

# THE REGISTERED APPRENTICESHIP OCCUPATIONS AND STANDARDS CENTER OF EXCELLENCE (AOSC)

## IT Generalist National Occupational Framework

ONET Code: 15-1232.00

RAPIDS Code: 1059

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## ABOUT THE URBAN INSTITUTE

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# Introduction to Using This Document

Under the Registered Apprenticeship Technical Assistance Centers of Excellence award, the Urban Institute leads the Occupations and Standards work. One of the main objectives of Urban's project is to create high-quality, well-researched, consensus-based work process schedules that are nonproprietary and widely available. This document is a product of that work and contains three sections: the occupational overview, the work process schedule, and the related technical instruction.

The **occupational overview** is a general introduction, including alternative job titles, any prerequisites, and, if applicable, the total number of hours needed to complete a time-based or hybrid program.

The **work process schedule** outlines the major job functions, competencies, and/or hours an apprentice completes in a registered apprenticeship program. It outlines what apprentices are expected to learn on the job with the support of a mentor or journeyworker (a worker mastering the competencies of an occupation in a particular industry), including both core competencies and those deemed optional by experts in the field. The work process schedule is the foundational document guiding a program.

Urban works with numerous experts to ensure the content is thoroughly researched and vetted to reflect the expectations of industry, educators, labor unions, employers, and others involved in apprenticeship for this occupation. Sponsors and employers can use the work process schedule as their program standards with assurances it has been approved by experts in the field.

The **related technical instruction** presents considerations for the coursework that apprentices will undertake to supplement on-the-job learning. It is intended to serve as a reference to sponsors exploring their options for the accompanying classroom, virtual, or hybrid training.

## How to Use the Work Process Schedule

Sponsors can adapt the work process schedule to accommodate their needs for competency- or time-based or hybrid programs. In a **competency-based** apprenticeship, sponsors assess apprentices' progress across core and optional competencies listed in the work process schedule. In a **time-based** apprenticeship, apprentices complete a predetermined number of hours across major job functions and the program overall. In a **hybrid** apprenticeship, sponsors monitor apprentices' hours spent on major job functions and assess their proficiency across competencies.

Each program type has a different method of assessment:

- **For a competency-based program**, apprentices engage in activities and make progress toward proficiency in the identified competencies. Sponsors overseeing apprentices' work assess their mastery of the outlined competencies using the following rating scale:

- 4—Competent/proficient (able to perform all elements of the task successfully and independently)
- 3—Satisfactory performance (able to perform elements of the task with minimal assistance)
- 2—Completed the task with significant assistance
- 1—Unsuccessfully attempted the task
- 0—No exposure (note the reason—absence, skill isn't covered, etc.)

The competencies may be completed in any order. Apprentices must perform at a level 4 or 3 in all competencies listed as “core” to complete the apprenticeship program successfully.

- **For a time-based program**, sponsors monitor apprentices' completion of hours in training across major job functions. The total number of hours recommended for this occupation is listed in the occupational overview and is based on guidance from the US Department of Labor. Generally, apprentices must have at least 2,000 hours overall for on-the-job learning, but occupations of greater complexity may require more hours. Sponsors will provide apprentices with supervised work experience and allocate the total number of hours across the major job functions to adequately train their apprentices.
- **The hybrid approach** blends both competency- and time-based strategies. Sponsors measure apprentices' skills acquisition through a combination of completing the minimum number of hours of on-the-job learning successfully demonstrating identified competencies. Sponsors will assess apprentices' proficiencies as described for competency-based programs with a rating scale of 0–4 for every core competency. Generally, apprentices have at least 2,000 hours overall for on-the-job learning, but occupations of greater complexity may require more hours. Sponsors will document apprentices' completion within a minimum and maximum range of hours assigned for each major job function.

# IT Generalist Occupational Overview

## Occupational Purpose and Context

IT (information technology) generalists provide many IT support functions within a company or with an IT support company or an IT department. They set up and upgrade software, create and manage networks and systems, troubleshoot user problems, and perform routine maintenance and inspections. They maintain functioning IT equipment, ensure information and IT infrastructure security, and uphold company policies regarding data use, security, and redundancy.

