

Networking Fundamentals, Semester A

Course Overview

Networking Fundamentals, Semester A is the first part of a two-semester course. This course introduces you to careers in networking as well as basic concepts in networking. You'll describe types of networks, network topologies, software-defined networking, private and public networks, as well as intranets and extranets. You'll also learn about the Internet of Things (IoT) technologies. You'll learn about networking models, networking protocols, IP addresses, and subnetting. You'll identify networking devices, cables, media, and connectors. You'll learn to install a network operating system and set up a small wired network. Finally, you'll identify common network security threats and preventive measures to secure a network.

Course Goals

This course will help you meet the following goals:

- Identify career opportunities in the field of networking.
- Create a career plan and résumé.
- Describe the skills required for a career in networking.
- Describe the different types of networks and network topologies.
- Describe the Internet of Things (IoT) technologies.
- Describe the Open Systems Interconnection (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP) models.
- Describe how various protocols work at each OSI layer.
- Identify the types of IP addresses (IPv4, IPv6) and describe their characteristics.
- Describe classful and classless subnetting and calculate subnets.
- Identify and describe various network devices.
- Describe the different types of cables and media required for network connections.
- Identify the different types of cable standards and connectors.
- Describe and install network operating systems (NOS).
- List and describe the steps to set up a small, wired network.
- Identify common network security threats.
- Identify prevention methods to secure a network.

General Skills

To participate in this course, you should be able to do the following:

- complete basic operations with word-processing software, such as Microsoft Word or Google Docs
- complete basic operations with presentation software, such as a Microsoft PowerPoint or Google Docs presentation
- perform online research using various search engines and library databases
- communicate through email and participate in discussion boards

For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Student Orientation document, found at the beginning of this course.

Credit Value

Networking Fundamentals, Semester A is a 0.5-credit course.

Course Materials

- notebook
- computer
- printer

Minimum Hardware and Software Requirements

- A computer running one of the following supported operating systems:
 - Windows 8 or later
 - macOS 10.12 or later
- Internet connectivity for online course access
- 4 GB memory (8 GB recommended)
- 40 GB disk space
- One of the following supported browsers:
 - Edge, Chrome, Safari, Firefox, Opera
- Word processing software:
 - Microsoft Word, Apple Pages, or a free open-source alternative (e.g., OpenOffice, LibreOffice, SoftMaker FreeOffice, etc.)
- Presentation software:
 - Microsoft PowerPoint, Apple Keynote, or a free open-source alternative (e.g., OpenOffice, LibreOffice, SoftMaker FreeOffice, etc.)

Additional Recommendations

- Microsoft Visio (diagramming, vector graphics, and visualization software; optional for use in creating network diagrams)
- VirtualBox & Extension Pack (free virtualization software for practice, available [here](#))
 - For virtualization practice, at least 8 GB memory and 80 GB disk space is recommended for adequate performance.
 - VirtualBox is available for Windows, macOS, or Linux.
 - Reference material:
 - [VirtualBox Overview and Quick Start Guide](#)
 - [Official VirtualBox 6.x User Guide](#)
- Windows 10 ISO file (disk image for virtualization practice; free evaluation version available [here](#))
 - Note: If you access this link via a browser on a PC running Windows 10, Microsoft will not allow you to directly download the Windows 10 .iso file. Instead, you will see a link to download the Windows 10 Media Creation Tool, which you can use to download the ISO file. The following steps apply to Microsoft Edge on a Windows 10 PC:
 - You must have administrator privileges on your PC to use this tool.
 - Select “Download tool now,” and click “Run.”
 - Click “Yes” when asked if you wish to allow this program to make changes to your PC.
 - Click “Accept” when you see the license terms.
 - On the next screen, select “Create installation media for another PC,” and then select “Next.”
 - On the next screen, the language, architecture, and edition of Windows 10 will be pre-filled based upon the recommended options for your PC. If you wish to keep these settings, choose “Next.” If not, uncheck the “recommended options” box and select your preferred options before clicking “Next.”
 - On the next screen, click “ISO file,” and then choose “Next.”
 - Choose your download location and click “Save.”
- Windows 2016 Server ISO file (disk image for virtualization practice; free evaluation version available [here](#))
- Ubuntu Desktop ISO file (disk image for Linux virtualization practice; this is a free, open-source operating system, available [here](#))
- PFSense ISO file (disk image; free customizable virtualized router/firewall appliance OS; can be deployed in VirtualBox or any VM hypervisor; download available [here](#))
 - Reference material:
 - [Comprehensive PFSense Video Tutorial](#)
 - [Official Netgate PFSense User Guide](#)

Attribution Information

Windows screenshots courtesy Microsoft Windows

Course Pacing Guide

This course description and pacing guide is intended to help you keep on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

Unit 1: Networking Careers and Basic Concepts

Summary

This unit focuses on career opportunities in the field of networking and basic concepts of networking. You'll identify various networking careers. You'll create a career plan and résumé. You'll describe the skills required for a career in networking. You'll describe different types of networks and network topologies. In addition, you'll describe virtualized and software-defined networking, private and public networks, and intranets and extranets. Finally, you'll describe the Internet of Things (IoT) technologies.

