CST 220: NETWORKING FUNDAMENTALS

Credit Hours: 3.0

Lab Hours: 2.0

Class Hours: 2.0

Prerequisite: CST 160

Course Description:

This course introduces students to fundamental networking concepts and skills. It provides instructions in networking media, physical and logical topologies, and common networking standards and protocols. Specifically, the course presents the conceptual framework of the OSI model, and its implementation with the TCP/IP and other network protocols. Communication principles over guided and unguided media are introduced as well as cloud computing, network virtualization, and network security. Both networking design and analysis methods are emphasized. Hands-on laboratory exercises and projects reinforce the material presented in the lectures and enable students to develop practical networking skills. The course also provides students with the knowledge necessary to design, install, configure, and support network infrastructure. Networking administration skills are developed for different operating systems.

Required Text:

Textbook: *Network+ Guide to Networks,* Jill West. Tamara Dean, and Jean Andrews, Seventh Edition, Course Technology, 2015, ISBN-13: 978-1305090941.

Older editions of *Network+ Guide to Networks* is similar to the textbook used for the class and students owning them should have no difficulties in mapping in-class lectures with sections of their own books but are required to map discussed subjects with sections of their books by themselves.

Grades: A, A⁻, B⁺, B, B⁻, C⁺, C, D, F

Course Objectives:
   Upon successful completion of the course, the student should be able to:

   • Demonstrate understanding and correct usage of networking terminology.

- Demonstrate understanding of various networking topologies, major types of network cabling and related technical terms.
- Describe the role of a Network Interface Card (NIC) for network communications and explain how the NIC controls network communication flow.
- Demonstrate understanding of the OSI reference model layers and their relationships to the networking software and protocols.
- Demonstrate understanding of the function and structure of protocol data units (PDUs) and communication protocols in a network; discuss the layered architecture of protocols and describe the common protocols and how various network Operating Systems (nOS) use them.
- Demonstrate understanding of the TCP/IP suite and its common protocols.
- Demonstrate understanding of the functions and features of a nOS.
- Perform related network administration tasks.
- Describe the elements of an effective troubleshooting methodology and use a variety of software and hardware tools to diagnose problems.
- Demonstrate understanding of network backup and recovery strategies and network protection from viruses.
- Identify security risks in Local Area Networks (LANs) and Wide Area Networks (WANs) and understand security techniques.
- Identify features and benefits of cloud computing and network virtualization to protectnetworks.
- Use nOS administration techniques to provide basic security.

Student Learning Outcomes:

1. Students will demonstrate fluency in describing the fundamentals of networking, and focus on the OSI model's layer functions, and different network protocols and topologies.
2. Students will demonstrate proficiency in identifying the functions of a network operating system and distinguishing between centralized, client/server, and peer-to-peer systems.
3. Students will demonstrate proficiency in setting up wired, and wireless networks and network devices.
4. Students will be able to distinguish between LANs and WANs and identify components used to expand a LAN into a WAN.
5. Students will demonstrate proficiency in describing network security challenges, vulnerabilities, threats, and remote access security.

Optional Class Material
Book on the Internet:

Computer Networking: Principle Protocols and Practice, an open book written by Dr. Olivier Bonaventure of the Universite catholique de Louvain (UCL) m Louvain-la-Neuve, Belgium.

Supportingclass material:
I will provide you with additional class materials via Blackboard to help you in better understanding some of the class subjects.

Grading Procedure:

Exams	55%
Quizzes	10%
Assignments	25%
Labs and Participation	10%
TOTAL	100%

Course Outline

Week	Topic	Chapter
1-6	Syllabus overview and Introduction to CST2307.	
	Introduction to Networking: How Networks are Used, Controlling Network Access, Networking Hardware, and Physical Topology, andThe Seven-Layer OSI Model. Quiz 1 - Chapter 1	I
	How Computers Find Each Other on Networks: Overview of Addressing on Networks, How Host Names and Domain NamesWork, How Ports and Sockets Work, and How IP Addresses areFormatted and Assigned. For chapter 2, students shout also refresh their knowledge ofnumbering systems by reviewing Appendix B. Quiz 2 - Chapter 2	2
	How Data Is Transported Over Networks: TCP/IP Core Protocolsand Routers and How They Works. Quiz 3 - Chapter 3	3

	LAB 1 Safety and troubleshooting (Ch. 1: When Working with Networks and Computers and Troubleshooting Network Problems; Ch; 2: Tools For Troubleshooting IP Address Problems; and Ch. 3: Troubleshooting Router Issues). Use of *ipconfig, nslookup,* *arp, tracert /traceroute, route, route, ping, pathping/mtr* commands as well as Wireshark program to investigate a network and its potential problems.	1-3
	Structured Cabling and Networking Elements: Network equipmentin Commercial Buildings, NICs, and Ethernets. Power and environment risks and management.	4
	Quiz4 Chapter 4	
	Exam 1 - Chapters 1-4	
7-14	Transmission Basics (signaling, modulation, multiplexing, bandwidth, baseband, broadband). Ethernet standards, interfaces, and cabling types (e.g., Twisted-Pair Cable and Fiber-Optic Cable). Quiz *5* - Chapter *5*	5
	Wireless Networking: Characteristics of Wireless Transmission, Wi-Fi WLAN Architecture, Implementing WLAN, and 802.11 Wireless Network Security. Quiz 6 - Chapter 6	6
	Cloud Computing: Cloud Computing, Remote Access, EncryptionTechniques, and Authentication Protocols. Quiz 7 - Chapter 7	7
	LAB2 Configure and diagnose LANs. Use DHCP and static IP addressing. Implement LAN security measures.	4-7
	Network Segmentation and Virtualization: Segmentation and Subnetting, Virtualization, and Virtual Network Components. Quiz 10 - Chapter 10	10
	LAB3	10

	Design, setup, and configure VLAN. Wide Area Networks: WAN Essentials, WAN topologies, PSTN, Wireless WANs, and overview of WAN protocols and technologies. Quiz 11 - Chapter 11	11
	Network Risk Management: Security Risks, Effective Security Policies, Security in Network Design, and Troubleshooting MalwareRisks and Infections. *(parts)* Quiz 8 - Chapter 8 Unified Communications and Network Performance Management. *(parts)* Quiz 9 - Chapter 9 **Exam 2** - Chapters **6-11** (plus some questions from chapters 1-7) Class meets to discuss final assignments andgrades	8 9