

**Information Technology Career Cluster  
Networking Fundamentals  
Course Number: 11.46100**

**Course Description:**

How do computers communicate? How are you connected? Start with a building block of knowledge of networks, local area networks, IP Addresses, subnetting, and data routes from a LAN to a WAN. This course is designed to provide students with the background necessary to understand the local area networking information on workstations and networking. Students will learn the processes involved in designing, implementing, upgrading, managing, and otherwise working with networks and network technologies.

Various forms of technologies will be used to expose students to resources, software, and applications of networking. Professional communication skills and practices, problem-solving, ethical and legal issues, and the impact of effective presentation skills are enhanced in this course to prepare students to be college and career ready. Employability skills are integrated into activities, tasks, and projects throughout the course standards to demonstrate the skills required by business and industry. Competencies in the co-curricular student organizations are integral components of both the employability skills standards and content standards for this course.

Networking Fundamentals is the second course in the Networking pathway in the Information Technology cluster. Students enrolled in this course should have successfully completed Introduction to Hardware Technology.

**Course Standard 1**

**IT-NF-1**

The following standard is included in all CTAE courses adopted for the Career Cluster/Pathways. Teachers should incorporate the elements of this standard into lesson plans during the course. The topics listed for each element of the standard may be addressed in differentiated instruction matching the content of each course. These elements may also be addressed with specific lessons from a variety of resources. This content is not to be treated as a unit or separate body of knowledge but rather integrated into class activities as applications of the concept.

**Standard: Demonstrate employability skills required by business and industry.**

The following elements should be integrated throughout the content of this course.

**1.1 Communicate effectively through writing, speaking, listening, reading, and interpersonal abilities.**

<b>Person-to-Person Etiquette</b>	<b>Telephone and Email Etiquette</b>	<b>Cell Phone and Internet Etiquette</b>	<b>Communicating At Work</b>	<b>Listening</b>
Interacting with Your Boss	Telephone Conversations	Using Blogs	Improving Communication Skills	Reasons, Benefits, and Barriers
Interacting with Subordinates	Barriers to Phone conversations	Using Social Media	Effective Oral Communication	Listening Strategies
Interacting with Co-workers	Making and Returning Calls		Effective Written Communication	Ways We Filter What We Hear
Interacting with Suppliers	Making Cold Calls		Effective Nonverbal Skills	Developing a Listening Attitude
	Handling Conference Calls		Effective Word Use	Show You Are Listening
	Handling Unsolicited Calls		Giving and Receiving Feedback	Asking Questions
				Obtaining Feedback

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				Getting Others to Listen
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Nonverbal Communication	Written Communication	Speaking	Applications and Effective Résumés
Communicating Nonverbally	Writing Documents	Using Language Carefully	Completing a Job Application
Reading Body Language and Mixed Messages	Constructive Criticism in Writing	One-on-One Conversations	Writing a Cover Letter
Matching Verbal and Nonverbal communication		Small Group Communication	Things to Include in a Résumé
Improving Nonverbal Indicators		Large Group Communication	Selling Yourself in a Résumé
Nonverbal Feedback		Making Speeches	Terms to Use in a Résumé
Showing Confidence Nonverbally		Involving the Audience	Describing Your Job Strengths
Showing Assertiveness		Answering Questions	Organizing Your Résumé
		Visual and Media Aids	Writing an Electronic Résumé
		Errors in Presentation	Dressing Up Your Résumé

### 1.2 Demonstrate creativity by asking challenging questions and applying innovative procedures and methods.

Teamwork and Problem Solving	Meeting Etiquette
Thinking Creatively	Preparation and Participation in Meetings
Taking Risks	Conducting Two-Person or Large Group Meetings
Building Team Communication	Inviting and Introducing Speakers
	Facilitating Discussions and Closing
	Preparing Visual Aids
	Virtual Meetings

### 1.3 Exhibit critical thinking and problem-solving skills to locate, analyze and apply information in career planning and employment situations.

Problem Solving	Customer Service	The Application Process	Interviewing Skills	Finding the Right Job
Transferable Job Skills	Gaining Trust and Interacting with Customers	Providing Information, Accuracy and Double Checking	Preparing for an Interview	Locating Jobs and Networking
Becoming a Problem Solver	Learning and Giving Customers What They Want	Online Application Process	Questions to Ask in an Interview	Job Shopping Online
Identifying a Problem	Keeping Customers Coming Back	Following Up After Submitting an Application	Things to Include in a Career Portfolio	Job Search Websites
Becoming a Critical Thinker	Seeing the Customer's Point	Effective Résumés:	Traits Employers are Seeking	Participation in Job Fairs
Managing	Selling Yourself and the Company	Matching Your Talents to a Job	Considerations Before Taking a Job	Searching the Classified Ads
	Handling Customer Complaints	When a Résumé Should be Used		Using Employment Agencies
	Strategies for Customer Service			Landing an Internship
				Staying Motivated to Search

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### 1.4 Model work readiness traits required for success in the workplace including integrity, honesty, accountability, punctuality, time management, and respect for diversity.

