



## Scope and Sequence Curriculum Outline

**Career Program:** Information Technology II

**DOE Code:** 5234

**Career Cluster:** Information Technology

**Recommended Grade Levels:** 12

**Prerequisites:** Information Technology I

**High School Credits:** 3 per semester (6 total per school year)

**Additional Information:** Counts as a Directed Elective or Elective for the General, Core 40, Academic Honors and Technical Honors diplomas

**Program Description:** Networking Fundamentals introduces students to concepts of local and wide area networks, home networking, networking standards using the IEEE/OSI model, network protocols, transmission media, and network architecture/topologies. Security and data integrity will be introduced and emphasized throughout this program. The purpose of this program is to offer students the critical information needed to successfully move into a role as an IT professional supporting networked computers. Concepts covered will include TCP/IP client administration, planning a network topology, configuring the TCP/IP protocol, managing network clients, configuring routers and hubs, and creating wireless LANs. Upon completing the program, students continue their education at the postsecondary level in both 2 and 4-year degree programs and enter employment in computer technology and support businesses.

**Alignment:** Indiana Department of Education Academic Standards Course Framework; CompTIA Network+, MTA 98-366, and TestOut Network Pro certification; Ivy Tech Community College and Vincennes University (dual credit agreements); and *Authorized Cert Guide CompTIA Network+* (Pearson) and *Mike Meyers Managing and Troubleshooting Networks Lab Manual* curriculum materials (McGraw-Hill)

**Companion Documents:** WCC Information Technology II Program Syllabus; WCC High School Pathway Plan; WCC Program Description Guide

### Curriculum Content Summary:

- Networking Technologies
- Network Media and Topologies
- Network Devices
- Network Security
- Network Tools
- Network Management
- Advanced Network Operating Systems
- Employability and Operational Procedures
- Problem Analysis/Software Tools/Algorithm

Content	Indiana DOE Standards	Knowledge & Skills <small>(based on instructional materials)</small>	Example Activities	Time Frame	Evaluation / Certification
<p><b>DOMAIN</b> Networking Technologies</p> <p><b>Core Standard I</b> Students validate network configuration, connectivity, and interoperability for managing successful networks</p>	<p><b>NET-1.1</b> Select the appropriate TCP/IP utility when given a troubleshooting scenario</p> <p><b>NET-1.2</b> Select the appropriate NIC and network configuration settings when given a network Configuration</p> <p><b>NET-1.3</b> Configure the connection for a remote connectivity scenario</p> <p><b>NET-1.4</b> Identify the basic capabilities of server operating systems such as UNIX/Linux, Netware, Windows, and Macintosh</p> <p><b>NET-1.5</b> Identify the basic characteristics of WAN technologies</p> <p><b>NET-1.6</b> Identify the purpose of network services</p> <p><b>NET-1.7</b> Define the function of TCP/UDP ports; Identify well-known ports</p> <p><b>NET-1.8</b> Define the purpose, function and/or use of all the protocols with in the TCP/IP suite</p> <p><b>NET-1.9</b> Differentiate between network protocols in terms of routing, addressing schemes, interoperability, and naming conventions</p>	<ul style="list-style-type: none"> <li>• Identify the purpose of a network</li> <li>• Identify network components</li> <li>• Discover how networks are defined by geography</li> <li>• Discover how networks are defined by topology</li> <li>• Discover how networks are defined by resource location</li> <li>• Identify three categories of wide-area network (WAN) connections</li> <li>• Identify how data rates are measured on various WAN technologies</li> <li>• Identify types of media (or wireless technologies) might be used in WAN connections</li> <li>• Identify the characteristics of the different WAN technologies</li> </ul>	<ul style="list-style-type: none"> <li>• Mike Meyer’s lab manual</li> <li>• Network Pro Labsim</li> <li>• Vocabulary terms</li> </ul>	<p>3 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Network+ Guide chapter review questions</li> <li>• Network+ Guide chapter tests</li> <li>• TestOut Network Pro labs and certification</li> <li>• Dual credit</li> <li>• Weekly participation</li> </ul>