Unlike an IT specialist, an IT generalist's support functions vary depending on whether they work with a large IT department with more specialty or a small business with bespoke functions. They may perform several functions, from setting up technology for employees to maintaining internal networks, supporting telework functions, and providing help desk support. IT generalists have a versatile skill set in IT, show flexibility and dependability on the job, and may have desirable characteristics demonstrating high levels of customer service and being detail oriented. This position works with various individuals, including IT colleagues, personnel at all organizational levels, external clients, or vendors.

## Potential Job Titles

IT generalist, network manager, network support technician, IT administrator, help desk specialist, IT technician, IT professional, IT technical support professional, computer support specialist, computer technician, desktop support technician, help desk analyst, help desk technician, information systems technician, IT specialist, IT support specialist, technical support specialist

## Apprenticeship Prerequisites

A high school diploma or equivalent is generally required. Candidates should possess foundational knowledge and skills of computer systems, mobile devices, and other tech products and have strong communication skills.

## Recommended Length of Apprenticeship (Time/Hybrid Programs Only)

The recommended length of on-the-job learning in an IT generalist apprenticeship is 2,000 to 3,000 hours.

# Work Process Schedule

IT Generalist

ONET Code: 15-1232.00

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## Instructions for Use:

**Competency-based programs:** In the “performance level achieved” column of the work process schedule (see examples starting on the next page), assess apprentices’ performances on each competency with the scale below. No monitoring of hours is required for this approach. See “Guidelines for Competency-Based, Hybrid and Time-Based Apprenticeship Training Approaches,” US Department of Labor, Employment and Training Administration, Office of Apprenticeship, October 20, 2015,

<https://www.apprenticeship.gov/sites/default/files/bulletins/Cir2016-01.pdf>.

- 4—Competent/proficient (able to perform all elements of the task successfully and independently)
- 3—Satisfactory performance (able to perform elements of the task with minimal assistance)
- 2—Completed the task with significant assistance
- 1—Unsuccessfully attempted the task
- 0—No exposure (note the reason—absence, skill isn’t covered, etc.)

**Time-based programs:** In the “hours” row, specify the number of hours apprentices will fulfill for each job function. No assessment of competencies is required for this approach.

**Hybrid programs:** In the “performance level achieved” column, assess apprentices’ performances on each competency using the 0–4 scale above. In the “hours” row, identify a range of hours apprentices should spend working on each major job function.

<b>Job Function 1: Communicates professionally with staff and clients</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0–4) (competency-based and hybrid programs only)</b>
A. Demonstrates professional etiquette over all communication methods, including responding in a timely manner	Core	
B. Provides quality customer service using active listening and empathy during various modes of interactions (e.g., in-person, telephone, email, remote, and chat) at a company-defined expectation level	Core	
C. Gives, receives, and acts on constructive feedback	Core	
D. Independently solves problems using critical thinking and clarifying questions	Core	
E. Escalates challenging IT and personnel situations to superiors when necessary	Core	
F. Explains complex issues to nontechnical and technical customers using appropriate language and terminology	Core	
G. Works collaboratively with colleagues across organizational departments	Core	
H. Conducts oneself with integrity and professionalism and follows organizational policies and procedures	Core	

<b>Job Function 2: Sets up and removes employee or client workstations or devices, including setting up access controls</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0–4) (competency-based and hybrid programs only)</b>
A. Sets up or assists with setting up desktop, laptop, mobile devices, and other devices for employees	Core	

B. Helps install software on network or individual users' computers, laptops, or devices and sets appropriate access controls or authorities	Core	
C. Assists in setting up user identifications and passwords and implements policies regarding passwords and user/administrator permissions	Core	
D. Handles user data ethically and securely following company procedures	Core	
E. Installs or remotely advises on the installation of printers on networks or individual devices	Core	
F. Assists or sets up network maps, employee folders, and centralized data repositories	Core	
G. Sets up email accounts for users and establishes storage limits and backup parameters	Core	
H. Maintains accurate and up to date asset management documentation	Core	
I. Maintains and manages software licenses	Core	
J. Removes users from the network, archives data and files, removes workstations, and turns off devices for users exiting the organization or prohibited from using IT resources	Core	
K. Establishes (with network team) secure external connections to network or desktops using secure remote access technology	Optional	

