpret, and adhere to software license agreements and legal mandates
21. Analyze legal and ethical dilemmas within the framework of current laws and legislation (e.g., virus development, hacking, threats, phishing)

IV. DEVICES AND COMPONENTS: Achievement Standard - Describe current and emerging devices and components; configure, install, and upgrade equipment; diagnose problems; and repair hardware.

Level 1 Performance Expectations

1. Identify devices appropriate for specific tasks
2. Identify the components of devices
3. Connect needed external components
4. Evaluate the capabilities and limitations of devices for user needs
5. Explain the purpose, operation, and care of devices and components
6. Identify examples of emerging technologies
7. Identify storage options

Level 2 Performance Expectations

8. Describe interrelationships between device components and supportive applications
9. Troubleshoot and diagnose applications and devices using appropriate resources (e.g., help desks, online help, manuals, technical support specialists)
10. Evaluate devices and features to make sound consumer decisions
11. Compare and contrast various storage devices (e.g., local, removable, remote, cloud)
12. Remove, upgrade, store, and install computer hardware and supportive applications

Level 3-4 Performance Expectations

13. Troubleshoot and repair computer hardware and resolve related application problems
14. Obtain hardware certification(s) needed for a chosen career path
15. Evaluate and recommend devices to solve specific problems
16. Analyze cost-benefit and life cycle of devices
17. Evaluate device vendors, warranties, and purchasing options

V. OPERATING SYSTEMS: Achievement Standard - Identify, evaluate, select, install, use, upgrade, and customize operating systems. Diagnose and solve problems with various types of operating system utilities.

Level 1-2 Performance Expectations

1. Navigate the basic operating system
2. Manage local and cloud-based files and folders
3. Describe various operating systems, platforms, and utilities (e.g., Android, iPhone system, Chrome, opensource)
4. Describe features of operating systems that can be personalized
5. Differentiate between operating systems and applications

Level 3–4 Performance Expectations

6. Compare and contrast the functions, features, and limitations of different operating systems and utilities (e.g., open-source, mobile, and proprietary operating systems)
7. Select operating systems and utilities appropriate for specific hardware, software, and tasks
8. Install and customize operating systems and utilities
9. Diagnose and repair installation and operational problems of operating systems
10. Identify and use appropriate help resources (e.g., help desks, online help, and manuals) to install, configure, upgrade, diagnose, and repair operating systems and utilities
11. Maintain operating system security
12. Troubleshoot and repair network operating system connectivity
13. Describe the use and benefit of operating systems running in a virtual environment
14. Install operating systems running in a virtual environment
15. Obtain operating system certification(s) needed for a chosen career path

VI. INPUT TECHNOLOGIES: Achievement Standard - Use various input technologies to enter and manipulate information appropriately.

Level 1 Performance Expectations

1. Develop and practice proper input techniques (e.g., keyboarding; voice recognition; facial recognition; handwriting recognition; virtual keypad; virtual reality; augmented reality; mixed reality; and the use of a multi-touch screen, mouse/pad, or stylus)
2. Identify appropriate input technology for various tasks
3. Describe ergonomic issues related to input technologies

Level 2–4 Performance Expectations

4. Select appropriate input technology to optimize performance
5. Apply a variety of input technologies to maximize productivity
6. Use a variety of input technologies to optimize academic and workplace performance
7. Create media using a variety of input technologies

VII. APPLICATIONS: Achievement Standard - Identify, evaluate, select, install, use, upgrade, troubleshoot, and customize applications.

Level 1 Performance Expectations

1. Identify and use applications appropriate for specific tasks to improve academic achievement across the curriculum
2. Use collaborative application tools to support learning
3. Produce projects that include a variety of media (e.g., images, text, video, web-based tools, and audio)
4. Explore web-based communication applications (e.g., social media, image sharing, video chat, instant messaging)
5. Identify help features and reference materials to learn applications and solve problems

Level 2 Performance Expectations

6. Use help features and reference materials to learn applications
7. Evaluate and select the appropriate applications to productively complete tasks
8. Identify application installation options (local, web based, software as a service [SaaS])
9. Identify and use resources to solve problems using application software
10. Compare and contrast application features
11. Install, upgrade, and customize applications

Level 3-4 Performance Expectations

12. Evaluate providers, licensing, and purchasing options
13. Use the collaborative features of applications to accomplish organizational tasks
14. Apply advanced features of applications for productivity
15. Evaluate the effectiveness of applications to solve specific problems
16. Diagnose and solve problems resulting from an application's installation and use
17. Compare and contrast locally-installed, web-based, mobile app-based, and cloud-based, installations of software applications
18. Use applications to analyze data for making good business decisions
19. Obtain software industry certification(s) needed for a chosen career path
20. Demonstrate the transferability of skills between applications
21. Diagnose and solve application problems
22. Select and integrate productivity software products appropriate for various computer and cloud platforms
23. Identify, evaluate, and select software specific to an organizational function and/or industry
24. Analyze cost benefit and life cycle of applications
25. Create training materials for applications