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<p><b>DOMAIN</b> Network Media and Topologies</p> <p><b>Core Standard 2</b> Students apply and adapt appropriate network media and topologies to maintain a functional network</p>	<p><b>NET-2.1</b> Identify the cause of the problem when given a network-troubleshooting scenario involving a wiring/infrastructure problem and its location in relation to the ISO layers</p> <p><b>NET-2.2</b> Identify the network area effected and the cause of the problem for a troubleshooting scenario involving a network with a particular physical topology and including a network diagram</p> <p><b>NET-2.3</b> Identify the cause of the failure in troubleshooting scenario involving a small office/home office network failure</p> <p><b>NET-2.4</b> Select the appropriate NIC and network configuration settings when given a network Configuration</p> <p><b>NET-2.5</b> Identify the differences between public vs. private networks</p> <p><b>NET-2.6</b> Choose the appropriate media type and connectors to add a client to an existing network</p> <p><b>NET-2.7</b> Recognize and identify media connectors and components of wiring distribution systems including description of their uses</p> <p><b>NET-2.8</b> Specify the characteristics of the various networking media types</p> <p><b>NET-2.9</b> Specify the main features of 802.3 (Ethernet), 802.11a/b/g/n (wireless), and FDDI networking technologies</p> <p><b>NET-2.10</b> Compare and contrast different wireless standards. 802.11 a/b/g/n MIMO, Channel bonding, Frequency, Latency, Speed and distance</p> <p><b>NET-2.11</b> Categorize WAN technology types and properties</p>	<ul style="list-style-type: none"> <li>• Identify the characteristics of various media types</li> <li>• Understand the role of a given network infrastructure component</li> <li>• Understand the features that are provided by specified specialized network devices</li> <li>• Identify virtualization technologies impacting traditional corporate data center designs</li> <li>• Understand some of the primary protocols and hardware components found in a Voice over IP (VoIP) network</li> <li>• Identify the elements in a structured troubleshooting model</li> <li>• Understand common physical layer troubleshooting issues</li> <li>• Identify potential Layer 2 issues when troubleshooting a network containing Ethernet switches</li> <li>• Identify what Layer 3 troubleshooting issues are common in a routed network</li> <li>• Identify the characteristics that are unique to wireless networks and impact the troubleshooting of a network containing wireless access points</li> </ul>	<ul style="list-style-type: none"> <li>• Mike Meyer’s lab manual</li> <li>• Network Pro Labsim</li> <li>• Vocabulary terms</li> </ul>	<p>3 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Network+ Guide chapter review questions</li> <li>• Network+ Guide chapter tests</li> <li>• TestOut Network Pro labs and certification</li> <li>• Dual credit</li> <li>• Weekly participation</li> </ul>

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<p><b>DOMAIN</b> Network Devices</p> <p><b>Core Standard 3</b> Students integrate devices into networks to effect network communications</p>	<p><b>NET-3.1</b> Determine the nature of the problem for a network scenario when given visual indicators</p> <p><b>NET-3.2</b> Identify the main characteristics of network attached storage</p> <p><b>NET-3.3</b> Identify the basic capabilities of client workstations</p> <p><b>NET-3.4</b> Identify the purpose of sub-netting and default gateways</p> <p><b>NET-3.5</b> Identify IP addresses (Ipv4, Ipv6) and their default subnet masks</p> <p><b>NET-3.6</b> Identify the purpose, features and functions of network components</p> <p><b>NET-3.7</b> Recognize logical or physical network topologies given a schematic diagram or description</p>	<ul style="list-style-type: none"> <li>• Understand how decimal numbers are represented in binary format</li> <li>• Understand the format of an IPv4 address</li> <li>• Understand the distinctions between unicast, broadcast, and multicast addresses</li> <li>• Discover which options are available for assigning IP addresses to networked devices</li> <li>• Understand how to determine the appropriate subnet mask for a network</li> <li>• Identify the primary characteristics of IPv6</li> <li>• Identify how source and destination IP address are used to route traffic</li> <li>• Understand how sources for routing information are used to populate a router's routing table</li> <li>• Understand how routed protocols differ from routing protocols</li> <li>• Identify how to reach a destination network and which route is chosen</li> <li>• Identify how the preferred path(s) are chosen</li> <li>• Understand the difference between IGP and EGP</li> <li>• Understand the primary differences between distance vector and link state routing protocols</li> <li>• Identify the characteristics of RIP, OSPF, IS-IS, EIGRP, and BGP protocols</li> <li>• Understand how NAT preforms IP address translation</li> <li>• Understand how PAT, SNAT, and DNAT approaches to NAT differ</li> <li>• Discover what protocols are used to route multicast traffic</li> </ul>	<ul style="list-style-type: none"> <li>• Mike Meyer's lab manual</li> <li>• Network Pro Labsim</li> <li>• Vocabulary terms</li> <li>• IP addressing and subnetting workbook</li> </ul>	<p>5 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Network+ Guide chapter review questions</li> <li>• Network+ Guide chapter tests</li> <li>• TestOut Network Pro labs and certification</li> <li>• Weekly participation</li> <li>• Dual credit</li> </ul>