<b>Job Function 3: Installs, provides user support for, and troubleshoots hardware and commercial software</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0-4)</b> (competency-based and hybrid programs only)
A. Follows standard operating procedures in the installation, support, and troubleshooting of hardware and commercial software	Core	
B. Uses a ticketing system and prioritizes tickets or requests for help based on business need, staff hierarchy, or urgency of problem	Core	

C. Uses internal and external knowledge bases or other job aids to troubleshoot hardware or software faults	Core	
D. Assists with or replaces or upgrades hardware components	Core	
E. Installs and tests the function of computer peripherals, e.g., mouse, keyboard, document cameras	Core	
F. Problem-solves to discover the source of faults and recommends appropriate solutions	Core	
G. Demonstrates ability to use essential software, including set-up of preferred default settings, instructs other users on the basic features of standard software packages, and identifies and remedies typical faults in relevant software packages	Core	
H. Identifies situations in which the issue must be escalated to a higher-level technology support individual, including an outside vendor and reports appropriately	Core	
I. Contacts outside vendors or vendor-supported help desk to solve complex problems or procure software patches as appropriate	Core	
J. Maintains records of data communication transactions, problems, and remedial actions taken or installation activities following organizational procedures	Core	
K. Answers user inquiries regarding computer software or hardware operation to resolve problems	Core	
L. Documents IT solutions and best practices	Core	
M. Assists with software patches and updates	Core	
N. Installs accessibility components and software on computers of individuals requiring accommodations, when necessary	Core	

#### Job Function 4: Installs, maintains, and troubleshoots networks and cloud systems

Hours (time-based and hybrid programs only):

Competencies	Core or optional	Performance level achieved (0-4) (competency-based and hybrid programs only)
A. Assists with or installs, maintains, or troubleshoots wired and wireless networks	Core	
B. Connects or remotely advises on connecting devices to networks physically	Core	

C. Appropriately uses remote access technology to troubleshoot	Core	
D. Uses network diagnostic tools (e.g., ping, tracert)	Core	
E. Installs network security software and devices on end use equipment	Core	
F. Assists in setting up, configuring, and managing servers, including data storage	Core	
G. Demonstrates ability to install and configure small office home office (SOHO) networks	Core	
H. Documents actions or procedures taken to resolve network issues related to tickets	Core	
I. Contacts technical vendors to resolve network or cloud issues	Core	
J. Troubleshoots performance of computer systems and networks	Core	
K. Displays basic working knowledge of cloud service uses (e.g., AWS, Azure, VMWare, Hyper-V), provides support to users, and works with vendors	Core	
L. Sets up or manages user identification parameters on servers	Optional	
M. Monitors or assists in monitoring server use, efficacy of data backup and storage systems, and integrity of redundant systems or technologies	Optional	

#### Job Function 5: Monitors and helps maintain network security by adhering to security policies

Hours (time-based and hybrid programs only):

Competencies	Core or optional	Performance level achieved (0-4) (competency-based and hybrid programs only)
A. Monitors adherence to password policies including communication of password update intervals	Core	
B. Sets user access levels and permissions based on organizational policies and employees' job roles	Core	
C. Monitors antivirus software (e.g., Norton, McAfee) to understand potential threats and updates as needed	Core	
D. Shows foundational knowledge of the current cyber threat levels and mechanisms for responding to threats	Core	

E. Ensures that encryption technology and access controls are utilized to protect sensitive data	Core	
F. Verifies that off-site staff are using secure connections to access network	Core	
G. Demonstrates foundational knowledge of malware and basic protection measures	Core	
H. Supports and coordinate with other organization divisions when signs of hacking intrusions or viruses are found, escalating when necessary	Core	
I. Demonstrates and applies foundational knowledge of malware and basic protection measures	Core	
J. Assists in or monitors the use of backup technologies and network redundancies to minimize risk	Optional	

<b>Job Function 6: Provides training to system users and stays abreast of emerging technologies</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0–4) (competency-based and hybrid programs only)</b>
A. Informally educates end users on proper usage of equipment and applications	Core	
B. Provides access to training (e.g., videos) for systems, applications, and software	Core	
C. Actively engages in ongoing IT education and certifications	Optional	
D. Uses AI technology to develop training videos, such as Script AI	Optional	