VIII. DIGITAL MEDIA: Achievement Standard - Use, analyze, and create digital media.

Level 1-2 Performance Expectations

1. Explore current and emerging digital media
2. Select and apply digital media appropriate for specific tasks

3. Create digital media to enhance academic achievement across the curriculum
4. Identify and select appropriate delivery methods and tools for digital media projects
5. Explore the impact of digital media on society
6. Troubleshoot digital media applications
7. Create digital media projects collaboratively
8. Use elements of digital and visual literacy appropriately

Level 3-4 Performance Expectations

9. Interpret, analyze, and determine meaning for digital media production
10. Create an original high-end, professional quality media production
11. Analyze the societal impacts of digital media
12. Analyze and select appropriate digital media formats and properties (e.g., plug-ins, codecs, compression)
13. Analyze digital media delivery tools and their effect on business functions
14. Evaluate and configure digital media delivery system solutions (e.g., streaming media servers, custom authored media, open media-sharing solutions, podcast, vodcast, screen share)
15. Select and integrate digital media appropriate for various platforms
16. Obtain digital media industry certification(s)

IX. WEB DEVELOPMENT AND DESIGN: Achievement Standard - Design, develop, test, implement, update, and evaluate web solutions.

Level 1-2 Performance Expectations

1. Identify and utilize various types of resources for web development
2. Identify and apply appropriate design concepts
3. Design and create web pages
4. Design and create websites incorporating digital media
5. Publish websites on local and cloud-based web development platforms

Level 3-4 Performance Expectations

6. Identify client and target audience needs
7. Create content that is readable, accessible, searchable, and sticky
8. Explain and use various Internet protocols
9. Research and apply accessibility guidelines and laws affecting website design
10. Assess website content in terms of organizational policies, inclusive practices, and federal and state laws
11. Research and analyze hosting and domain name solutions
12. Compare and contrast the features of web development applications and web content management systems
13. Use digital media optimized for website integration
14. Install and configure web development applications and plug-ins
15. Design, develop, and deliver advanced web content and applications using authoring tools
16. Build dynamic web elements utilizing scripting, coding, and applications using authoring tools
17. Create a comprehensive website using industry design standards
18. Test, implement, and evaluate the website
19. Analyze web server solutions and platforms
20. Plan, set up, and configure a web server
21. Design e-commerce solutions
22. Troubleshoot advanced server and site dilemmas
23. Analyze workflow and project management procedures relevant to web design
24. Build responsive websites to support all platforms (e.g., computer, mobile, tablet)
25. Develop organizational policy for website content and access
26. Connect web servers to application servers for interoperability
27. Obtain web development and design industry certification(s)

X. DATABASE MANAGEMENT SYSTEMS: Achievement Standard - Use, plan, develop, and maintain database management systems.

Level 1 Performance Expectations

1. Retrieve and use information from a database
2. Define basic database terminology

Level 2 Performance Expectations

3. Identify the appropriate type of database for a particular situation
4. Identify the variety of data types that are stored in database management systems
5. Create, modify, and extract data from databases for decision making
6. Describe search strategies and use them to solve common information problems
7. Organize and present the results of data retrieval through reports

Level 3 Performance Expectations

8. Identify the concepts and terminology for enterprise-level databases
9. Plan, develop, and implement an enterprise-level database management system
10. Utilize the application development tools from various vendors to interact with a developed enterprise-level database management system
11. Analyze, assess, and troubleshoot enterprise-level database management systems
12. Deploy database development tools to create solutions for reaching organizational goals
13. Obtain database management industry certification(s)

Level 4 Performance Expectations

14. Develop retention schedules that adhere to organizational policies and governmental laws
15. Use data mining techniques to extract useful information
16. Explain the options for converting legacy records to electronic database management systems

XI. PROJECT MANAGEMENT AND SYSTEMS ANALYSIS: Achievement Standard - Analyze and design projects and information systems using appropriate management and development tools.

Level 1–2 Performance Expectations

1. Define project management principles
2. Use project management to complete projects across the curriculum
3. Build timelines for projects
4. Apply project management concepts for collaborative works projects
5. Identify the different project management methodologies

Level 3-4 Performance Expectations

6. Identify and explain the steps in the systems development life cycle
7. Identify and describe various structured analysis and design tools
8. Use project management to manage information systems development projects
9. Analyze a current system using structured systems analysis tools
10. Define system requirements using structured systems analysis tools
11. Incorporate appropriate user interface design principles
12. Identify and apply appropriate application development tools
13. Develop a conversion plan
14. Develop design specifications for record types, output, and data stores
15. Create appropriate documentation for information systems
16. Develop a testing plan
17. Develop a training plan
18. Obtain project management industry certification

XII. PROGRAMMING AND APPLICATION DEVELOPMENT: Achievement Standard - Design, develop, test, and implement programs and applications.

