GeorgiaStandards.Org
GATEWAY TO EDUCATION & PROFESSIONAL RESOURCES
One Stop Shop For Teachers

Program Concentration: **Business & Computer Science**
Career Pathway: **Computer Networking**
Course Title: **Networking Systems**

Course Description: This course is designed to provide students with the background necessary to understand the local area networking information on workstations and networking. It also is designed to prepare students to successfully complete Comp Tia Net+, Cisco's CCNT & CCNA, and Networking Essentials exams. The course serves as a general introduction for students who need a foundation in current networking technology for local area networks (LANs), wide area networks (WANs), and the Internet. It includes text-based study material, simulation lab exercises, and demonstrations so students can do networking tasks that reinforce the information in the text.

INTRODUCTION TO NETWORKING

Students should know the processes involved in designing, implementing, upgrading, managing, and otherwise working with networks and network technologies. Students should begin the study through identifying networking terms as simple concepts which will prepare for a more comprehensive understanding of networking.

BCS-NTS-1. Students will explore local-area network (LAN), metropolitan area network (MAN), and wide-area (WAN) trends and issues including the basics of telecommunications and use in the interconnection of networks.

   a. Explain the advantages and disadvantages of a network system.
   b. Identify the three major network classifications: LAN, MAN, and WAN.
   c. Identify the basic network topologies.
   d. Compare and contrast a peer-to-peer network with a client/server network.
   e. Describe how data is packaged and transmitted.
   f. Explain the purpose of a protocol.
   g. List the common networking protocols.
   h. Explain the purpose of general network devices such as a hub, repeater, switch, and gateway.
   i. Identify the major standards organizations.
   j. Identify and explain the purpose of the IEEE 802 standards.
   k. List and explain the purpose of each OSI layer.

Academic Standards:
MM2P4 Students will make connections among mathematical ideas and to other disciplines.

ELA10RL5 The student understands and acquires new vocabulary and uses it correctly in reading and writing.

ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

NETWORK MEDIA – COPPER CORE, FIBER-OPTIC, WIRELESS

Students should be able to list the characteristics of the IEEE 802.3 (Ethernet), 802.5 (token ring), 802.3 (fiber-optic), and 802.11 (wireless) standards. Students should know the type of cables, connectors, speed, topology, cable lengths, and access methods. Students should be able to configure a wireless network card and view all configuration properties.

BCS-NTS-2. Students will demonstrate knowledge of LAN physical media and knowledge of network connectivity basics.

    a.   Match the five forms of electronic signals to the media types on which they travel.
    b.   Describe the major differences between an analog and a digital signal.
    c.   Describe the two methods of data transmission: Broadband and Baseband.
    d.   Define simplex, half-duplex, and full-duplex communication.
    e.   Define electronic terms such as impedance, reflected loss, and crosstalk.

BCS-NTS-3. Students will demonstrate knowledge of the basics of Ethernet and Token Ring technology.

    a.   List the characteristics of the 802.3 classifications.
    b.   List the characteristics of the 802.5 classifications.
    c.   Describe the various types of wiring faults.

BCS-NTS-4. Students will demonstrate knowledge of the basics of token bus, Fiber Distributed Data Interface (FDDI), and Wireless LAN technology.

    a.   List the advantages of fiber-optic cable as compared to copper core cable.
    b.   Explain the properties of light associated with fiber-optic cable.
    c.   Describe the characteristics of fiber-optic cable transmission.
    d.   Describe the difference between multimode and single-mode fiber-optic cable.
    e.   List the characteristics and specifications of the IEEE 802.3 fiber-optic standards.
    f.   List the characteristics and specifications of the FDDI standard.
    g.   Describe the principles of radio wave transmission.
    h.   Describe the three transmission techniques used in radio wave-based transmission.
    i.   Identify the characteristics of the U-NII classifications.
    j.   Identify the key characteristics of the IEEE 802.11 wireless networking standards.
    k.   Describe the CSMA/CA access method.
    l.   Identify the key characteristics of the Bluetooth standard.
    m. Explain how cellular technology works.
    n.   Describe the two types of microwave networks.
    o.   Describe the two types of infrared transmission.
    p.   List the advantages and disadvantages of wireless networking.
    q.   Explain the purpose of the SSID.
    r.   Explain how security is provided in wireless networks.