<b>Job Function 7: Supports internal or external clients in the use of audio/visual technology and conference technology</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0–4) (competency-based and hybrid programs only)</b>
A. Sets up and links audiovisual equipment, including projectors, screens, cameras, and related devices	Optional	

B. Installs, launches, operates and troubleshoots software designed to facilitate presentations, web-based conferencing, and audio conferencing	Optional	
C. Tests equipment and software before use to ensure sound and video quality is acceptable	Optional	
D. Manages or troubleshoots web-based or video conferences on behalf of staff members of organization	Optional	
E. Sets up user accounts on voice technologies or systems and mobile devices	Optional	

<b>Job Function 8: Makes software modifications to improve performance or customize to user needs</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0-4) (competency-based and hybrid programs only)</b>
A. Communicates with end users and collects input to understand which software modifications are needed	Optional	
B. Installs minor modifications to a program within a software package, including securing permission from vendors	Optional	
C. Inserts or loads organizational templates or standards into software, such as presentation templates in PowerPoint or equivalent software	Optional	
D. Monitors computer performance by recommending or making upgrades or modifications to improve speed and other performance parameters	Optional	
E. Uses software to set up needed business functions, such as workflows, tracking, archiving and other functions	Optional	
F. Automates workflows and tasks using technologies such as PowerShell and PowerBI	Optional	

<b>Job Function 9: Maintains and updates web content and manages user access profiles and authorities</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0-4) (competency-based and hybrid programs only)</b>
A. Sets user or author access permissions based on the organization's policies	Optional	
B. Uploads new content to the organization's website and removes old content as instructed	Optional	
C. Tests functionality of links embedded within the website	Optional	
D. Notifies the appropriate person if incorrect, outdated, or otherwise problematic web content is identified	Optional	
E. Contacts the appropriate person if the organization's website is malfunctioning	Optional	
F. Assists in maintaining website accessibility and website update policies	Optional	
G. Collects user experience feedback and collaborates with technical teams to design, build, and maintain the website	Optional	
H. Supports UX project team members in research and documents customer and employee feedback	Optional	

<b>Job Function 10: IT project management</b>		
<b>Hours (time-based and hybrid programs only):</b>		
<b>Competencies</b>	<b>Core or optional</b>	<b>Performance level achieved (0-4) (competency-based and hybrid programs only)</b>
A. Collaborates with stakeholders to define IT project requirements and objectives	Optional	
B. Supports with the planning, coordinating, and execution of IT projects within established timelines and budgets	Optional	
C. Assists with monitoring project progress and communicates updates to relevant parties	Optional	
D. Assists with post-implementation reviews to evaluate project success and identifies areas for improvement	Optional	

E. Assists with identifying opportunities for leveraging AI and automation to streamline project management	Optional	
F. Assigns tickets and tasks to appropriate resources to stay in key performance indicators (KPI)	Optional	
G. Demonstrates understanding of best practices in compliance	Optional	

# Related Technical Instruction

## IT Generalist

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### Instructions for Use:

Registered apprenticeships must include at least 144 hours of related technical instruction (RTI). Courses offered by accredited colleges and universities may be assigned a credit hour determination rather than a contact hour determination. In general, an academic credit unit is the equivalent of 15 clock hours of instruction.

**Development and Use of This RTI Outline:** Employers and academic institutions may approach RTI in markedly different ways. Our goal was not to identify the single best way to provide RTI, or to identify a single provider whose content we deemed to be superior. Instead, our goal was to survey a number of education providers, including employers, institutions of higher education, high schools, private continuing education providers, labor organizations, professional associations and, in some cases, municipalities that provide worker training, to identify topics or courses common among those providers that align with the job functions included in this WPS. Those common topics or courses are reflected in the RTI Outline provided below, which may be useful in developing your RTI program or communicating your needs to an educational partner. In developing the RTI for this occupation, we relied heavily on the curriculum developed by Google and delivered on Coursera in support of the Google IT Support Certificate (<https://www.coursera.org/professional-certificates/google-it-support>), as well as the content of Apple Certified Support Professional Training program delivered on Udemy (<https://www.udemy.com/course/apple-certified-support-professional-training-2024>), and CompTia A+ Certification Exam content lists. We also consulted with SAFAL PARTNERS who generously provided examples of the work process schedules they have developed for registered apprenticeships in the IT Support Specialist occupation (<https://safalpartners.com>).