Level 1-2 Performance Expectations

1. Identify and define programming terminology
2. Demonstrate the ability to code using programming tools

Level 3–4 Performance Expectations

3. Identify and explain programming structures
4. Differentiate between source and object code
5. Choose the appropriate language or application development tool for specific tasks
6. Use scripting languages in application development
7. Apply design principles to programming tasks
8. Develop both procedural and object-oriented programs
9. Select and incorporate appropriate compiler
10. Code common tasks using application development tools
11. Code a program solution in more than one programming language
12. Test, debug, and document code
13. Maintain and modify existing code
14. Develop programs and applications for a variety of platforms
15. Explore the integration of artificial intelligence (AI) in application development
16. Design 3D, augmented reality, and gaming environments in relationship to the development of applications
17. Explore immersive and visualization techniques
18. Obtain programming industry certification(s)

XIII. DATA AND NETWORKING INFRASTRUCTURES: Achievement Standard - Develop the skills to design, deploy, and administer networks and telecommunications systems.

Level 1–2 Performance Expectations

1. Identify basic network connectivity concepts
2. Apply basic networking terminology to a network environment
3. Explore and explain the benefits of cloud computing
4. Identify and use basic networking resources
5. Recognize the impact of the convergence of communication technologies on networks
6. Configure basic networking devices and security

Level 3 Performance Expectations

7. Identify network connectivity hardware and related software
8. Identify network architecture and topologies
9. Identify and distinguish network protocols, standards, and theoretical models in actual implementations
10. Identify network hardware infrastructure components including networking media and connection hardware and software
11. Design and develop network infrastructure
12. Explore distributed cloud infrastructures
13. Install and configure network servers, routers, clients, and related hardware and software
14. Monitor and manage computer networks
15. Apply virtualization technologies to servers, networks, storage, and related infrastructure
16. Configure and manage network operating systems in multi-vendor environments
17. Implement hardware and software security solutions
18. Monitor and fortify network security
19. Develop enterprise networking solutions
20. Obtain cloud storage, data management, telecommunications or networking industry certification(s)

Level 4 Performance Expectations

21. Implement a distributed storage solution
22. Develop strategic networking plans
23. Develop policies, protocols, and procedures for maintaining enterprise networks

XIV. INFORMATION TECHNOLOGY PLANNING AND ACQUISITION: Achievement Standard - Plan the selection and acquisition of information technologies.

Level 1-2 Performance Expectations

1. Identify personal technology needs and budget
2. Identify and research reliable sources of information about information technologies
3. Select appropriate information technologies

Level 3-4 Performance Expectations

4. Identify and analyze user needs within an organization
5. Research and identify information technology solutions to meet organizational needs
6. Compare, contrast, and identify potential solutions to meet the needs for an organization
7. Analyze, compare, and contrast total costs of ownership for information technology solutions and the return on investment (ROI)
8. Explore sustainability strategies relative to information technology planning, acquisition, and disposal
9. Develop request for proposals for information systems
10. Evaluate bid specifications received from vendors
11. Identify the importance of inventory management and system life cycles on decision making
12. Develop and present a project plan for identifying, evaluating, selecting, purchasing, installing, and supporting an information system

XV. SECURITY AND RISK MANAGEMENT: Achievement Standard - Design and implement security and risk management policies and procedures for information technology.

Level 1–2 Performance Expectations

1. Identify and discuss privacy issues and vulnerabilities relative to the individual and within an organization
2. Implement organizational policies and procedures for security, privacy, and risk management
3. Discuss the risks of data loss and methods of prevention
4. Apply ergonomic techniques to information technology tasks to avoid injury
5. Identify and demonstrate best practices at home and while working (e.g., computers, mobile phones, televisions, tablets)
6. Demonstrate cybersecurity best practices at home and while working with computers, mobile phones, televisions, tablets or other related devices.

Level 3 Performance Expectations

7. Analyze security, privacy, and risk management issues
8. Identify potential risks to enterprise systems from physical or cyber threats
9. Implement configuration management strategies
10. Implement procedures used to recover information from failures and security breaches
11. Implement controls to prevent loss of integrity of data and other information resources

Level 4 Performance Expectations

12. Identify risks to personnel, facilities, data, communications systems, and applications
13. Identify and select controls for personnel, facilities, data, communications systems, and applications appropriate to specific risks
14. Explore the integration of artificial intelligence (AI) in security systems
15. Develop mechanisms to protect an enterprise system from physical and cyber threats
16. Design and implement a security plan for information systems
17. Develop and implement data retention, records management, and destruction schedules
18. Develop and implement disaster prevention and recovery policies and procedures (e.g., Continuity of Operations Plan [COOP])

XVI. END-USER SUPPORT AND TRAINING: Achievement Standard - Develop the technical and interpersonal skills and knowledge to train and support a diverse user community.