Academic Standard:
ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

NETWORK OPERATING SYSTEMS
Students should have a thorough understanding of how network technology accesses the network media. Students should be knowledgeable of the interoperability between differing network operating systems. Students should develop a basic understanding of how to log on to various operating systems.

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BCS-NTS-5. Students will demonstrate knowledge of the general characteristics of network operating systems and knowledge of common network computing platforms.

a. Describe the common traits of all major network operating systems.
b. Describe the purpose of the data link layer of the OSI model.
c. Explain the principle of Ethernet communication.
d. Explain the principle of AppleTalk communication.
e. Explain the principle of Token Ring communication.
f. Explain the principle of Token Bus communication.
g. Explain the principle of ARCnet communication.
h. Describe the function of NetBIOS.
i. Describe the function of NetBEUI.

BCS-NTS-6. Students will demonstrate knowledge of network applications and knowledge of network operating systems (i.e., Windows NT, LINUX, Appletalk). Students will install basic system architectures using current windows operating system software and will perform network administration.

a. Identify the major differences between a Microsoft peer-to-peer network and a Microsoft client/server network.
b. Discuss the differences between FAT16, NTFS4.0, and NTFS5.0.
c. Describe the Windows NT domain model.
d. Explain the Windows NT authentication process.
e. Describe the Windows 2000 Server and Windows Server 2003 Active Directory structure.
f. Explain the Active Directory authentication process.
g. Explain the purpose of the Microsoft Management Console (MMC).
h. Explain how a domain user and group account is set up in Active Directory.
i. Explain the ways to obtain interoperability between clients and servers in networks with different network operating systems.
j. Describe the major features in the UNIX/Linux operating system.
k. Describe the file systems associated with Linux.
l. Compare and contrast the file system structure of UNIX with other common file system structures.
m. Define the file and directory permissions used with the Linux file system.
n. Explain how UNIX/Linux can establish communications with a Microsoft operating system.

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TCP/IP ESSENTIALS
Students will explore the key features and importance of the TCP/IP model for standards in communication over computer networks. Extensive knowledge of how IP addresses function in a network system is crucial to the study of networks. Students should have a solid grasp of the relationship of IP addresses and subnet mask as well as the common command line utilities, such as **ping**, **tracert**, **nbstat**, **ipconfig**, and **winipcfg**. Students should be able to explain how WINS, DNS, DHCP, and APIPA services function in a network

BCS-NTS-7. Students will explore the standard computer network communication protocol TCP/IP and its importance to standards based networks.

a. Explain the differences between IPv4 and IPv6.
b. Explain the purpose and operation of the Network Address Translation (NAT) protocol.
c. Determine the IP address and subnet mask on a workstation.

d. Explain the purpose and operation of the Domain Name System (DNS).
e. Describe how UDP, TCP, and IP relate to the OSI model.
f. Explain the purpose and operation of the Windows Internet Naming Service (WINS).
g. Explain the purpose and operation of the Dynamic Host Configuration Protocol (DHCP).
h. Identify an Automatic Private IP Addressing (APIPA) address.
i. Interpret the displays of TCP/IP troubleshooting utilities.

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SUB-NETTING FUNDAMENTALS
Students should know how to access TCP/IP properties for all major operating systems. Students should also know how to identify a network class by looking at the first octet of an IPv4 IP address. The numeric value range of the first octet is how the network is classified.

BCS-NTS-8. Students will explore the concept of sub-netting and its importance to standards based networks.

a. Count using the binary number system.
b. Calculate a specific subnet mask needed for a set of conditions.
c. Identify subnet network characteristics by inspecting the subnet mask.
d. Explain the purpose, advantages, and disadvantages of sub-netting.
e. Explain the characteristics and purpose of a Virtual LAN (VLAN).

