**Career-Technical Credit Transfer (CT)²**
**Information Support Services and Networking**
**Career-Technical Assurance Guide (CTAG)**
**5/3/16**

The following courses, indicated by a Career-Technical Articulation Number (CTAN), are eligible for post-secondary credit and transfer among Ohio's Public Secondary career-technical institutions and state institutions of higher education.  The SCTAI alignment document with ODE competencies and post-secondary learning outcomes can be found on the ODHE website at https://www.ohiohighered.org/sctai/ctags.

| CTIT002 Networking/CompTIA Network + | Credits: 3 Semester Hours |
|---|---|
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>• Successfully complete the ODE secondary courses below and earn a qualifying score on the corresponding End of Course examination(s).<br>   o **Course 1: Networking (145035)**, *qualifying score of 60 or higher*, **and**<br>   o **Course 2: Network Management (145045)** *qualifying score of **50 or higher***.<br>• **Or**, the student must hold the current CompTIA Network+ certification, Cisco Certified Network Associate (CCNA) certification, Cisco Certified Entry Networking Technician (CCENT) certification, or passed Cisco I and II semester tests (proctored and closed book test environment). | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS.<br>https://www.ohiohighered.org/transfer/ct2/affirmation |

| CTIT005 Introduction to Desktop Operating Systems | Credits: 3 Semester Hours |
|---|---|
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>• Successfully complete the ODE secondary course **[Computer Software (145030)]** and receive a qualifying/passing score on the "End of Course" examination of *60 or higher.* | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS.<br>https://www.ohiohighered.org/transfer/ct2/affirmation |

| CTIT006 Introduction to User Support **(Institutions must choose to submit for either this CTAN or CTIT015 but not both)** | Credits: 3 Semester Hours |
|---|---|
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>• Successfully complete the ODE secondary course **[Network Security (145050)]** with a "C" or better, and receive a *qualifying/passing score of 63 or higher*.<br>• **Or,** the student must hold the current Microsoft Enterprise Desktop Support Technician credential (exam #70-685 or current equivalent exam). | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS. https://www.ohiohighered.org/transfer/ct2/affirmation |
| CTIT015 CompTIA Security + **(Institutions must choose to submit for either this CTAN or CTIT006 but not both)** | **Credits: 3 Semester Hours** |
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program NO LATER than 3 years after completing the approved secondary program.<br>   ◦ Successfully complete the ODE secondary courses **[Network Security (145050]** and receive a *qualifying/passing score of 55 or higher*.<br>• **Or,** the student must hold the current CompTIA Security + certification (exam # SY0-301 or current equivalent exam). | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS. https://www.ohiohighered.org/transfer/ct2/affirmation |
| CTIT007 Cisco I: CCNA 1 – Introduction to Networks | **Credits: 3 Semester Hours** |
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program NO LATER than 3 years after completing the approved secondary program.<br>• Successfully complete the CISCO™ course with a "C" or better and pass applicable semester tests (proctored and closed book test environment) in Cisco I curriculum (official CISCO™ End of Course" exam).<br>• **Or** Student holds current Cisco certification.<br>   ◦ or Holds Cisco Certified Network Associate (CCNA) certificate (separate exam).<br>   ◦ or, holds Cisco Certified Entry Networking Technician (CCENT) certificate. | **FULL FACULTY REVIEW:** Until valid WebXam[tm] scores are received, this CTAN will require a full submission and faculty panel review for approval. |