Level 1-2 Performance Expectations

1. Work in a team to solve problems and share knowledge
2. Tutor and support others in information technology skills
3. Develop technical reading skills
4. Develop technical writing, digital communication, and presentation skills to work effectively with global cultures and diverse individuals
5. Develop critical thinking skills to locate resources to solve problems
6. Develop interpersonal skills
7. Use information technologies to facilitate learning
8. Explore online learning opportunities

Level 3 Performance Expectations

9. Demonstrate an inclusive, customer-oriented, service quality approach with users
10. Use a logical and structured approach to isolate, identify, and resolve problems
11. Identify, evaluate, and use resources for problem identification and resolution
12. Explore help-desk resources (e.g., software, videos, support specialists)
13. Develop help-desk procedures
14. Develop traditional and computer-mediated training materials for users
15. Obtain industry certification in one or more information technology areas
16. Explain the need for lifelong learning and professional growth
17. Design a job aid to teach a "how-to"

Level 4 Performance Expectations

18. Train end users to recognize and solve typical information technology problems
19. Identify, evaluate, and select training resources to meet user needs
20. Select appropriate training delivery methods
21. Create learning materials to facilitate user training
22. Plan and create resources to promote lifelong learning
23. Plan, design, deliver, and evaluate traditional and computer-mediated user training solutions

XVII. INFORMATION TECHNOLOGY AND BUSINESS FUNCTIONS: Achievement Standard - Describe the information technology components of business functions and explain their interrelationships.

Level 3-4 Performance Expectations

1. Identify and examine information systems and their impact on the enterprise (e.g., Enterprise Resource Planning [ERP] systems)
2. Identify and explain the major components of marketing and sales information technologies and their interrelationships
3. Identify and explain the major components of accounting and finance information technologies and their interrelationships
4. Identify and explain the major components of manufacturing and logistics information technologies and their interrelationships
5. Identify and explain the major components of research and development information technologies and their interrelationships
6. Identify and explain the major components of human resource management information technologies and their interrelationships

XVIII. INFORMATION TECHNOLOGY CAREERS: Achievement Standard - Explore career opportunities in information technology.

Level 1-2 Performance Expectations

1. Identify information technologies commonly used in all careers
2. Discuss the impact of information technology on all careers
3. Identify common tasks performed in information technology careers

4. Identify and explore career opportunities in information technology (e.g., LinkedIn, Indeed, etc.)

Level 3-4 Performance Expectations

5. Describe best practices for posting a resume and professional information on job search websites
6. Examine education, experience, skills, and personal requirements for careers in information technology
7. Describe the impact of technological change on information technology positions and the resulting need for lifelong learning
8. Experience an information technology career (e.g., job shadowing, community service, apprenticeship, internship, entry-level job, virtual career exploration)
9. Identify the benefits of industry certifications and higher education for various information

Appendix C: TSA Competition Crosswalk

	Units									
TSA Competition	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Architectural Design		X	X			X	X	X	X	
Chapter Team	X									X
Coding						X	X		X	
CAD Architecture		X	X			X	X	X	X	
CAD Engineering		X	X			X	X	X	X	
Data Science							X		X	X
Digital Video Production						X	X	X	X	X
Drone Challenge			X		X	X				
Engineering Design		X	X			X	X	X	X	
Future Tech Teacher	X	X	X	X	X	X	X	X	X	X
Music Production						X	X	X	X	
On Demand Video						X	X	X	X	
Prepared Presentation	X	X	X	X	X	X	X	X	X	X
Promotional Design							X	X	X	X
Software Development						X	X		X	X
Structural Design		X	X							
System Control Tech			X	X	X	X	X			
Tech Problem Solving		X					X	X		X
VR Simulation						X	X		X	X
Webmaster							X		X	