Workplace Ethics	Personal Characteristics	Employer Expectations	Business Etiquette	Communicating at Work
Demonstrating Good Work Ethic	Demonstrating a Good Attitude	Behaviors Employers Expect	Language and Behavior	Handling Anger
Behaving Appropriately	Gaining and Showing Respect	Objectionable Behaviors	Keeping Information Confidential	Dealing with Difficult Coworkers
Maintaining Honesty	Demonstrating Responsibility	Establishing Credibility	Avoiding Gossip	Dealing with a Difficult Boss
Playing Fair	Showing Dependability	Demonstrating Your Skills	Appropriate Work Email	Dealing with Difficult Customers
Using Ethical Language	Being Courteous	Building Work Relationships	Cell Phone Etiquette	Dealing with Conflict
Showing Responsibility	Gaining Coworkers' Trust		Appropriate Work Texting	
Reducing Harassment	Persevering		Understanding Copyright	
Respecting Diversity	Handling Criticism		Social Networking	
Making Truthfulness a Habit	Showing Professionalism			
Leaving a Job Ethically				

### 1.5 Apply the appropriate skill sets to be productive in a changing, technological, diverse workplace to be able to work independently and apply teamwork skills.

Expected Work Traits	Teamwork	Time Management
Demonstrating Responsibility	Teamwork Skills	Managing Time
Dealing with Information Overload	Reasons Companies Use Teams	Putting First Things First
Transferable Job Skills	Decisions Teams Make	Juggling Many Priorities
Managing Change	Team Responsibilities	Overcoming Procrastination
Adopting a New Technology	Problems That Affect Teams	Organizing Workspace and Tasks
	Expressing Yourself on a Team	Staying Organized
	Giving and Receiving Constructive Criticism	Finding More Time
		Managing Projects
		Prioritizing Personal and Work Life

### 1.6 Present a professional image through appearance, behavior, and language.

On-the-Job Etiquette	Person-to-Person Etiquette	Communication Etiquette	Presenting Yourself
Using Professional Manners	Meeting Business Acquaintances	Creating a Good Impression	Looking Professional
Introducing People	Meeting People for the First Time	Keeping Phone Calls Professional	Dressing for Success
Appropriate Dress	Showing Politeness	Proper Use of Work Email	Showing a Professional Attitude
Business Meal Functions		Proper Use of Cell Phone	Using Good Posture
Behavior at Work Parties		Proper Use in Texting	Presenting Yourself to Associates
Behavior at Conventions			Accepting Criticism

International Etiquette			Demonstrating Leadership
Cross-Cultural Etiquette			
Working in a Cubicle			

## Course Standard 2

### IT-NF-2

#### Review and update personal online career portfolio.

- 2.1 Review and update résumé to reflect new knowledge and skills mastery and additional work experience.
- 2.2 Compose an additional cover letter seeking employment for a position representative of new skills, knowledge, and work experience.
- 2.3 Replace outdated transcripts to reflect current courses successfully completed.
- 2.4 Review and revise existing artifacts to bring them up to date with new skills mastered, as necessary.
- 2.5 Identify and upload additional industry-appropriate artifacts reflective of mastered skills throughout this course. Write and include a reflective entry for each artifact discussing steps taken, problems encountered and how they were overcome, and other pertinent information about the learning.

## Course Standard 3

### IT-NF-3

#### Identify the fundamental principles of networking, local area networks, network topologies and access methods, Ethernet architecture, and the client-server and peer-to-peer networking models.

- 3.1 Define a local area network (LAN), including LAN elements, design, perimeter networks, and IP addressing.
- 3.2 Identify the different types of LANs.
- 3.3 Identify what a perimeter network is and explain its purpose.
- 3.4 Identify the different network topologies, such as star, mesh, and ring.
- 3.5 Identify and explain different protocols, such as TCP, UDP, layers, HTML, FTP, websocket, and others.
- 3.6 Define Ethernet standards.
- 3.7 Identify the differences between client/server and peer-to-peer distributed networks.