| **CTIT008 Cisco II: CCNA 2 – Routing and Switching Essentials** | Credits: 3 Semester Hours |
|---|---|
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>• Successfully complete the CISCO™ course with a "C" or better and pass applicable semester tests (proctored and closed book test environment) in Cisco II curriculum (official CISCO™ End of Course" exam).<br>• **Or** hold Current CompTIA Network+ certificate.<br>• **Or** hold current Cisco certification.<br> ▪ Cisco Certified Network Associate (CCNA) certificate.<br> ▪ Cisco Certified Entry Networking Technician (CCENT) certificate. | **PLEASE NOTE:** Students are not required to hold the official CISCO certification. However, the institution must offer the approved CISCO curriculum. |
| **CTIT009 Cisco III: CCNA 3 – Scaling Networks** | Credits: 3 Semester Hours |
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Student must matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>• Successfully complete the CISCO™ course with a "C" or better and pass applicable semester tests (proctored and closed book test environment) in Cisco III curriculum (official CISCO™ End of Course" exam).<br>• **Or** Student holds current Cisco certification.<br> o Cisco Certified Network Associate (CCNA) certificate. | **PLEASE NOTE:** Students are not required to hold the official CISCO certification. However, the institution must offer the approved CISCO curriculum. |
| **CTIT010 Cisco IV: CCNA 4 – Connecting Networks** | Credits: 3 Semester Hours |
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Student must matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>• Successfully complete the CISCO™ course with a "C" or better and pass applicable semester tests (proctored and closed book test environment) in Cisco IV curriculum (official CISCO™ End of Course" exam).<br>• **Or** Student holds current Cisco certification.<br> o Cisco Certified Network Associate (CCNA) certificate. | **PLEASE NOTE:** Students are not required to hold the official CISCO certification. However, the institution must offer the approved CISCO curriculum. |

| CTIT011 Microsoft Windows Desktop Operating System | Credits: 3 Semester Hours |
|---|---|
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>o Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>o Successfully complete the ODE secondary courses and receive a qualifying/passing score on the corresponding ODE "End of Course" examination(s).<br>   o **Course 1: Computer Software (145030),** *qualifying score of 60 or higher* **and**<br>   o **Course 2: Network Operating Systems (145040)** *qualifying score of 55 or higher* on the "End of Course" examination.<br>• **Or,** the student must hold the current Microsoft Client Operating System certification (exam #70-620 or 70-680 or current equivalent exam). | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS.<br>https://www.ohiohighered.org/transfer/ct2/affirmation |
| CTIT013 Microsoft Server Administration (<span style="color:red">**Institutions must choose to submit for either this CTAN or CTIT016 but <u>not both</u>)**</span> | Credits: 3 Semester Hours |
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>o Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>o Successfully complete the ODE secondary course **[Network Operating Systems (145040)** and receive a ***qualifying/passing score of 55 or higher*** on the "End of Course" examination.<br>o **Or**, the student must hold the current Microsoft Server Certification (For example, Windows Server 2012 or comparable, Server Administration Exam #70-646 or current equivalent exam). | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS.<br>https://www.ohiohighered.org/transfer/ct2/affirmation |
| CTIT016 Linux (<span style="color:red">**Institutions must choose to submit for either this CTAN or CTIT013 but <u>not both</u>)**</span> | Credits: 3 Semester Hours |
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>o Successfully complete the ODE secondary courses **[Network Operating Systems (145040]** and receive a qualifying/passing **score of 55 or higher** on the "End of Course" examination.<br>• **Or,** the student must hold one of the following current certifications: CompTIA Linux +, Linux Professional Institute Junior Exam, Red Hat Certified System Administrator, or Novell Certified Linux Administration. | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS.<br>https://www.ohiohighered.org/transfer/ct2/affirmation |

| CTIT014 PC Operating System, Hardware Operation and Maintenance/A+ | Credits: 3 Semester Hours |
|---|---|
| **Advising Notes:** In order to access post-secondary college credit for this CTAN, the student must adhere to the following:<br><br>• Matriculate to an institution of higher education with an approved or comparable program within 3 years after completing the approved secondary program.<br>o Successfully complete the ODE secondary courses and receive a qualifying/passing score on the corresponding ODE "End of Course" examination(s).<br>   o **Course 1: <u>Computer Software (145030)</u>**, qualifying score of ***60 or higher* <u>and</u>**<br>   o **Course 2: <u>Computer Hardware (145025)]</u>** *qualifying score of* **55 or higher.**<br>o **<u>Or</u>**, the student must hold the current CompTIA A+ certificate (current exams #220-801 and 220-802 or current equivalent exam). | **CERTIFICATE OF AFFIRMATION** can be used for course submission through CEMS.<br>https://www.ohiohighered.org/transfer/ct2/affirmation |

Each CTAN identifies the learning outcomes that are equivalent or common in introductory technical courses.  In order for students to be able to receive credit under these agreements, the career-technical secondary programs and the post-secondary institutions must document that their course/program content matches the learning outcomes in the CTANs.  In accordance with ORC 3333.162, industry standards and certifications provide documentation of student learning.  Recognized industry standards are expectations established by business, industry, state agencies, or professional associations. These standards define training program curricular requirements, establish certification or licensure criteria, and often serve as the basis for program accreditation. Where there are not recognized industry standards that define curriculum, statewide faculty panels define the curricular requirements, and then seek input and consensus from institutions statewide.