National TSA Conferences High School Competitive Events

1. **Architectural Design:** In response to the annual design challenge, participants develop a set of architectural plans and related materials, and construct both a physical and computer-generated model to accurately depict their design. Semifinalists deliver a presentation and participate in an interview.
2. **Chapter Team:** Participants take a parliamentary procedure test to qualify for the semifinal round of competition. Semifinalists conduct an opening ceremony, items of business, parliamentary actions, and a closing ceremony.
3. **Coding:** Participants take a test, which concentrates on aspects of coding, to qualify for the semifinal round of competition. Semifinalists develop a software program – in a designated amount of time – that accurately addresses an onsite problem.
4. **Computer-Aided Design (CAD), Architecture:** Participants use complex computer graphic skills, tools, and processes to respond to a design challenge in which they develop representations of architectural subjects, such as foundation and/or floor plans, and/or elevation drawings, and/or details of architectural ornamentation or cabinetry. The solution to the design challenge and participant answers in an interview are evaluated.
5. **Computer-Aided Design (CAD), Engineering:** Participants use complex computer graphic skills, tools, and processes to respond to a design challenge in which they develop three-dimensional representations of engineering subjects, such as a machine part, tool, device, or manufactured product. The solution to the design challenge and participant answers in an interview are evaluated.
6. **Data Science and Analytics:** Participants identify a societal issue, collect or compile data from various sources about the issue, and then produce documentation and a digital scientific poster about their findings. Semifinalists create a synopsis and digital visual representation of a data set provided in an onsite challenge.
7. **Digital Video Production:** Participants develop and submit a digital video and a documentation portfolio (including such items as a storyboard, script, summary of references and sources, and equipment list) that reflects the annual theme. Semifinalists participate in an interview.
8. **Drone Challenge (UAV):** Participants design, build, assemble, document, and test fly an open-source Unmanned Aerial Vehicle (UAV) according to the stated annual theme/problem specifications. The required documentation

portfolio must include elements such as a photographic log, wiring schematics, and a description of the programming software used. Semifinalists participate in an interview.

9. **Engineering Design:** Participants develop a solution to an annual theme that is based on a specific challenge noted by the National Academy of Engineering (NAE) in its compilation of the grand challenges for engineering in the 21st century. The solution will include a documentation portfolio, a display, and a model/prototype. Semifinalists deliver a presentation and participate in an interview.
10. **Future Technology Teacher:** Participants research a developing technology, prepare a video showing an application of the technology in the classroom, and create a lesson plan/activity that features the application and connects to the Standards for Technological and Engineering Literacy (STEL), as well as STEM initiatives and integration. Semifinalists demonstrate the lesson plan and answer questions about their presentation.
11. **Music Production:** Participants produce an original musical piece that reflects the annual theme on the TSA website under Themes & Problems. The quality of the musical piece and required documentation (including elements such as a plan of work, self-evaluation, and a list of hardware, software, and instruments used) determines advancement to the semifinal level of competition, during which semifinalist participants are interviewed.
12. **On Demand Video:** Once participants receive the challenge details (required criteria, such as props and a line of dialogue) at the national TSA conference, they have 36 hours to produce a 60-second film that showcases video skills, tools, and communication processes. The quality of the completed video production determines the finalists.
13. **Prepared Presentation:** Participants deliver a three-to-five-minute oral presentation related to the current national TSA conference theme. Both semifinalists and finalists are determined based on the quality of the presentation and the appropriate use and content of the accompanying required slide deck.
14. **Promotional Design:** Participants use computerized graphic communications layout and design skills to produce a promotional resource packet. The resource must address the annual theme/problem and include at least four printed publication items and required documentation. Semifinalists demonstrate publishing competency in an onsite technical design challenge.
15. **Software Development:** Participants use their knowledge of cutting-edge technologies, algorithm design, problem-solving principles, effective communication, and collaboration to design, implement, test, document, and present a software development project of educational or social value. Both semifinalists and finalists are determined based on the quality of the presentation and project.
16. **Structural Design and Engineering:** Participants apply the principles of structural engineering to design and construct a structure that complies with the annual challenge. An assessment of the required documentation and the destructive testing of the structure (to determine its design efficiency) determine both semifinalists and finalists.
17. **System Control Technology:** Participants develop a solution to a problem (typically one from an industrial setting) presented onsite at the conference. They analyze the problem, build a computer-controlled mechanical model, program the model, demonstrate the programming and mechanical features of the model-solution in an interview, and provide instructions for evaluators to operate the model.
18. **Technology Problem Solving:** Participants use problem-solving skills to design and construct a finite solution to a challenge provided onsite at the conference. Solutions are evaluated at the end of 90 minutes using measures appropriate to the challenge, such as elapsed time, horizontal or vertical distance, and/or strength.
19. **Virtual Reality Simulation (VR):** Participants use video and 3D computer graphics tools and design processes to create a two-to-three-minute VR visualization (accompanied by supporting documentation) that addresses the annual theme. Semifinalists deliver a presentation about their visualization and participate in an interview.
20. **Webmaster:** Participants design, build, and launch a website that addresses the annual challenge. Semifinalists participate in an interview to demonstrate the knowledge and expertise gained during the development of the website.