## Course Standard 4

### IT-NF-4

#### Identify the layers of the OSI (Open Systems Interconnection) Model and define the communications sub-network.

- 4.1 Explain the OSI model by defining each of the layers.
- 4.2 Explain the separate the functions of the lower levels of the OSI, or the communications sub-network, from the upper levels where message creation begins.
- 4.3 Explain the differences between layer 2 and layer 3 switches, and to gain a basic understanding of how they operate.
- 4.4 Differentiate between the OSI model and the TCP model.

## Course Standard 5

### IT-NF-5

#### Identify wired networks, media types and wireless networks.

- 5.1 Identify twisted-pair cable, cabling tools, and testers.

- 5.2 Identify what can interfere with twisted-pair cabling and how to avoid it.
- 5.3 Identify some of the basics about fiber optic cabling and some of the standards associated with fiber optic cabling.
- 5.4 Identify wireless devices, wireless settings and configurations, wireless standards, and encryption protocols.

## Course Standard 6

### IT-NF-6

#### Explore Internet Protocol IPv4 and IPv6 and emerging protocols in industry.

- 6.1 Demonstrate how to categorize IPv4 addresses using classifications such as Class A, B, and C.
- 6.2 Identify the default gateway and DNS server and how to configure them within a network adapter's TCP/IP properties dialog box.
- 6.3 Demonstrate how to define advanced TCP/IP concepts, such as NAT and sub-netting, and how to create a sub-netted network.
- 6.4 Demonstrate how to define CIDR.
- 6.5 Demonstrate the basics of IPv6 and how to configure IPv6 in the command line.
- 6.6 Define IPv6 dual stack and tunneling technologies.

## Course Standard 7

### IT-NF-7

#### Demonstrate how to work with the basic and advanced command prompts.

- 7.1 Work with the command prompt as an administrator and in an efficient manner.
- 7.2 Demonstrate basic TCP/IP commands such as ipconfig and ping to analyze and test a network.
- 7.3 Demonstrate more advanced commands such as netstat, nbtstat, tracert, pathping, route, and netsh to fully examine a computer and configure it in the command line.
- 7.4 Work with the Net command in an effort to find out more information about a system, start and stop services, and work with the network configuration.

## Course Standard 8

### IT-NF-8

#### Demonstrate how to set up common networking services and define Name Resolution Techniques.

- 8.1 Install and configure DHCP to hand out IP addresses to client computers.
- 8.2 Explain the four-step DHCP process known as DORA.
- 8.3 Install and configure Terminal Services so that client computers can connect remotely to a server and take control of it in the GUI.
- 8.4 Install and configure Network Policy Service (NPS) as a LAN router.
- 8.5 Define IPsec and the various types, including SA, AH, and ESP.
- 8.6 Explain how DNS and WINS function and how to install them in Windows Server 2008, as well as how to create forward lookup zones.

## Course Standard 9

### IT-NF-9

#### Explore the concepts of Wide Area Networks, describe routing, and define common WAN technologies and connections.

- 9.1 Explain the differences between static and dynamic routing.

- 9.2 Describe how to install and configure RRAS to function as a network router and how to install the Routing Information Protocol.
- 9.3 Explain the basics about various wide area networking technologies.
- 9.4 Explain the basics of software-defined networking.
- 9.5 Explain different personal and small business Internet connectivity types.

## Course Standard 10

### IT-NF-10

#### Explore network infrastructures and network security.

- 10.1 Differentiate between the Internet, intranets, and extranets.
- 10.2 Demonstrate how to set up a virtual private network.
- 10.3 Explain firewalls and how to initiate port scans on them to see whether they are locked down.
- 10.4 Explain other perimeter devices and zones, such as proxy servers, internet content filters, NIDS, NIPS, and the DMZ.

## Course Standard 11

### IT-NF-11

#### Explore how related student organizations are integral parts of career and technology education courses through leadership development, school and community service projects, entrepreneurship development, and competitive events.

- 11.1 Explain the goals, mission, and objectives of Future Business Leaders of America (FBLA) and/or Technology Student Association (TSA) and/or SkillsUSA.
- 11.2 Explore the impact and opportunities a student organization (FBLA, TSA, SkillsUSA) can develop to bring business and education together in a positive working relationship through innovative leadership and career development programs.
- 11.3 Explore the local, state, and national opportunities available to students through participation in related student organizations (FBLA, TSA, SkillsUSA) including but not limited to conferences, competitions, community service, philanthropy, and other student organization activities.
- 11.4 Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.
- 11.5 Explore the competitive events related to the content of this course and the required competencies, skills, and knowledge for each related event for individual, team, and chapter competitions.