**Requirements and Credit Conditions:**

1. The receiving institution must have a comparable program, major, or courses that have been approved through submission to the Ohio Department of Higher Education (CT)[2] approval process for the CTANs listed in this document.
2. Credits apply to courses in the specified technical area at Ohio's public institutions of higher education, provided that the institution offers courses in the specific technical area.  In the absence of an equivalent course, and when the institution offers the technical program, the receiving institution will guarantee to grant and apply an equivalent credit value of the Career-Technical Articulation Number (CTAN) toward the technical requirements of the specific degree/certificate program.
3. The applicant must provide proof to the receiving institution that she/he completed a course or program that has been approved through the (CT)[2] approval process and that she/he holds the appropriate credential or has passed the end-of-course assessment(s).
4. A career-technical student seeking credit under the terms of this CTAG must apply and be accepted to the college within three years of completing a career-technical education program/course or within the currency of the industry certificate or license.
5. A career-technical student who meets all eligibility criteria will receive the credit hour value for the comparable course(s) as offered at the receiving state institution of higher education.
6. The admission requirements of individual institutions and/or programs are unaffected by the implementation of (CT)² outcomes.
7. The transfer of credit through this CTAG will not exempt a student from the residency requirements at the receiving institution.
8. Public/State-assisted institutions seeking participation in these statewide articulations must document course equivalency (how learning outcomes are met and measured). Review will be conducted by the Information Support Services/Networking CTAG Faculty Review Panel. All submissions for approval must be submitted electronically through the Course Equivalency Management System (CEMS).

Secondary Career-Technical students must complete the Information Technology Pathway to be eligible for credit under this CTAG.  This pathway is outlined in the Ohio Department of Education's *Information Technology Career Field Technical Content Standards.*

| CTIT002 Networking CompTIA Network+ | Credits: 3 Semester Hours |
|---|---|

**General Course Description:** This course is designed to provide network technicians and support staff with the foundation-level skills they need to install, operate, manage, maintain, and troubleshoot a network. Data communications, network components, the OSI reference model and popular industry communication protocols are explored.  Major types of network topologies and infrastructures are discussed. This course will help prepare students for the CompTIA Network+ certification exam.

**Credits:** 3 Semester Hours

**Learning Outcomes:**

1. Describe Network Concepts*
2. Perform Network Installation and Configuration*
3. Explain Network Media and Topologies*
4. Demonstrate Network Management*
5. Describe Network Security*
6. Describe emerging networking technology*

*Asterisk Indicates Essential Learning Outcomes*

| CTIT005 Introduction to Desktop Operating Systems | Credits: 3 Semester Hours |
|---|---|

**General Course Description:** This course is a broad overview of computer operating systems.  Core operating system concepts are covered.  Computer memory utilization is explored, basic security compliance is examined and common system operation procedures are applied.  The student will learn to respond to system needs and perform basic backup tasks.

**Credits:** 3 Semester Hours

**Learning Outcomes:**

1. Explain operating systems*
2. Implement and maintain security compliance*
3. Apply systems operations procedures*
4. Maintain and respond to system needs*
5. Perform standard computer backup procedures*

*Asterisk Indicates Essential Learning Outcomes*

| **CTIT006 Introduction to User Support** | **Credits: 3 Semester Hours** |

**General Course Description:** Introduction to the skills and abilities required to provide technical support and assistance to computer users with an emphasis on current Microsoft Client Operating Systems. Additional emphasis is on customer service, problem solving and communication skills (needs analysis, troubleshooting and interaction with users). Topics include service concepts, technical skill sets, career paths, strategies to provide technical support and operations of the help desk and user support industry.