Appendix D: SkillsUSA Competition Crosswalk

	Units									
SkillsUSA Competition	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
3D Visualization Animation									X	
Advertising Design	X									
Architectural Drafting			X							
Career Pathways Business Management/Tech	X								X	X
Career Pathways Industrial Engineering Tech	X	X	X	X	X	X	X	X	X	X
Chapter Business Procedure										X
Commercial SUAS Drone						X				
Computer Programming							X			
Cyber Security	X						X	X		
Employment Application Process	X									X
Engineering Tech Design									X	
Extemporaneous Speaking										X
Information Tech Services		X	X	X		X	X	X	X	
Interactive Application/Video Game Development							X			
Internetworking		X	X	X	X	X	X	X		
IoT Smart Home						X				
Job Interview	X									X
Prepared Speech										X
Principles of Engineering Tech					X				X	
Quiz Bowl	X	X	X	X	X	X	X	X	X	X
Robotics Automation Tech							X			
Technical Computer Applications		X								
Technical Drafting					X					
Telecommunication Cabling			X			X				
Video Production	X									
Web Design/Develop						X			X	

National SkillsUSA Conferences High School Competitive Events

1. **3D Visualization and Animation:** The world of 3D is rapidly expanding, and career opportunities exist in a wide range of fields, including architecture, games, product and industrial design, civil engineering, and film and television animation. This competition allows students to step into a real-world 3D production environment where creative output must be accomplished within specific timeframes, resources, and design constraints. This is a two-person team event and includes a written exam. Competitors must produce high quality images and an animated short subject using computer-generated 3D images. Students are evaluated on their technical knowledge, production skills, and creative abilities, including visual development and storyboarding. Competitors can also interface with and get feedback from judges with successful careers in 3D visualization and animation.
2. **Advertising Design:** This competition tests technical skills and creative aptitude as though competitors worked for an advertising agency. In addition to a written test, competitors will recreate a provided advertisement on a computer. Competitors are judged on their accuracy, proficiency with industry software, and ability to meet a deadline. The competition also includes a creative portion. The creative portion involves the application of creative thinking and a design challenge. Layout, drawing, and illustration skills are used, as well as the ability to create vibrant, effective designs using a computer.
3. **Architectural Drafting:** Competitors will use their drafting skills to solve an architectural problem. The competition includes a written test, a hand sketch, and drawings that are either computer-generated or board drafted. The competition evaluates the competitors' problem-solving abilities, not simply CAD skills.
4. **Career Pathways – Business Management and Technology:** Student teams use their course of study as the basis of a project that will benefit their class, school, community or industry. The project must highlight an aspect of their

Career Cluster training. Upon completion of the project, the students will develop a display and use it within the community to explain their training and project. This competition will judge mastery of their training, its application, the project's benefit to their community, and display and presentation techniques. Teams must be entered in the appropriate Career Pathways - Business Management and Technology - based on the course enrollment of the students (not on the content of the project). The following career clusters are represented in this competition: Business Management and Administration; Finance; Information Technology; and Marketing.

5. **Career Pathways Industrial and Engineering Technology**: Student teams use their course of study as the basis of a project that will benefit their class, school, community or industry. The project must highlight an aspect of their Career Cluster training. Upon completion of the project, the students will develop a display and use it within the community to explain their training and project. This competition will judge mastery of their training, its application, the project's benefit to their community, and display and presentation techniques. Teams must be entered in the appropriate Career Pathways - Industrial and Engineering Technology based on the course enrollment of the students (not on the content of the project). The following career clusters are represented in this competition: Architecture and Construction; Manufacturing; Science, Technology, Engineering, and Mathematics; and Transportation Distribution and Logistics.
6. **Chapter Business Procedure:** Student teams demonstrate knowledge of parliamentary procedure in both a written exam and a team demonstration. The written exam covers questions related to materials found in Robert's Rules of Order—Newly Revised. During the presentation, the team will demonstrate the running of a typical business meeting using a standard order of business. During the presentation, the team must properly insert into the order of business the secretary's minutes, treasurer's report and business items identified by the technical committee. In addition to the debate and transaction of the business items, teams will also properly demonstrate different parliamentary procedure motions, including at least one of each of the following: main, privileged, subsidiary, incidental and motions that bring back issues to the floor. Minutes of the demonstration will be read by the secretary upon completion of the demonstration.
7. **Commercial sUAS Drone:** (Team of 2) This competition is designed to evaluate team members' skills and preparation for employment in multiple career fields related to the safe and efficient use of drone technology in the National Airspace System and to recognize outstanding performance by participants in real-world, scenario-based situations.
8. **Computer Programming:** Competitors demonstrate knowledge of computer programming, describe how programs and programming languages work, and describe the purposes and practices of structured programming. The competition may include a computer programming problem consisting of background information and program specifications. An appropriate (successfully executable) computer program from design notes and instructions will be developed.
9. **Cyber Security:** The competition is open to active SkillsUSA members enrolled in programs with Cyber Security, Information Security, or Systems and Networking Security Architecture as occupational objectives. Students will be tested on the elements of the NIST Publication 800-181 Cybersecurity Workforce Framework categories including Securely Provision, Operate and Maintain, and Protect and Defend. This competition's skill performance stations are created to be part of a "scouting combine" where teams will demonstrate a wide range of skillsets needed in Cyber Security industry. This scouting combine will assess a team's knowledge and skills in a series of individual stations that will be totaled to determine the team's overall score.
10. **Employment Application Process:** This competition tests the competitor's readiness in applying for employment and their understanding of the process. The competition includes completing an application and interviewing with the judges. Their resume and portfolio are used during their interviews. The competition is available to students who are classified under the provisions of Public Law 105-17, Individuals with Disabilities Education Act, 1997.
11. **Engineering Technology – Design (includes Middle School):** (Team of 3) Students demonstrate their ability to design an innovative engineering project and present those ideas along with a display and live model. During the presentation, students are judged on their performance as a professional team, presentation of their project to a panel of judges from the engineering field, their storyboard presentation model, and the overall effect of the presentation.
12. **Extemporaneous Speaking (includes Middle School):** The competition requires competitors to give a three- to five-minute speech on an assigned topic with five minutes of advance preparation. Competitors enter the preparation area one at a time, where they are given a speech topic. They are judged on voice, mechanics, platform deportment, organization, and effectiveness.
13. **Information Technology Services:** Competitors demonstrate their skills with hands-on modules designed to test their knowledge as an IT service professional. The competition challenges competitors to correct end-user computing issues, configure and secure networks, manage virtual machines, navigate and modify operating system internals, deploy operating systems, leverage troubleshooting software and tools, identify virus and malware origins, work with mobile devices, and proficiently use command line interfaces. The operating systems used in the

