Introduction to Data Communications and Networking

Course Outcome Summary

Course Information
Organization: South Central College
Course Number: COMP1360
Division: Business
Department: Computer Careers
Total Credits: 4

Description
This course serves as a general introduction for students seeking to acquire a foundation in current network technologies for local area networks (LANs), wide area networks (WANs) and the Internet. The course provides an introduction to hardware, software, terminology, components, design, and connections of a network. Network concepts such as the OSI model, topologies, and major protocols, as well as the basic functions of system administration and operation are also included. The course is operating system independent and provides an introduction to several popular network operating systems.

Types of Instruction

<table>
<thead>
<tr>
<th>Instruction Type</th>
<th>Contact Hours</th>
<th>Credits</th>
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<tbody>
<tr>
<td>Active Learning</td>
<td>64</td>
<td>4</td>
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Prerequisites
None.

Exit Learning Outcomes

Core Abilities
A. Critical Thinking
B. Math Logic
C. Technological Literacy

Competencies
1. **Describe the impact of computer networking on today's society**
   Learning Objectives
   a. Explain how networks impact daily life
   b. Describe the role of data networking in the human network
   c. List the key components of a data network
   d. List the opportunities and challenges posed by converged networks
   e. List the main characteristics of common network architectures

2. **List the fundamental concepts of data communication**
   Learning Objectives
   a. Analyze the structure of a network
   b. List the components of a network
c. Define the role of protocols in network communications
d. List the advantages of using a layered network model
e. Describe the role of each layer in the OSI and TCP/IP models
f. Explain the addressing and naming schemes used in network communications

3. **Work with the application layer of the OSI model**
   Learning Objectives
   a. List the three top layers in the OSI model
   b. List the functions performed by the top three layers in the OSI model
c. Describe how people use the application layer when communicating across the network
d. Explain the functions of the well-known TCP/IP applications and their services
e. Describe how protocols ensure compatibility between different network devices
f. Analyze network traffic

4. **Work with the transport layer of the OSI model**
   Learning Objectives
   a. Describe the role of the OSI model's transport layer
   b. Explain the difference between TCP and UDP
c. Describe how TCP and UDP function
d. List appropriate uses of TCP and UDP

5. **Work with the network layer of the OSI model**
   Learning Objectives
   a. Explain how packets are routed from a device on one network to a device on a different network
   b. Describe how IP provides connectionless service
c. Explain the difference between physical and logical networks
d. Describe how routers use next-hop addresses to determine the path that packets need to take to reach their destinations
e. Describe how routers forward data packets

6. **Explain the structure of IPv4 addresses**
   Learning Objectives
   a. Describe the IPv4 addressing structure
   b. Convert numeric values from binary, hexadecimal, or decimal to another numbering system
c. Explain how network administrators assign network addresses
d. Explain how ISPs assign network addresses
e. Calculate the network portion of a host address
f. Calculate the host portion of a host address
g. Explain the role of the subnet mask in dividing networks
h. Test networks to verify connectivity and operational status

7. **Work with the data link layer of the OSI model**
   Learning Objectives
   a. Describe the role of the data link layer protocols
   b. Explain how the data link layer prepares data for transmission
c. Explain MAC and how it's methods function
d. List the component parts of a Layer 2 frame and their roles

8. **Work with the physical layer of the OSI model**
Learning Objectives
a. List the physical layer protocols and their roles
b. Describe physical layer signaling and encoding
c. Explain how electrical signals can be used to represent data bits
d. List the basic characteristics of copper cable, fiber optic cable, and wireless network media

9. Describe the characteristics and operation of Ethernet
Learning Objectives
a. Describe the evolution of Ethernet
b. Describe the Ethernet frame and the purposes of its fields
c. Explain how Ethernet makes use of the physical and data link layers
d. Explain the differences between an Ethernet hub and an Ethernet switch
e. Describe ARP and its operation

10. Work with data communications network media
Learning Objectives
a. List the basic network media required to make a LAN connection
b. Describe the differences between intermediate and end-device connectivity in a LAN
c. List the pin-out configurations for straight-through and crossover cables

11. Construct a simple Ethernet LAN
Learning Objectives
a. Construct a straight-through and a crossover cable
b. Design an addressing scheme for a network
c. Create a logical design of a simple Ethernet LAN
d. Create a physical design of a simple Ethernet LAN

12. Explain the importance of information security
Learning Objectives
a. Define information security
b. Identify the challenges for information security
c. List important information security terms

13. Describe information security attacks
Learning Objectives
a. Describe the four basic types of attacks
b. Create an attack and attacker profile
c. Identify denial of service attacks
d. Define malicious code

14. Describe the basic principles of designing a secure system
Learning Objectives
a. Identify who is responsible for information security
b. List the five principles of information security
c. Explain the three pillars of information security

15. Describe how to secure a simple Ethernet LAN
Learning Objectives
a. Disable non-essential systems
b. Harden operating systems and applications
c. Secure the network infrastructure
d. Secure removable media

16. **Explain how to protect internet-based services**

   **Learning Objectives**
   
   a. List the main vulnerabilities of internet-based services
   b. Implement security measures for electronic mail, web browsing, and instant messaging

17. **List the practical uses of cryptography**

   **Learning Objectives**
   
   a. Define cryptography
   b. Explain how to use cryptography
   c. Describe the public key/private key system
   d. Create a public key/private key set
   e. Create a self-signed certificate