Information Technology Career Cluster
Introduction to Cybersecurity
Course Number: 11.48100

Course Description:
Introduction to Cybersecurity is designed to provide students the basic concepts and terminology of cybersecurity. The course examines how the concept of security integrates into the importance of user involvement, security training, ethics, trust, application of cybersecurity practices and devices, and best practices management. The fundamental skills cover internal and external threats to network security and design, how to enforce network level security policies, how to protect an organization's information, and a broad range of other topics.

Various forms of technologies will be used to expose students to resources, software, and applications of cybersecurity. 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.

Introduction to Cybersecurity is the second course in the Cybersecurity career pathway of the Information Technology Career Cluster and primarily focuses on the National Cybersecurity Workforce Framework category Protect and Defend and the Computer Network Defense work roles. Students enrolled in this course should have successfully completed Introduction to Hardware Technology.

Course Standard 1

IT-ICS-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.

Person-to-Person Etiquette	Telephone and Email Etiquette	Cell Phone and Internet Etiquette	Communicating At Work	Listening
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
				Getting Others to Listen

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

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

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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-ICS-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-ICS-3
Demonstrate an understanding of cybersecurity concepts and research.
3.1 Explain the importance of data security and data classification (confidential, sensitive, etc.).
3.2 Explain the concepts of confidentiality, integrity, availability, authentication, and non-repudiation. [NICE 63]
3.3 Research current events on breaches; focus on particular Information Assurance (IA) areas that were compromised. [NICE 165]
3.4 Explain the importance of physical security.

Course Standard 4

IT-ICS-4
Identify the fundamental principles of networking (wired and wireless), local area networks (elements, perimeter networks, IP addressing, access methods and topologies), client-server and peer-to-peer networking models, and wide area networks.
4.1 Define and identify the different types of LANs.
4.2 Identify and describe the purpose for a perimeter network.
4.3 Identify the different network topologies to include client/server and peer-to-peer distributed networks.
4.4 Define and describe Ethernet standards.
4.5 Identify wireless devices, wireless settings and configurations, wireless standards, and encryption protocols.

4.6 Explain the differences between static and dynamic routing.
4.7 Explain how to install and configure Routing and Remote Access Service (RRAS) to function as a network router and how to install the Routing Information Protocol.
4.8 Explain the basics about various other wide area networking technologies.
4.9 Explain different personal and small business Internet connectivity types.

Course Standard 5

IT-ICS-5
Identify the fundamental principles of the Open Systems Interconnection Model, Internet Protocol IPv4 and IPv6, and common networking services to include Name Resolution Techniques.

5.1 Explain the Open Systems Interconnection (OSI) model by defining each of the layers and their functions.
5.2 Explain the differences and operation of layer 2 and layer 3 switches.
5.3 Differentiate between the OSI model and the TCP model.
5.4 Demonstrate how to categorize IPv5 addresses using the Class A, B, and C classifications.
5.5 Identify the default gateway and Domain Name System (DNS) server and explain how to configure within a network adapter's Transmission Control Protocol/Internet Protocol (TCP/IP) properties dialog box.
5.6 Demonstrate how to define advanced TCP/IP concepts, such as Network Address Translation (NAT) and sub-nets, and how to create a sub-netted network.
5.7 Demonstrate the basics of IPv6 and how to configure IPv6 in the command line and define dual stack and tunneling technologies.
5.8 Implement Dynamic Host Configuration Protocol (DHCP) to assign IP addresses to client computers demonstrating an understanding of the four-step process known as DORA (discover, offer, request, acknowledgment).
5.9 Implement Terminal Services so that client computers can connect remotely to a server and take control of it in the Graphical User Interface (GUI).
5.10 Implement Network Policy Service (NPS) as a LAN router and define IPsec and the various types of protocols, including Security Associations (SA), Authentication Header (AH), and Encapsulating Security Payload (ESP).
5.11 Explain the function of Domain Name System (DNS) and Windows Internet Name Service (WINS) and explain how to install in Windows Server 2008, as well as how to create forward-lookup zones.

Course Standard 6

IT-ICS-6
Demonstrate how to work with the basic and advanced command prompts.

6.1 Manipulate and explain the command prompt as an administrator.
6.2 Demonstrate basic TCP/IP commands such as ipconfig and ping to analyze and test a network.
6.3 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.
6.4 Manipulate 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 7

IT-ICS-7
Explore and research network infrastructures and network security.
  7.1   Differentiate between the Internet, Intranets, and Extranets.
  7.2   Demonstrate how to set up a virtual private network (VPN).
  7.3   Explain firewalls and how to initiate port scans on them to see whether they are locked down and what it means if they are.
  7.4   Explain other perimeter devices and zones, such as proxy servers, internet content filters, Network Intrusion Detection Systems (NIDS), Network Intrusion Prevention Systems (NIPS), and Demilitarized Zones (DMZ).