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<p><b>DOMAIN</b> Network Security</p> <p><b>Core Standard 4</b> Students Integrate security in the design and management of networks</p>	<p><b>NET-4.1</b> Identify the purpose and characteristics of disaster recovery</p> <p><b>NET-4.2</b> Identify security protocols and describe their purpose and function</p> <p><b>NET-4.3</b> Define the function of remote access protocols and services</p> <p><b>NET-4.4</b> Given a scenario, implement appropriate wireless security measures</p> <p><b>NET-4.5</b> Explain the methods of network access security</p> <p><b>NET-4.6</b> Explain methods of user authentication</p> <p><b>NET-4.7</b> Explain common threats, vulnerabilities, and mitigation techniques</p> <p><b>NET-4.8</b> Given a scenario, install and configure a basic firewall</p> <p><b>NET-4.9</b> Categorize different types of network security appliances and methods</p>	<ul style="list-style-type: none"> <li>• Identify the goals of network security and what sorts of attacks to defend against</li> <li>• Describe the best practices that can be implemented to defend against security threats</li> <li>• Identify the characteristics of various remote-access security technologies</li> <li>• Understand how firewalls can be used to protect an organization’s internal network, while allowing connectivity to an untrusted network</li> <li>• Understand how virtual private networks (VPN) can be used to secure traffic as that traffic flows over an untrusted network</li> <li>• Define the difference between intrusion prevention and intrusion detection systems, and how they protect an organization from common security threats</li> </ul>	<ul style="list-style-type: none"> <li>• Mike Meyer’s lab manual</li> <li>• Network Pro Labsim</li> <li>• Vocabulary terms</li> </ul>	<p>4 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Network+ Guide chapter review questions</li> <li>• Network+ Guide chapter tests</li> <li>• TestOut Network Pro labs and certification</li> <li>• Weekly participation</li> <li>• Dual credit</li> </ul>

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<p><b>DOMAIN</b> Network Tools</p> <p><b>Core Standard 5</b> Students validate concepts of networking tools to manage and implement networks</p>	<p><b>NET-5.1</b> Use the appropriate tool for a given a wiring task</p> <p><b>NET-5.2</b> Identify the purpose, benefits and characteristics of using a proxy</p> <p><b>NET-5.3</b> Predict the impact of a particular security implementation on network functionality when given a wiring task</p> <p><b>NET-5.4</b> Given a scenario, use the appropriate network monitoring resource to analyze traffic</p> <p><b>NET-5.5</b> Describe the purpose of configuration management documentation</p> <p><b>NET-5.6</b> Explain different methods and rationales for network performance optimization</p>	<ul style="list-style-type: none"> <li>• Understand why high availability is a requirement in today’s network designs, and what mechanisms can help provide that high availability</li> <li>• Identify various technology optimize network performances</li> <li>• Identify which QoS mechanisms can help with network performance</li> <li>• Identify some of the more common tools used to physically maintain a network</li> <li>• Identify which components are involved in configuration management</li> <li>• Understand which networking tools are available to network administrators</li> <li>• Understand the types of information that are included in various logs</li> </ul>	<ul style="list-style-type: none"> <li>• Mike Meyer’s lab manual</li> <li>• Network Pro Labsim</li> <li>• Vocabulary terms</li> </ul>	<p>3 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Network+ Guide chapter review questions</li> <li>• Network+ Guide chapter tests</li> <li>• TestOut Network Pro labs and certification</li> <li>• Dual credit</li> <li>• Weekly participation</li> </ul>