competition include Windows, Macintosh, and Linux. Additionally, competitors are evaluated on their interpersonal skills (such as communication, teamwork, and professionalism). Competitors will take a written exam which is aligned with CompTIA A+; the industry standard certification for Information Technology.

14. **Interactive Application and Video Game Development:** The competition is a two-person team event that tests technical knowledge and production skills, including critical thinking, creative problem solving, teamwork, interpersonal and visual communication, artistic design, and technical programming. Teams must produce an original prototype or sample of an interactive application or video game with at least one level and ten (10) minutes of interactive content. It must be created during the school year immediately preceding the competition deadline.
15. **Internetworking:** The competition tests the networking knowledge and hands-on ability of the competitors. The online written portion tests the student's complete knowledge of internetworking concepts. The hands-on component demonstrates the abilities of the competitor to make cables, troubleshoot network systems, configure routers, switches and servers, and to deliver customer service in a technical assistant center environment. The competitors will find errors in WAN and LAN networks; do a full network configuration using routers, switches, and servers; talk a technician through an error they are having on their network; and take an online certification-type test. The national competition is based on the most current CCNA certification. In today's job market system administration skills are needed, therefore server skills that will be scored include, but are not limited to DNS, Active Directory, and DHCP.
16. **Internet of Things (IOT) Smart Home:** The competition tests each competitor's preparation for employment and recognizes outstanding students for excellence and professionalism in the field of home technology integration. The competitors will complete both a written test and hands on demonstration of the installation of "smart home" residential products including bulbs; thermostats; locks; alarms; sensors; cameras; speakers; home theater systems; computer networking; and video security equipment. Construction of the various interconnecting cables such as cat 6/networking cables, coax cables and low and high voltage residential wiring will also be necessary. The competition will challenge competitors to configure and secure networks, update firmware/software and configure operating system settings. Troubleshooting skills will also be tested. Finally, the competition requires a demonstration of all hardware software set up, completed in an easy-to-understand manner fit for the typical customer.
17. **Job Interview:** Competitors are evaluated on their understanding of employment procedures faced in applying for positions in the occupational areas in which they are training. The competition is divided into phases, including the following: completion of employment application; introduction scenario with a receptionist; and an in-depth interview(s).
18. **Prepared Speech (includes Middle School):** The competition requires students to deliver a five- to seven-minute prepared speech based on the annual SkillsUSA competition theme. Competitors are evaluated on their ability to present thoughts relating to the central theme clearly and effectively, and are rated on voice, mechanics and platform deportment.
19. **Principles of Engineering – Technology:** The competition evaluates competitors' understanding of basic technical concepts and principles of the applied sciences and their ability to demonstrate and explain the concept/principle in action and application. Any technical concept may be demonstrated, provided it is related to the principles of technology or engineering curriculum and incorporates basic principles of the applied sciences.
20. **Quiz Bowl:** The Quiz Bowl competition tests a team of five to seven competitors on their ability to quickly respond to knowledge questions covering academics, current events
21. **Robotics and Automation Technology:** In this competition, two-person teams will showcase their skills in designing and implementing an automated robotic work cell. Each team will be presented with a simulated task and accompanying wiring schematics. Using industry-standard best practices, participants must integrate a 6-axis industrial robot with a range of peripherals, including Programmable Logic Controllers (PLCs), motorized components, sensors, and machine vision systems. Teams are required to document their approach, configure and program the work cell, and present their solution to a panel of judges. Performance is evaluated based on technical accuracy, operational efficiency, speed, and collaboration.
22. **Technical Computer Applications:** Competitors will demonstrate installation, configuration and use of Windows, Mac OSX and Linux Professional Operating Systems and one or more integrated office suite packages including email, word processing, spreadsheet applications, database applications, web page development, money management applications, presentations applications, internet browser applications, etc. The use of open-source software such as OpenOffice is preferable. Microsoft Office and other integrated office suites can be used. The utilization of instant messaging, collaboration and social networking software will be required during the contest. Competitors are expected to perform in teams while demonstrating individual technical skills. The competition includes an oral presentation demonstrating the student's ability to communicate with others, a hands-on skills demonstration and a written examination.