**Credits:** 3 Semester Hours:

**Learning Outcomes:**

1. Identify causes of and resolution for desktop application issues including installation related issues and general software failures.*
2. Identify causes of and resolution for networking issues including connectivity, name resolution, logon and printing issues.*
3. Manage and maintain systems that run the current Microsoft Client Operating System including performance issues and common hardware failures.*
4. Support mobile users and issues they report including wireless connectivity and remote access issues.*
5. Identify causes of and resolution of security issues including resolving incidents related to malicious software, web browsers and cryptographic key management.*

*Asterisk Indicates Essential Learning Outcomes*

| **CTIT007 Cisco I: CCNA 1 – Introduction to Networks** | **Credits: 3 Semester Hours** |

**General Course Description:** This course introduces the architecture, structure, functions, components, and models of the Internet and other computer networks. The principles and structure of IP addressing and the fundamentals of Ethernet concepts, media, and operations are introduced to provide a foundation for the curriculum. By the end of the course, students will be able to build simple LANs, perform basic configurations for routers and switches, and implement IP addressing schemes.

**Credits:** 3 Semester Hours:

**Learning Outcomes:**

1. Understand and describe the devices and services used to support communications in data networks and the Internet
2. Understand and describe the role of protocol layers in data networks
3. Understand and describe the importance of addressing and naming schemes at various layers of data networks in IPv4 and IPv6 environments
4. Design, calculate, and apply subnet masks and addresses to fulfill given requirements in IPv4 and IPv6 networks
5. Explain fundamental Ethernet concepts such as media, services, and operations
6. Build a simple Ethernet network using routers and switches
7. Use Cisco command-line interface (CLI) commands to perform basic router and switch configurations

8. Utilize common network utilities to verify small network operations and analyze data traffic

**The learning outcomes are dictated by the credential examination.**

| CTIT008 Cisco II: CCNA 2 – Routing and Switching Essentials | Credits: 3 Semester Hours |
|---|---|

**General Course Description:** This course describes the architecture, components, and operations of routers and switches in a small network. Students learn how to configure a router and a switch for basic functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with RIPv1, RIPng, single-area and multi-area OSPF, virtual LANs, and inter-VLAN routing in both IPv4 and IPv6 networks.

**Credits:** 3 Semester Hours:

### Learning Outcomes:

1. Understand and describe basic switching concepts and the operation of Cisco switches
2. Understand and describe the purpose, nature, and operations of a router, routing tables, and the route lookup process
3. Understand and describe how VLANs create logically separate networks and how routing occurs between them
4. Understand and describe dynamic routing protocols, distance vector routing protocols, and link-state routing protocols
5. Configure and troubleshoot static routing and default routing (RIP and RIPng)
6. Configure and troubleshoot an Open Shortest Path First (OSPF) network
7. Understand, configure, and troubleshoot access control lists (ACLs) for IPv4 and IPv6 networks
8. Understand, configure, and troubleshoot Dynamic Host Configuration Protocol (DHCP) for IPv4 and IPv6 networks
9. Understand, configure, and troubleshoot Network Address Translation (NAT) operations

**The learning outcomes are dictated by the credential examination.**

| CTIT009 Cisco III: CCNA 3 – Scaling Networks | Credits: 3 Semester Hours |
|---|---|

**General Course Description:** This course describes the architecture, components, and operations of routers and switches in larger and more complex networks. Students learn how to configure routers and switches for advanced functionality. By the end of this course, students will be able to configure and troubleshoot routers and switches and resolve common issues with OSPF, EIGRP, and STP in both IPv4 and IPv6 networks. Students will also develop the knowledge and skills needed to implement a WLAN in a small-to-medium network.