<b>Licensure or certification requirements:</b> Google IT Support Professional Certificate; Apple Certified Support Professional Certification (ACSP); and CISCO Certified Support Technician and CompTIA A+ exams
<b>Degree requirements for licensure or certification, if applicable:</b> None
<b>Accreditation requirements of instructional provider for licensure or certification, if applicable:</b> None
<b>Anticipated changes in licensure or certification requirements, if known:</b> None known

**Examples of state licensure or certification requirements:** Not applicable

#### **Examples of RTI providers for this occupation**

**Professional associations and labor organizations:** The Network Professional Association sponsors the Certified Network Professional (CNP) certification program for IT and network professionals.

The Association for Computing Machinery (ACM) also offers a variety of educational resources for students and professionals in computing and informational technologies, including online books, courses, and training videos (<https://www.acm.org/education/about-education>). Access to these resources is made available to paid ACM Members.

**Military:** Instruction for IT generalists in the military includes 20 weeks of Advanced Individual Training with on-the-job instruction (<https://cybercoe.army.mil/Cyber-Center-of-Excellence/Schools/Signal-School/Signal-Courses/Enlisted-Courses/25B-Information-Technology-Specialist>).

**Federal:** Not applicable

**States/municipalities:** Not applicable

**Colleges and universities:** There are many accredited colleges and universities that offer coursework and educational programming leading to relevant degrees and certifications for IT generalists.

**No-cost online providers:** SANS Institute provides free training and resources on cybersecurity fundamentals (<https://www.sans.org/cyberaces>).

**Continuing education or specialty education providers:** In the IT field, there are many providers that offer education and training programs, as well as certification programs, for users competent in particular software, systems or services.

#### **Prerequisite knowledge, skills or experience typically required by RTI providers for this occupation**

Some RTI providers require individuals to have basic information technology literacy and to be able to use a computer as well as smart devices.

## Employer Onboarding

Hours: 1–3

### Sample learning objectives

- Explain the mission of the employer’s organization.
- Explain the organizational structure of the employer organization.
- Explain the chain-of-command in the employer’s organization, as well as the steps an employee should take to report concerns about practices or behaviors in the workplace or to share ideas about how to improve processes or efficiencies.
- Explain the employer’s policies for workplace conduct and ethics.
- Explain the employer’s policies regarding medical leave and vacation.
- Explain the requirements of the apprenticeship program and the role of the apprentice in the organization’s business activities.
- Demonstrate effective use of techniques to manage time, including prioritizing among outstanding tasks or deliverables, and communicating with others about the likely timeline of response or product delivery.

## Communication in the Work Environment

Hours: 30–45

### Sample learning objectives

- Demonstrate the ability to properly use electronic communication technologies, such as email, text messaging, chat messaging, and client services software.
- Demonstrate the ability to properly format an email, a memorandum and a business letter, and to compose correspondence using proper sentence structure, grammar, punctuation, spelling and word choices.
- Explain and access resources to enable communication with those who do not speak English, who have hearing or speech limitations, or who have intellectual disabilities or age-related cognitive deficiencies.
- Demonstrate the ability to engage in active listening and to summarize information provided by another person orally and in writing.
- Explain the importance of teamwork and describe strategies that effective teams use to engage all members of the team and exploit each member’s unique talents and expertise.
- Demonstrate the ability to use problem-solving strategies when disagreements arise among team members. Explain the importance of having civil disagreements and demonstrate the ability to listen and understand positions different from your own and explain why that position may have merit.

- Discuss appropriate strategies for assisting others in the workplace who appear to be struggling, who demonstrate anxiety or anger, who are showing signs of stress or anxiety, or who may pose a threat to others.
- Explain the importance of responding promptly to calls, emails or messages, even if it will take additional time to resolve an individual's concern or provide the requested information or service.
- Demonstrate proper etiquette when initiating, receiving or responding to phone calls, voicemails, emails, or text messages.
- Demonstrate the ability to leave a clear and concise voicemail that communicates the date, time and purpose of your call, and the information or service you are requesting from the recipient.