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<p><b>DOMAIN</b> Network Management</p> <p><b>Core Standard 6</b> Students establish routines and procedures appropriate for network management</p>	<p><b>NET-6.1</b> Identify the cause of the problem when given a network-troubleshooting scenario involving a client connectivity problem</p> <p><b>NET-6.2</b> Predict the impact of modifying, adding, or removing network services on network resources and users</p> <p><b>NET-6.3</b> Configure a client to connect to a server running an identified NOS when given specific Parameters</p> <p><b>NET-6.4</b> Identify the cause of the problem when given a troubleshooting scenario involving a remote connectivity problem</p> <p><b>NET-6.5</b> Identify the purpose and characteristics of fault tolerance</p> <p><b>NET-6.6</b> Identify the main characteristics of VLANs</p> <p><b>NET-6.7</b> Identify the seven layers of the OSI model and their functions</p> <p><b>NET-6.8</b> Identify the OSI layers at which networking components operate</p> <p><b>NET-6.9</b> Given a scenario, use appropriate hardware and software tools to troubleshoot connectivity issues</p> <p><b>NET-6.10</b> Given a scenario, use the appropriate network monitoring resource to analyze traffic</p> <p><b>NET-6.11</b> Explain different methods and rationales for network performance optimization</p> <p><b>NET-6.12</b> Describe the purpose of configuration management documentation</p>	<ul style="list-style-type: none"> <li>• Understand the purpose of a network model</li> <li>• Identify the layers of the OSI model</li> <li>• Understand the characteristics of each layer of the OSI model</li> <li>• Identify how the TCP/IP stack compares to the OSI model</li> <li>• Identify the well-known TCP and/or UDP port numbers</li> <li>• Identify the characteristics of Ethernet networks, in terms of media access, collision domains, broadcast domains, and distance/speed limitations of various Ethernet standards</li> <li>• Understand which functions are performed by Ethernet switch features</li> </ul>	<ul style="list-style-type: none"> <li>• Mike Meyer’s lab manual</li> <li>• Network Pro Labsim</li> <li>• Vocabulary terms</li> </ul>	<p>4 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Network+ Guide chapter review questions</li> <li>• Network+ Guide chapter tests</li> <li>• TestOut Network Pro labs and certification</li> </ul>

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<p><b>DOMAIN</b> Advanced Network Operating Systems (not Personal Area Network Operating Systems)</p> <p><b>Core Standard 7</b> Students manage multiple network operating systems to meet industry demands</p>	<p><b>NET-7.1</b> Classify System Architectures and apply basic O.S. configurations</p> <p><b>NET-7.2</b> Install Open Source software (ex: Linux) and applications through the use of Package Management</p> <p><b>NET-7.3</b> Complete tasks either via the GUI or the command line as appropriate</p> <p><b>NET-7.4</b> Demonstrate proper use of GNU and Unix Commands, including those involving redirection, filtering and piping</p> <p><b>NET-7.5</b> Manage user and group accounts and administer file permissions and attributes</p> <p><b>NET-7.6</b> Create basic bash scripts to accomplish given O.S. tasks</p> <p><b>NET-7.7</b> Demonstrate knowledge of devices and how they interact with the system</p> <p><b>NET-7.8</b> Configure devices using O.S. tools and commands</p> <p><b>NET-7.9</b> Demonstrate competency of open source (ex: Linux Filesystems, and Filesystem Hierarchy Standard (FHS) with an emphasis on manipulating a Filesystem)</p> <p><b>NET-7.10</b> Navigate using Help utilities, such as HELP, MAN pages, and INFO</p>	<ul style="list-style-type: none"> <li>Identify useful Microsoft Windows commands for configuring and troubleshooting network clients and servers</li> <li>Identify useful UNIX commands for configuring and troubleshooting network clients and servers</li> </ul>	<ul style="list-style-type: none"> <li>Mike Meyer's lab manual</li> <li>Network Pro Labsim</li> <li>Vocabulary terms</li> <li>Initializing and reloading a router and switch lab</li> <li>Configure a router and switch lab</li> </ul>	<p>5 weeks</p> <p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>Network+ Guide chapter review questions</li> <li>Network+ Guide chapter tests</li> <li>TestOut Network Pro labs and certification</li> <li>Dual credit</li> <li>Weekly participation</li> </ul>

**Additional content from Information Technology I reinforced in Information Technology II**

Content	Indiana DOE Standards	Knowledge & Skills <small>(based on instructional materials)</small>	Example Activities	Time Frame	Evaluation / Certification
<p><b>DOMAIN</b> Employability and Operational Procedure</p> <p><b>Core Standard 6</b> Students apply customer service concepts to be effective computer technicians</p>	<p><b>CTS-6.1</b> Describe the aspects and importance of safety and environmental issues, safe work environments, equipment handling, and disposal of equipment</p> <p><b>CTS-6.2</b> Employ good communication skills including listening and tact/ discretion when communicating with customers and colleagues</p> <p><b>CTS-6.3</b> Employ job-related professional behavior including notation of privacy, confidentiality, and respect for the customer and customers' property</p>	<ul style="list-style-type: none"> <li>• Demonstrate how to prevent electrostatic discharge (ESD) and work safely with computers</li> <li>• Identify how to control the environment and protect against issues that are out of your control</li> <li>• Demonstrate how to talk to and treat customers, focusing on respect for the customer</li> </ul>	<ul style="list-style-type: none"> <li>• Practice being a technician</li> <li>• NTHS</li> <li>• Student ambassadors</li> <li>• Guest speakers</li> <li>• Field trips</li> </ul>	<p>Reinforced throughout the year</p>	<ul style="list-style-type: none"> <li>• Essential Skills Evaluation</li> <li>• Technical Skills Evaluation</li> <li>• Weekly participation</li> <li>• Work Ethic Certification</li> </ul>