**Credits:** 3 Semester Hours:

### Learning Outcomes:

1. Understand, configure and troubleshoot enhanced switching technologies such as VLANs, Rapid Spanning Tree Protocol (RSTP), Per VLAN Spanning Tree Plus Protocol (PVST+), and EtherChannel
2. Understand, configure, and troubleshoot first hop redundancy protocols (HSRP) in a switched network

3. Understand, configure, and troubleshoot wireless routers and wireless clients
4. Configure and troubleshoot routers in a complex routed IPv4 or IPv6 network using single-area OSPF, multi-area OSPF, and Enhanced Interior Gateway Routing Protocol (EIGRP)
5. Manage Cisco 10S® Software licensing and configuration files

**The learning outcomes are dictated by the credential examination.**

| CTIT010 Cisco IV: CCNA 4 – Connecting Networks | Credits: 3 Semester Hours |
| --- | --- |

**General Course Description:** This course discusses the WAN technologies and network services required by converged applications in a complex network. The course enables students to understand the selection criteria of network devices and WAN technologies to meet network requirements. Students learn how to configure and troubleshoot network devices and resolve common issues with data link protocols. Students will also develop the knowledge and skills needed to implement virtual private network (VPN) operations in a complex network.

**Credits:** 3 Semester Hours:

**Learning Outcomes:**

1. Understand and describe different WAN technologies and their benefits
2. Understand and describe the operations and benefits of virtual private networks (VPNs) and tunneling
3. Understand, configure, and troubleshoot serial connections
4. Understand, configure, and troubleshoot broadband connections
5. Understand, configure, and troubleshoot tunneling operations
6. Understand, configure, and troubleshoot Network Address Translation (NAT) operations
7. Monitor and troubleshoot network operations using syslog, SNMP, and NetFlow
8. Understand and describe network architectures:
   a. Borderless networks
   b. Data centers and virtualization
   c. Collaboration technology and solutions

**The learning outcomes are dictated by the credential examination.**

| CTIT011 Microsoft Windows Desktop Operating System | Credits: 3 Semester Hours |
| --- | --- |

**General Course Description:** Perform clean installations of or upgrades to the current Windows client operating system from previous versions of Windows including the migration of user profiles. Create and manage system images as a method of deployment. Configure aspects of a Windows client including hardware devices and application software; network connectivity including IPv4 and IPv6, firewall settings and remote management; and mobile computing features of Windows including BitLocker, DirectAccess and remote connectivity. Manage access to resources via authentication, authorization and user account control. Manage and monitor systems including system performance, backup and recovery. This course helps prepare students for a current Microsoft desktop based certification exam.

**Credits:** 3 Semester Hours

**Learning Outcomes:**

1. Manage the installation of the current Microsoft desktop operating system as a clean install or an upgrade from a previous version including the migration of user data.*
2. Create, modify and deploy system images as a method of installation.*
3. Configure hardware devices and their associated drivers.*
4. Configure software applications and their related settings and restrictions via local policies or group policies.*
5. Manage and configure network protocols, e.g., IPv4 and IPv6, and related settings such as Windows Firewall and remote management.*
6. Manage resource access issues including sharing, file and folder permissions via NTFS, user account control and Encrypting File System (EFS).*
7. Configure features related to mobile computing including BitLocker, Trusted Platform Module (TPM), Direct Access and mobility options.*
8. Monitor and maintain systems via software updates, disk management and performance settings.*
9. Perform activities in support of a sound strategy for backup and recovery options and business continuity.*

*Asterisk Indicates Essential Learning Outcomes*

| CTIT013 Microsoft Server Administration | Credits: 3 Semester Hours |
|---|---|

**General Course Description:** This course trains students in the operations and day to day management of Windows Server.  They will examine the server operating system, file services, directory services, software distribution, fault tolerance, remote access as well as system monitoring and troubleshooting. This course will help prepare students to sit for the current Microsoft Server Administrator exam. It should be noted, however, that additional test preparation work is recommended before attempting the actual certification exam.

**Credits:**  3 Semester Hours

**Learning Outcomes:**

1. Explain and Implement Server Deployment Concepts*
2. Perform Server Management*
3. Monitor and Maintain Servers*
4. Define Application and Data Provisioning*
5. Plan for Business Continuity and High Availability*

*Asterisk Indicates Essential Learning Outcomes*

| CTIT014 PC Operating System, Hardware Operation and Maintenance/A+ | Credits: 3 Semester Hours |
|---|---|

**General Course Description:** This course provides basic knowledge for properly installing, configuring, upgrading, maintaining and troubleshooting modern computer hardware including CPUs, storage devices, adapters, video displays, printers and communication devices. Coverage includes desktop and server systems, basic networking and security; it includes functions and characteristics of operating systems in common use.