Day	Activity/Objective	Type
1 day: 1	Syllabus and Student Orientation <i>Review the Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
4 days: 2–5	Networking Careers <i>Identify career opportunities in the field of networking.</i>	Lesson
4 days: 6–9	Career Planning <i>Create a career plan and résumé.</i>	Lesson
4 days: 10–13	Employability Skills <i>Describe the skills required for a career in networking.</i>	Lesson
4 days: 14–17	Introduction to Networks <i>Define a network and explain how a client-server model works.</i>	Lesson
4 days: 18–21	Network Types and Topologies, Part 1 <i>Describe the different types of networks and network topologies.</i>	Lesson
4 days: 22–25	Network Types and Topologies, Part 2 <i>Describe virtualized and software-defined networking, private and public networks, and intranets and extranets.</i>	Lesson
5 days: 26–30	IoT Technologies <i>Describe the background, concepts, technologies, and objectives used within the Internet of Things (IoT).</i>	Lesson
3 days: 31–33	Unit Activity and Discussion—Unit 1	Unit Activity / Discussion
1 day: 34	Posttest—Unit 1	Assessment

Unit 2: Networking Models and Protocols

Summary

This unit focuses on networking models and protocols. You'll first describe the Open Systems Interconnection (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP) models. Then, you'll describe how various protocols work at each OSI layer. You'll also compare IPv4 and IPv6 addresses and differentiate between public and private addresses. In addition, you'll describe classful and classless subnetting and calculate subnets.

Day	Activity/Objective	Type
4 days: 35–38	Networking Models <i>Describe the Open Systems Interconnection (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP) models.</i>	Lesson
4 days: 39–42	Networking Protocols <i>Describe how various protocols work at each OSI layer.</i>	Lesson
4 days: 43–46	IP Addresses <i>Identify the types of IP addresses (IPv4, IPv6) and describe their characteristics.</i>	Lesson
5 days: 47–51	Subnetting <i>Describe classful and classless subnetting, and calculate subnets.</i>	Lesson
3 days: 52–54	Unit Activity and Discussion—Unit 2	Unit Activity / Discussion
1 day: 55	Posttest—Unit 2	Assessment

Unit 3: Networking Infrastructure

Summary

This unit focuses on networking infrastructure. You'll first differentiate between wired and wireless network components and then you'll describe common network devices. You'll also describe the different types of cables and media required for network connections. In addition, you'll describe the different copper cable standards, copper cable termination standards, and different types of connectors. Finally, you'll describe and install a network operating system (NOS).

Day	Activity/Objective	Type
4 days: 56–59	Networking Devices <i>Identify and describe various network devices.</i>	Lesson
3 days: 60–62	Cabling and Media <i>Describe the different types of cables and media required for network connections.</i>	Lesson
3 days: 63–65	Cable Standards and Connectors <i>Identify the different types of cable standards and connectors.</i>	Lesson
4 days: 66–69	Network Operating Systems <i>Describe and install network operating systems (NOS).</i>	Lesson
3 days: 70–72	Unit Activity and Discussion—Unit 3	Unit Activity / Discussion
1 day: 73	Posttest—Unit 3	Assessment

Unit 4: Network Setup and Security

Summary

This unit focuses on network setup and security. You'll describe routing tables and learn how to connect a router to a local area network. You'll set up a small, wired network. Then, you'll identify common network security threats and prevention methods to secure a network.

Day	Activity/Objective	Type
4 days: 74–77	Setting Up a Wired Network <i>List and describe the steps to set up a small, wired network.</i>	Lesson
3 days: 78–80	Security Threats <i>Identify common network security threats.</i>	Lesson
3 days: 81–83	Prevention Methods <i>Identify prevention methods to secure a network.</i>	Lesson
3 days: 85–87	Unit Activity and Discussion—Unit 4	Unit Activity / Discussion
1 day: 88	Posttest—Unit 4	Assessment
1 day: 89	Semester Review	Review
1 day: 90	End-of-Semester Exam	Assessment