Course Standard 8

IT-ICS-8
Demonstrate how to work with fundamental components of cybersecurity.
  8.1   Explain the security function and purpose of network devices and technologies (e.g., Intrusion Detection System (IDS) tools and applications and IDS hardware and software, including open-source tools, and their capabilities. [NICE 3, 59 and 146].
  8.2   Distinguish and differentiate between network design elements and compounds.
  8.3   Securely install cabling.
  8.4   Configure firewalls.
  8.5   Configure secure network connections (in Windows or Linux).
  8.6   Justify the use of basic Windows or Linux commands to configure communications (e.g., ipconfig/ifconfig).
  8.7   Design a basic secure network topology demonstrating knowledge of intrusion detection methodologies and techniques for detecting host- and network-based intrusions via intrusion detection technologies. [NICE 66]

Course Standard 9

IT-ICS-9
Demonstrate how to employ host system and application security.
  9.1   Compare and contrast common operating systems, e.g., Windows, Linux, OS X.
  9.2   Compare and contrast common file systems.
        a. Demonstrate how to protect them by locking them down with a File Integrity Monitor, such as Carbon Black.
  9.3   Explain the importance of application security.
  9.4   Demonstrate knowledge of system and application security threats and vulnerabilities (e.g., buffer overflow, mobile code, cross-site scripting, Procedural Language/Structured Query Language [PL/SQL] and injections, race conditions, covert channel, replay, return-oriented attacks, malicious code). [NICE 105]
  9.5   Install, configure, and maintain (patch) anti-virus software.
  9.6   Perform command line exercises specific to operating systems.
  9.7   Demonstrate knowledge of what constitutes a network attack and the relationship to both threats and vulnerabilities and how to differentiate between types of application attacks. [NICE 150]
  9.8   Justify the need and implement Active X and Java Security.
  9.9   Discuss protection from buffer overflow attacks.
  9.10 Recognize, mitigate, and prevent input validation attacks and scripting attacks.
  9.11 Justify the need for and implement secure cookies.

Course Standard 10

IT-ICS-10
Demonstrate how to implement proper security administration.
10.1 Implement appropriate procedures to establish host security.
10.2 Secure operating systems (OS), user profiles, and computer permissions.
   a. Explain the differences between system purposes, such as production system, QA system, development system and others.
10.3 Secure firewalls and Web browsers.
10.4 Establish a secure baseline for host OS.
10.5 Analyze security using Microsoft Baseline Security Analyzer (MBSA).
10.6 Demonstrate knowledge of data backup, types of backups (e.g., full, incremental), and recovery concepts and tools such as Microsoft (MS) Backup/Restore. [NICE 29]
10.7 Methodically examine and conduct a security audit to review system performance and settings in Windows and Linux.
10.8 Demonstrate the ability to select and set both file and folder permissions in Windows and Linux.
10.9 Set up shared documents and folders.
10.10 View and edit Windows services (disable services).
10.11 Secure DNS/BIND, web, email, messaging, FTP servers.

Course Standard 11

IT-ICS-11
Demonstrate how to monitor proper access controls and identity management.
11.1 Demonstrate knowledge of host/network access controls (e.g., access control list) to include the function and purpose of authentication services. [NICE 49]
11.2 Explain the fundamental concepts and best practices related to authentication, authorization, and access control.
11.3 Implement appropriate security controls when performing account management.
11.4 Review authentication using Passfaces.com.
11.5 Manage user accounts, including basic to advanced protocol procedures.

Course Standard 12

IT-ICS-12
Research and explore basic principles of cryptology.
12.1 Summarize general cryptography concepts (symmetric encryption, asymmetric encryption). [NICE 27]
12.2 Demonstrate basic cipher systems (e.g., Caesar cipher, Vigenere cipher).
12.3 Demonstrate file hashing.
12.4 Demonstrate knowledge of current applications of steganography to include concealed identification, authentication, and communications.

Course Standard 13

IT-ICS-13
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.

13.1 Explain the goals, mission, and objectives of Future Business Leaders of America (FBLA) and/or Technology Student Association (TSA) and/or SkillsUSA.

13.2 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.

13.3 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.

13.4 Explain how participation in career and technology education student organizations can promote lifelong responsibility for community service and professional development.

13.5 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.