Emphasis will be given to the current Windows operating system, small office/home office (SOHO) networks and security practices for both. This course will help students prepare for the CompTIA A+ certification exam. It should be noted, however, that additional test preparation work is recommended before attempting the actual certification exam.

**Credits:** 3 Semester Hours

**Learning Outcomes:**

1. Explain, compare and contrast common hardware components of a modern personal computer including storage devices, motherboards, power supplies, processors, memory, display, printers and other peripherals.*
2. Install and configure hardware and software components including printers, multimedia devices, scanners, video devices, etc.*
3. Interpret common hardware and software symptoms and apply appropriate troubleshooting methods to resolve the identified problems.*
4. Compare and contrast common versions of the Windows operating system, their features, installation methods and utilities.*
5. Summarize basic networking fundamentals including devices (hubs, switches, routers, etc.), protocols (TCP/IP, HTTP, FTP, SMTP, etc.), media (UTP, STP, fiber or coaxial) and types (wireless, Bluetooth, cellular and others).*
6. Explain basic principles and concepts of securing networks and devices including encryption, firewalls, authentication, authorization, malicious software, etc.*
7. Outline appropriate operational procedures to address safety and environmental issues and their impact on customers.*
8. Install, configure, maintain, troubleshoot and repair components of a modern personal computer, both desktop and laptop, including storage devices, motherboards, processors, memory, adapters and printers using appropriate tools.*
9. Differentiate between recent versions of Windows Client Operating Systems in their directory structure including user folder locations, program files, temporary files and offline files and folders.*
10. For recent versions of Windows Client Operating Systems, use system utilities (device manager, disk management, administrative tools, task manager, etc.) and command line tools (msconfig, chkdsk, copy, format, ipconfig, pint, etc.) to troubleshoot and resolve issues.*
11. Troubleshoot and resolve client networking problems using protocol (TCP/IP, FTP, SMTP, etc.) settings, firewall configuration settings and system tools (ping, tracert, nslookup, ipconfig, etc.).*
12. Install and configure a fully featured small office or home office (SOHO) network including a shared broadband connection (DSL, cable, ISDN or satellite), wireless devices using encrypted communication methods, routers/access points, bluetooth and firewall devices.*
13. Install and configure system software to reduce the risk of malware infection via scheduled system scans and signature updates and identify, quarantine and repair infected systems.*

14. Increase operating system security by managing local users and groups, file and folder permissions, share permissions, encryption and BIOS security.*

*Asterisk Indicates Essential Learning Outcomes*

| CTIT015 CompTIA Security+ | Credits: 3 Semester Hours |
| --- | --- |

**General Course Description:** A current overview of both network and Internet based security practices and conventions; including planning, implementing, and managing network security.  Through an exploration of security technologies, vulnerability assessment and attack methods this course offers methods to minimize potential security risks by means of organizational policy, education and technology. This course helps students prepare for the CompTIA Security+ certification exam. It should be noted, however, that additional test preparation work is recommended before attempting the actual certification exam.

**Credits:**  3 Semester Hours

**Learning Outcomes:**

1. Implement practices to properly harden operating systems and application software on a continuing basis.*
2. Identify commonly used ports and protocols, in both wired and wireless communications, their vulnerabilities and methods to mitigate those vulnerabilities.*
3. Identify and implement software and hardware tools (IP scanning, packet sniffing, and others) to increase network security.*
4. Conduct risk and vulnerability assessments and implement appropriate plans to mitigate common risks and vulnerabilities.*
5. Implement procedures to properly log system events, review those logs and audit security settings on a regular basis.*
6. Explain and implement redundancy planning, disaster recovery and incident response as means to provide business continuity.*
7. Explain the impact of organizational policy, state and federal legislation, and environmental controls on security planning.*
8. Compare and contrast access control methods including role based, discretionary, mandatory and rule based and implement appropriately to secure network resources.*
9. Summarize and deploy various authentication methods including password based, biometric and certificate based models.*
10. Explain general cryptographic concepts including hashing, symmetric and asymmetric encryption, digital certificates and public key infrastructure (PKI).*
11. Explain secure protocols including Secure Socket Layer (SSL) and IPSec to provide encrypted communication.*

*Asterisk Indicates Essential Learning Outcomes*

**General Course Description:** This course is designed to teach critical knowledge of installation, operation, administration and troubleshooting services common to all distributions of the Linux operating system.  Topics include managing user accounts, command line utilities, file system creation, file system maintenance, access permissions, system backup, and operation system installation.  This course will help prepare students for an industry standard certification exam. It should be noted, however, that additional test preparation work is recommended before attempting the actual certification exam.