23. **Video Production:** (Team of 2) Competitors are required to plan and shoot a video (generally 30 seconds or one minute in length) on location to convey the theme of the event. Editing is done in the competition area with special emphasis on professional production of the video by industry standards, quality of audio and video and adequate conveyance of the theme to the viewer of the final piece.
24. **Technical Drafting:** The competition evaluates a competitor's preparation for employment and recognizes outstanding students for excellence and professionalism in the field of technical drafting. The competition will focus on the solution of industry-developed problems by applying appropriate technical drafting skills and tools including computer-aided drafting (CAD).
25. **Telecommunications** Cabling**:** This competition is intended for students interested in voice and data network cabling and installation. Industry indicates that 80% of the problems in networking, security systems installations and other installations are caused by cabling and connectivity issues, not the computers, servers, switches, etc. This competition tests students' knowledge of worldwide industry standards related to cabling and connectorization, which involves attaching physical connectors to the ends of cables, fibers, or other components, for data and voice connections, physical and logical networks and signal transmission. Competitors demonstrate skills in fiber and copper cable termination, pulling and mounting cabling, patch panel installation and termination, installing jacks, cable and fiber optic testing and troubleshooting, and providing customer service. The competition stresses safety in all activities.
26. **Web Design and Development:** (Team of 2) Teams complete a series of challenges focusing on creating a website for a client and a specific target audience. Judging will focus on meeting the client's needs, usability and accessibility, and industry-standard best practices. Teams will also be evaluated on the process they use to meet the challenges and how well they work as a team. Teams will need Internet access as all competition materials (including the coding environment) will only be available online.

Appendix E: CompTIA CertMaster Learn Network+

	Units									
Standards	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
1.1		X	X							
1.2			X	X	X					
1.3									X	
1.4		X			X					
1.5			X							
1.6		X								
1.7					X	X				
1.8									X	
2.1					X					
2.2				X						
2.3						X				
2.4			X							
3.1							X			
3.2							X			
3.3							X			
3.4					X	X				
3.5						X				
4.1								X		
4.2								X		
4.3								X		
5.1		X								
5.2			X							
5.3							X	X		
5.4				X	X					
5.5					X	X		X		

CompTIA CertMaster Learn Network+ - N10-009 Exam Objective Standards

1. **Networking Concepts**
   1. Explain concepts related to the Open Systems Interconnection (OSI) reference model.
   2. Compare and contrast networking appliances, applications, and functions.
   3. Summarize cloud concepts and connectivity options.
   4. Explain common networking ports, protocols, services, and traffic types.
   5. Compare and contrast transmission media and transceivers.
   6. Compare and contrast network topologies, architectures, and types.
   7. Given a scenario, use appropriate IPv4 network addressing.
   8. Summarize evolving use cases for modern network environments.
2. **Networking Implementation**
   1. Explain characteristics of routing technologies.
   2. Given a scenario, configure switching technologies and features.
   3. Given a scenario, select and configure wireless devices and technologies.
   4. Explain important factors of physical installations.
3. **Networking Operations**
   1. Explain the purpose of organization processes and procedures.
   2. Given a scenario, use network monitoring technologies.
   3. Explain disaster recovery (DR) concepts.

4. Given a scenario, implement IPv6 network services.
5. Compare and contrast network access and management methods.

4. **Networking Security**
    1. Explain the importance of basic network security concepts.
    2. Summarize various types of attacks and their impact to the network.
    3. Given a scenario, apply network security features, defense techniques, and solutions.
5. **Networking Troubleshooting**
    1. Explain the troubleshooting methodology.
    2. Given a scenario, troubleshoot common cabling and physical interface issues.
    3. Given a scenario, troubleshoot common issues with network services.
    4. Given a scenario, troubleshoot common performance issues.
    5. Given a scenario, use the appropriate tool or protocol to solve networking issues.