## Software for Business

Hours: 30-45

### Sample learning objectives

- Demonstrate the ability to install and update Microsoft Office software.
- Demonstrate the ability to set up an email account on computers and mobile devices.
- Demonstrate the ability to use Microsoft Outlook to set up one-time and recurring meetings, invite others to participate in meetings, share documents necessary for a meeting, block time on the calendar, and use electronic calendars to track time utilization.
- Demonstrate the ability to create a new Word document, create a Word template, and format a Word document based on various parameters.
- Demonstrate the ability to insert images into a Word document and align text around the image.
- Demonstrate the ability to use track changes to edit a document and resolve edits provided by others.
- Demonstrate the ability to use section headings to create an automated table of contents.
- Demonstrate the ability to set up a basic PowerPoint presentation using corporate templates, standard templates, and self-designed templates.
- Demonstrate the ability to move slides from one PowerPoint presentation to another, to use automated features to deliver a presentation, and to use accessories such as note pages to provide additional information in support of PowerPoint slides.
- Demonstrate the ability to set up an Excel spread sheet.
- Demonstrate the ability to set up simple functions on an Excel spread sheet, such as addition and multiplication functions.
- Demonstrate the ability to use Excel spread sheets to create graphics and pivot tables.

- Demonstrate the ability to download and use appropriate Acrobat software, such as PDF readers and generators, and to prepare documents for electronic signature.

## IT Technical Support Fundamentals

Hours: 26

### Sample learning objectives

- Define information technology and explain its importance in business, arts, culture, entertainment, research, and communication.
- Discuss the history and evolution of the internet.
- Discuss the types of computer hardware commonly used for personal, business, and industrial computing.
- Explain the components of a computer network and demonstrate the ability to assemble a basic computer network.
- Discuss the importance of providing reliable IT support to individuals and organizations.
- Explain how the binary system works.
- Assemble a computer from scratch.
- Select, install, and configure an operating system on a computer—Windows OS, Mac OS, Chrome OS, Android, and Linux OS.
- Explain how applications are created and how they work on a computer.
- Explain the steps of providing end-to-end customer support, including identifying problems, troubleshooting, and debugging.
- Explain privacy concerns related to the use of remote technologies to visualize a computer on the network and troubleshoot it.
- Explain how remote access software is used to enable IT support staff to troubleshoot problems.

## Computer Networking

Hours: 25

### Sample learning objectives

#### PC-based:

- Describe the elements in a typical computer network, such as the user space, the kernel space, hardware, cloud storage, and print servers.
- Describe the five-layer model of computer networks.
- Describe the standard protocols involved in setting up a small office/home office network.
- Describe how TCP/IP protocols govern how data is transmitted over the internet.

- Explain how Wi-Fi and Ethernet work to connect devices to a network.
- Explain the types of tools and techniques used to troubleshoot networks.
- Explain how network services like DNS and DHCP work to make computer networks run.
- Explain the theory of cloud computing as a service provider and data storage utility.
- Compare and contrast cloud computing concepts.
- Set up client-side virtualizations.

#### **Apple-based:**

- Explain and demonstrate the process used to update, upgrade, and reinstall the current Mac operating system.
- Explain the techniques used for managing file systems, storage, encryption, permissions, and file sharing.
- Use hidden items, shortcuts, file archives, metadata, and Spotlight. Manage system resources and Time Machine.
- Discuss strategies and techniques for managing basic and advanced network settings; troubleshoot network issues.
- Discuss and describe techniques for managing network services, host sharing, and a personal firewall.
- Explain the process for managing printers and scanners; troubleshoot peripherals, startup, and other system issues.
- Set up virtualizations that permit Mac users to utilize software designed for use on a Windows OS.

#### **CompTia A+ certification:**

- Compare and contrast the five basic operating systems currently available and explain the advantages and disadvantages of each.
- Configure, install, and upgrade operating systems, including Windows, Apple/Mac OS X, Linux, iOS, Android, and Windows Mobile.
- Explain the role of virtualization systems and provide examples of when it might be necessary for an individual or organization to rely on virtualization to run apps written for a different operating system than the primary operating system in use.
- Install and image virtual machines.
- Set up and troubleshoot peripheral devices.
- Assemble and disassemble computing hardware.
- Set up and support basic home and small office networks.
- Implement cybersecurity controls appropriate to helpdesk and technical support roles.
- Troubleshoot and support end user access to applications and data.