    **Credits:**  3 Semester Hours

    **Learning Outcomes:**

1. Explain system hardware architecture such as major system devices, peripheral devices, and network connectivity devices.*
2. Perform Operating System and Application Software Installation*
3. Use common command line and scripting utilities*
4. Manage the Filesystem*
5. Perform Common Administrative Tasks*
6. Explain and Apply Fundamental Networking concepts and protocols.*

***Asterisk Indicates Essential Learning Outcomes***

**Information Support Services and Networking Panel Participants**
**Spring 2015**

| | | |
|---|---|---|
| Tony Hills (N) | Northwest State Community College | SCTAI Panel Lead Expert |
| Mike Beaver (N) | University of Rio Grande | SCTAI Panel Expert |
| Dan Heighton (N) | Clark State Community College | SCTAI Panel Expert |
| Christine Wolfe  (N) | Ohio University | SCTAI Panel Expert |
| Valerie Fronczak (N) | Hocking College | SCTAI Panel Expert |
| Linda Williams (N) | Marion Technical College | SCTAI Panel Expert |
| | | |
| Dovel Myer (N) | Shawnee State University | Item Writer |
| Rick Stumm (N) | University of Cincinnati | Item Writer |
| Naeem Shareef (N) | The Ohio State University | Item Writer |
| Duane Geistenberger (N) | Marion Technical College | Item Writer |
| Catherine Bakes (N) | Kent State University | Item Writer |
| Miekel Hollowell (N) | Cuyahoga Community College | Item Writer |
| | | |
| Bob Sherman (ISS) | Sinclair Community College | SCTAI Lead Expert |
| Hazem Said (ISS) | University of Cincinnati | SCTAI Panel Expert |
| Martin Walsh(ISS) | Cuyahoga Community College | SCTAI Panel Expert |
| Barb Miller (ISS) | Zane State College | SCTAI Panel Expert |
| Greg Teets (ISS) | Clark State Community College | SCTAI Panel Expert |
| Martin Anderson (ISS) | Bowling Green State University | SCTAI Panel Expert |
| | | |
| James Leasure (ISS) | Cuyahoga Community College | Item Writer |
| Carol Buser (ISS) | Owens Community College | Item Writer |
| Naeem Shareef (ISS) | The Ohio State University | Item Writer |
| Kathy Tamerlano (ISS) | Cuyahoga Community College | Item Writer |
| Tony Hills (ISS) | Northwest State Community College | Item Writer |
| Leon Madrid (ISS) | The Ohio State University | Item Writer |
| Gloria Rogiers (ISS) | Columbus State Community College | Item Writer |
| LyNette Cordaro (ISS) | Cuyahoga Community College | Item Writer |
| Becky Grasser (ISS) | Lakeland Community College | Item Writer |
| | | |
| Dr. Jim Austin | Center on Education and Training at OSU | |
| Brooke Parker | Center on Education and Training at OSU | |
| | | |
| Cyndi Brill | Ohio Department of Education | Program Specialist |
| Aaron Stewart | Ohio Department of Education | Program Specialist |
| | | |
| Dr. Bob Haas | Ohio Department of Higher Education | SCTAI Staff Expert |

| | | |
|---|---|---|
| Jamilah Tucker | Ohio Department of Higher Education | Director of Career-Technical Transfer Initiatives |
| Anne Skuce | Ohio Department of Higher Education | Senior Associate Director of SCTAI |
| Misty McKee | Ohio Department of Higher Education | Assistant Director of SCTAI |
| Jessi Spencer | Ohio Department of Higher Education | Administrative Coordinator of SCTAI |