**Additional content from Computer Science I (Core Standards 4-6; 1-3 are included in Information Technology I)**

Content	Indiana DOE Standards	Knowledge & Skills <small>(based on instructional materials)</small>	Example Activities	Time Frame	Evaluation / Certification
<p><b>DOMAIN</b> Program Development/Program Verification and Debugging/Documentation</p> <p><b>Core Standard 4</b> Students create a functional computer program</p> <p><b>Core Standard 5</b> Students prove a computer program solution works by using verification and debugging techniques</p> <p><b>Core Standard 6</b> Students connect an associated task with the code by providing documentation</p>	<p><b>CP1-4.1</b> Define the process of programming</p> <p><b>CP1-4.2</b> Create a computer program that corresponds to an algorithm or proposed solution</p> <p><b>CP1-4.3</b> Define programming structures</p> <p><b>CP1-4.4</b> Recognize data variables and constants</p> <p><b>CP1-4.5</b> Recognize local scope and global scope</p> <p><b>CP1-4.6</b> Use conditionals (IF statements)</p> <p><b>CP1-4.7</b> Use loops (while statements, for statements)</p> <p><b>CP1-4.8</b> Define single and multidimensional Arrays</p> <p><b>CP1-4.9</b> Use functions and methods to break down the program logic and support reuse</p> <p><b>CP1-4.10</b> Define the graphical user interface</p> <p><b>CP1-4.11</b> Identify the parts of the programming platform</p> <p><b>CP1-4.12</b> Identify different types of errors and handle them programmatically</p> <p><b>CP1-4.13</b> Use the order of operations when using calculations</p> <p><b>CP1-5.1</b> Predict and explain output</p> <p><b>CP1-5.2</b> Identify cause/effect for input/output</p> <p><b>CP1-5.3</b> Perform input validation</p> <p><b>CP1-5.4</b> Scrutinize peers code for errors</p> <p><b>CP1-6.1</b> Describe the function of a computer program</p> <p><b>CP1-6.2</b> Identify the purposes of a computer program</p> <p><b>CP1-6.3</b> Explain concepts related to a computer program</p> <p><b>CP1-6.4</b> Describe how to use a computer program</p> <p><b>CP1-6.5</b> Identify cause/effect by explaining input and output</p> <p><b>CP1-6.6</b> Interpret input/output</p>	<ul style="list-style-type: none"> <li>• Understand the process of programming</li> <li>• Create a computer program that corresponds to an algorithm or proposed solution</li> <li>• Identify programming structures</li> <li>• Recognize data variables and constants</li> <li>• Recognize local scope and global scope</li> <li>• Understand conditionals (IF Statements)</li> <li>• Understand loops (while statements, for statements)</li> <li>• Identify single and multidimensional Arrays</li> <li>• Understand functions and methods to break down the program logic</li> <li>• Identify graphical user interface</li> <li>• Identify the parts of the programming platform</li> <li>• Identify different types of errors and handle them programmatically</li> <li>• Understand the order of operations when using calculations</li> <li>• Predict and explain output</li> <li>• Identify cause/effect for input/output</li> <li>• Perform input validation</li> <li>• Scrutinize peers code for errors</li> <li>• Understand the function of a computer program</li> <li>• Identify the purposes of a computer program</li> <li>• Explain concepts related to a computer program</li> <li>• Describe how to use a computer program</li> <li>• Identify cause/effect by explaining input and output</li> <li>• Understand input/output</li> </ul>	<ul style="list-style-type: none"> <li>• Python Programming, including:             <ul style="list-style-type: none"> <li>○ Lists and tuples</li> <li>○ Strings</li> <li>○ Dictionaries and sets</li> <li>○ Classes and object-oriented programming</li> <li>○ Inheritance</li> <li>○ Recursion</li> <li>○ GUI programming</li> </ul> </li> </ul>	<p>9 weeks</p>	<ul style="list-style-type: none"> <li>• Python chapter review questions</li> <li>• Python chapter tests</li> <li>• Weekly participation</li> </ul>