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NETWORK SECURITY
Students should pay particular attention to the subject of passwords and password best practices. Students should also know port numbers are also a source of questions.

BCS-NTS-9. Students will explore the concepts related to computer network and host based security. Students will design network security systems.

a. Identify common network security breaches and vulnerabilities.
b. Explain the difference between symmetrical and asymmetrical encryption.
c. Explain the role of a Certificate Authority (CA).
d. Explain the security process associated with the Challenge Handshake Access Protocol (CHAP).
e. Describe the characteristics of a secure password.
f. Describe how a firewall and proxy server are used to secure network access.
g. Describe how to monitor network activities.
h. Design network security protocol system.

Academic Standards:
ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

ELA10W2 The student demonstrates competence in a variety of genres.

ELA10W3 The student uses research and technology to support writing.

ELA10LSV1The student participates in student-to-teacher, student-to-student, and group verbal interactions.

OSI MODEL
Students should be able to compare and contrast the different processes, services, and protocols as outlined through the OSI systems model.

BCS-NTS-10. Students will be able to differentiate processes, services, and protocols. Students will demonstrate knowledge of the Open Systems Interconnection (OSI) standard (ISO Standard 7498) and knowledge of communications standards for networks.

a. Compare the OSI model to the DoD/TCP/IP model.
b. Describe the function of the IEEE logical link control (LLC) and the media access control (MAC) sublayers.
c. Compare various network hardware to the OSI model.
d. Explain the function of each layer of the OSI model.
e. Compare various IEEE standards to the OSI model.
f. Describe the encapsulation process.
g. Compare the TCP/IP protocol suite to the OSI model.
h. Compare the IPX/SPX protocol suite to the OSI model.
i. Compare the AppleTalk protocol suite to the OSI model.

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DESIGNING, INSTALLING, MAINTAINING, AND TROUBLESHOOTING COMPUTER NETWORKS
Students should be able to design, install, maintain, and troubleshoot a computer network for use in a SOHO to medium business environment.

BCS-NTS-11. Students will demonstrate knowledge of design standards, analysis and section for networks.

a. Describe the factors to be considered when designing or modifying a network.
b. Describe methods used for naming conventions.
c. Explain the various stages of network design.
d. Identify and explain terminology used by standards to identify network cable connection locations.
e. Describe the various facilities used in a telecommunications infrastructure.

Academic Standard:
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BCS-NTS-12. Students will demonstrate knowledge of installation procedures.

a. Explain the various stages of network design and installation.
b. Identify and explain terminology used by standards to identify network cable connection locations and addressing schemes.
c. Describe the various facilities used in a telecommunications infrastructure.

Academic Standard:
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BCS-NTS-13. Students will demonstrate knowledge of computer network operation and management procedures including network maintenance and diagnostic testing.

a. Explain why a baseline is established.
b. Describe how to perform a baseline.
c. Explain the purpose and proper procedure for installing patches, upgrades, and service packs.
d. Describe the commonly accepted practices for protecting data.
e. Explain fault tolerance.
f. Describe server data backup strategies.
g. Explain the purpose of an Uninterruptible Power Supply (UPS).
h. List commonly accepted antivirus procedures and policies.

Academic Standard:
ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

BCS-NTS-14. Students will demonstrate knowledge in troubleshooting network problems.

a. Explain the CompTIA troubleshooting strategies.
b. Determine the best course of action to remedy a network problem.
c. Describe in detail the boot sequence for Microsoft NT–based and Windows 98 workstations.
d. Determine if the problem is user-, hardware-, or software-generated.
e. List the most common network problems encountered.
f. Describe how event logs are used to assist with troubleshooting the network.
g. Describe common TCP/IP utilities and explain their use as applied to troubleshooting networks.

Academic Standard:
ELA10RC3 The student acquires new vocabulary in each content area and uses it correctly.

Reading Across the Curriculum

Reading Standard Comment
After the elementary years, students engage in reading for learning. This process sweeps across all disciplinary domains, extending even to the area of personal learning. Students encounter a variety of informational as well as fictional texts, and they experience text in all genres and modes of discourse. In the study of various disciplines of learning (language arts,

mathematics, science, social studies), students must learn through reading the communities of discourse of each of those disciplines. Each subject has its own specific vocabulary, and for students to excel in all subjects, they must learn the specific vocabulary of those subject areas in *context*.

