**Learning Tips for Chapter 7**

This chapter begins by identifying some of the major reasons why it is more challenging to transfer data wirelessly. It is important to understand these and how they are addressed.

Transmission ranges, signal interference, and using shared media contribute to less reliable data transfers in wireless networks. Additional Data Link and Physical layer communication functions are required in wireless networks including different frame structures, shared media access control protocols, Data Link layer error checking and correction, frequency band specification, and analog signal modulation.

Wi-Fi and other radio waves are analog signals. Modulation encodes data on radio waves by altering their frequencies, amplitude, and phases. QAM is very common and is the modulation technique that is most important to understand.

Different wireless technologies have different communication ranges. No matter what technology is used, communication between devices is most reliable when they are closer together than when they are just inside the maximum communication distance. In a Wi-Fi network, a device must be within the communication range of an AP to communicate with it.

Numerous factors can adversely affect or weaken wireless signals and cause errors. Collectively these make Data Link layer error detection and correction necessary in wireless networks.

It is important to understand Wi-Fi architecture in business facilities. BSSs are the building blocks of facility wide ESSs. Devices in a BSS communicate with other devices in the BSS via the AP, not directly with each other. In an ESS, BSS APs connect to a distribution system that enables devices in different BSSs to communicate and to communicate with devices in wired networks.

CSMA/CA is the official Wi-Fi protocol. It includes the DCF and PCF, but typically, only the DCF is used. This means that collision avoidance mechanisms used in the DCF are the most important ones to remember for CSMA/CD.

Wi-Fi networks continue to evolve. As they do, they are getting faster and more secure. Advances in MIMO, QAM, channel bonding, and OFDM and OFDMA are major contributors to faster connection speeds, and these are what you should focus on.

Wi-Fi networks are vulnerable to numerous threats and attacks and it valuable for you to be familiar with Wi-Fi infrastructure security best practices for business facilities. WPA3 is the latest Wi-Fi security standard, and it is valuable to have a general understanding of what it includes.

Private 5G cellular networks are becoming more common in business facilities and are being used to support IoT deployments. This chapter introduces them; the next provides additional details.

Do not ignore the Key Concepts in Chapter 7 Presentation.

You are also encouraged to leverage the supplement videos and readings for this chapter.

Use the Chapter 7 Problems and Exercises tips to assist with any problems and exercises that you may be assigned.

The appendices for Chapter 7 provide additional information on numerous topics in this chapter.

**Especially Important Sections**

Section 7.1.1

Section 7.1.2 and each of its subsections

Section 7.1.3

Section 7.1.4

Section 7.2.1

Section 7.2.2 and each of its subsections

Section 7.3 and each of its subsections

Section 7.4.1

Section 7.4.3

Section 7.5

**Especially Important Figures and Tables**

*Note:* It is important to read/study the discussion related to each figure and table that is identified.

Figure 7-2

Figure 7-3

Figure 7-4

Figures 7-5, 7-6, and 7-7

Figures 7-8, 7-9, and 7-10

Figures 7-11, 7-12, and 7-13

Table 7-2 and Figures 7-14 and 7-15

Figure 7-16 and Table 7-3

Figure 7-18

Table 7-4

Table 7-5

Figure 7-20

Figure 7-22

Table 7-6

Figure 7-24

Table 7-7 and Figure 7-25

Figure 7-27

Figure 7-28

Table 7-8

Figure 7-31

Figure 7-32

Figure 7-33

Figure 7-34

Figure 7-36

Figure 7-37

Figure 7-38

Table 7-9

Table 7-10

Table 7-11

Table 7-13

Table 7-14

**Especially Important Key Terms**

Carrier signal

Channel bonding

Extended service set (ESS)

Modem

Modulation

Multiple-input and multiple output (MIMO)

Orthogonal frequency division multiplexing (OFDM)

Orthogonal frequency division multiple access (OFDMA)

Quadrature amplitude modulation (QAM)

Private 5G network

Service set identifier (SSID)

Wi-Fi channel

**Especially Important Review Questions**

Questions 2-11, 13, 16-18, 21-28

**Especially Valuable Problems and Exercises**

Exercises 7-1 and 7-2