## Computer Operating Systems

Hours: 34

### Sample learning objectives

- Discuss the role of Windows, Mac, Chrome, and Linux filesystems and navigate those systems using a graphical user interface and command line interpreter.
- Set up users, groups, and permissions for account access.
- Install, configure, and remove software on the Windows and Linux operating systems.
- Configure disk partitions and filesystems.
- Explain how system processes work and how to manage them.
- Work with system logs and remote connection tools.
- Utilize operating system knowledge to troubleshoot common issues in an IT support specialist role.

## System Administration and Infrastructure Services

Hours: 28

### Sample learning objectives

- Discuss the key considerations in selecting hardware, vendors, and services for an organization's computer network.
- Describe the most common infrastructure services that keep an organization running and how to manage infrastructure servers.
- Describe how the Cloud supports an organization's computing and data storage needs.
- Manage an organization's computers and users using the directory services, Active Directory, and OpenLDAP.
- Describe the types of tools that organizations use to manage, update, and maintain their IT infrastructure.
- Discuss the importance of backing up data and the strategies used by organizations to protect against loss of data in a disaster.
- Describe how systems administrators plan and improve processes for IT environments.

## IT Security

Hours: 35

### Sample learning objectives

- Explain the importance of antivirus software and demonstrate the ability to select, install, and maintain antivirus software.
- Explain the importance of firewalls and demonstrate the ability to establish an effective firewall and permit appropriate individuals access to penetrate the firewall.
- Discuss the nature of cyberthreats and threat origins of concern to individuals and organizations.
- Explain how various encryption algorithms and techniques work, as well as their benefits and limitations.
- Differentiate between authentication and authorization systems and discuss the advantages and disadvantages of each.
- Demonstrate the ability to evaluate potential risks and recommend solutions for reducing or mitigating those risks.
- Describe the best practices used to secure a network.
- Demonstrate the ability to explain to others the most common types of cyberthreat they will encounter, as well as strategies and procedures for protecting against data and security breaches.

## Mobile Devices

Hours: 20–30

### Sample learning objectives

- Explain the function of a mobile device's digitizer.
- Explain and identify the types of USB ports that can be found on mobile devices.
- Name the proprietary connector type used by Apple mobile devices.
- Explain the use of short-range wireless technology to connect personal devices in a wireless personal area network (WPAN).
- Differentiate between 2G, 3G, 4G, and 5G mobile communications standards.
- Define long-term evolution and the improvements it provides in terms of speed.
- Explain the purpose and function of mobile hotspots.
- Explain how a mobile device uses bands, sub-bands, and service provider IDs to allow a device to connect to the right cell phone tower.
- Explain the role of GPS technologies in using mobile devices.
- Name and describe the software that enables centralized administration of mobile devices.

- Describe the technologies that facilitate the synchronization of mobile devices.
- Explain the types of common troubleshooting required of mobile device users.

### Introduction to Computer Programming

Hours: 30–45

#### Sample learning objectives

- Accurately identify and define terms relevant to Python programming.
- Explain Python's logic and structure (keywords, instructions, indentations).
- Explain numeral systems, data types, input/output operations, and control flow mechanisms used to program in Python.
- Demonstrate the ability to create data collections and functions using Python programming.
- Demonstrate the ability to use appropriate Python syntax, semantics, and runtime.

### Relevant military experience

25B MOS—Information Technology Specialist

3D0X2 AFSC—Cyber Systems Operations Specialist

### Diversity, equity, and inclusion

According to a 2022 Zippia.com report, 62 percent of tech employees in the United States are white and 73.3 percent are male, while women and ethnic minorities remain underrepresented in tech roles (<https://www.zippia.com/advice/diversity-in-high-tech-statistics>). Women hold only 26.7 percent of tech roles. Compared with other industries, the tech industry employs a smaller percentage of Hispanic workers, who make up only 8 percent of tech positions, and Black Americans, who occupy just 7 percent of tech jobs.

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