Beginning with the middle grades years, students begin to self-select reading materials based on personal interests established through classroom learning. Students become curious about science, mathematics, history, and literature as they form contexts for those subjects related to their personal and classroom experiences. As students explore academic areas through reading, they develop favorite subjects and become confident in their verbal discourse about those subjects.

Reading across curriculum content develops both academic and personal interests in students. As students read, they develop both content and contextual vocabulary. They also build good habits for reading, researching, and learning. The Reading Across the Curriculum standard focuses on the academic and personal skills students acquire as they read in all areas of learning.

CTAE-RC-1 Students will enhance reading in all curriculum areas by:
Reading in All Curriculum Areas
-Read a minimum of 25 grade-level appropriate books per year from a variety of subject disciplines and participate in discussions related to curricular learning in all areas.
-Read both informational and fictional texts in a variety of genres and modes of discourse.
-Read technical texts related to various subject areas.

Discussing Books
-Discuss messages and themes from books in all subject areas.
-Respond to a variety of texts in multiple modes of discourse.
-Relate messages and themes from one subject area to messages and themes in another area.
-Evaluate the merit of texts in every subject discipline.
-Examine author's purpose in writing.
-Recognize the features of disciplinary texts.

Building Vocabulary Knowledge
-Demonstrate an understanding of contextual vocabulary in various subjects.
-Use content vocabulary in writing and speaking.
-Explore understanding of new words found in subject area texts.

Establishing Context
-Explore life experiences related to subject area content.
-Discuss in both writing and speaking how certain words are subject area related.
-Determine strategies for finding content and contextual meaning for unknown words.

CTAE Foundation Skills

The Foundation Skills for Career, Technical and Agricultural Education (CTAE) are critical competencies that students pursuing any career pathway should exhibit to be successful. As core standards for all career pathways in all program concentrations, these skills link career, technical and agricultural education to the state's academic performance standards.

The CTAE Foundation Skills are aligned to the foundation of the U. S. Department of Education's 16 Career Clusters. Endorsed by the National Career Technical Education Foundation (NCTEF) and the National Association of State Directors of Career Technical Education Consortium (NASDCTEc), the foundation skills were developed from an analysis of all pathways in the sixteen occupational areas. These standards were identified and validated by a national advisory group of employers, secondary and postsecondary educators, labor associations, and other stakeholders. The Knowledge and Skills provide learners a broad foundation for managing lifelong learning and career transitions in a rapidly changing economy.

CTAE-FS-1 Technical Skills: Learners achieve technical content skills necessary to pursue the full range of careers for all pathways in the program concentration.

CTAE-FS-2 Academic Foundations: Learners achieve state academic standards at or above grade level.

CTAE-FS-3 Communications: Learners use various communication skills in expressing and interpreting information.

CTAE-FS-4 Problem Solving and Critical Thinking: Learners define and solve problems, and use problem-solving and improvement methods and tools.

CTAE-FS-5 Information Technology Applications: Learners use multiple information technology devices to access, organize, process, transmit, and communicate information.

CTAE-FS-6 Systems: Learners understand a variety of organizational structures and functions.

CTAE-FS-7 Safety, Health and Environment: Learners employ safety, health and environmental management systems in corporations and comprehend their importance to organizational performance and regulatory compliance.

CTAE-FS-8 Leadership and Teamwork: Learners apply leadership and teamwork skills in collaborating with others to accomplish organizational goals and objectives.

CTAE-FS-9 Ethics and Legal Responsibilities: Learners commit to

work ethics, behavior, and legal responsibilities in the
workplace.

CTAE-FS-10 Career Development: Learners plan and manage
academic-career plans and employment relations.

CTAE-FS-11 Entrepreneurship: Learners demonstrate understanding of
concepts, processes, and behaviors associated with
successful entrepreneurial performance.