

SPRINGFIELD TECHNICAL COMMUNITY COLLEGE
ACADEMIC AFFAIRS

Course Number: ELE-230 Class/Lect. Hours: 2 Lab Hours: 3 Credits: 3 Dept.: Electronics Technology
Course Title: Wireless Networks Semester: Fall Year: 2015

Course Description, Prerequisite, Corequisite:

This course will introduce the student to the fundamentals of wireless networks typically used for data transmission applications in an industrial, clinical, or home setting and also those networks used to implement cyber-physical system applications (i.e applications of the Internet of Things or IoT). Starting with an introduction to the concepts of wireless networking, the student is quickly introduced to the ideas of radio frequency (RF) signals, the frequency bands used for networking, and fundamentals of digital modulation techniques. The function of the wireless networking physical layer components (i.e. system hardware: transmitter, receiver, transmission lines, and antennas and the basics of electromagnetic (EM) propagation) are presented and related to the particular wireless system application and associated frequency band of operation. Present day wireless cellular technology (i.e. 4G and soon to be implemented 5G) are introduced first and then the most prevalent IEEE wireless networking standards (IEEE 802.11.X, IEEE 802.15.X, and IEEE 802.16.X) are covered. Emphasis is placed on the WiFi networking standard (IEEE 802.11.X) and personal area networking standard (IEEE 802.15.X) for home, industrial, and cyber-physical applications. In lab, students are introduced to basic test and measurement equipment used in this field and the fundamentals of wireless system operation evaluation. Additional lab work will include the setting up, deployment, and testing of various wireless networks.

Prerequisites: Senior Standing

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Course Objectives	Competencies
1. To become familiar with the concept of a wireless network	<ul style="list-style-type: none">a. To be able to describe the purpose of a wireless network and the components used to construct such a systemb. To be able to recognize the functions of the various components of a wireless networkc. To be able to describe how the various nodes of a wireless network are addressedd. To be able to describe the fundamental concepts of TCP/IP
2. To become familiar with the limitations of wireless networks due to various system impairments	<ul style="list-style-type: none">a. To be able to demonstrate knowledge about system limitations due to noise and electromagnetic propagation properties
3. To become familiar with basic sub-systems of wireless networks and electronic communications systems	<ul style="list-style-type: none">a. To be aware of the functions of the various kinds of electronic filtersb. To be aware of the operation of RF amplifiers, oscillators, mixers, frequency synthesizers, PLLs, A/D and D/A converters, Software defined Radio (SDR), and detectorsc. To be conversant with the use of dBs and referenced dBs
4. To become familiar with the concept of RF signals, wireless networking frequency bands, and digital modulation	<ul style="list-style-type: none">a. To be able to describe the concepts of RF signals and digital modulationb. To be able to demonstrate knowledge of the various frequency bands used for wireless networking and other electronic communications application
5. To become familiar with the functions of the physical layer components of a wireless network	<ul style="list-style-type: none">a. To be able to demonstrate a system level knowledge of wireless hardware: transmitter, receiver, transmission line, and antenna hardware

Course Objectives	Competencies
<p>6. To become familiar with the properties of electromagnetic propagation</p> <p>7. To become familiar with today's wireless networking systems</p> <p>8. To become familiar with typical wireless test and measurement equipment</p> <p>9. To become familiar with the techniques used to diagnose and evaluate the correct operation of wireless networks</p>	<p>a. To be able to demonstrate a knowledge of EM propagation characteristics and relate this knowledge to the frequency bands used by wireless networks</p> <p>a. To be able to demonstrate a knowledge of various wireless networking technologies including cellular, IEEE 802.11.X, and IEEE 802.15.X, and IEEE 802.16.X and the various applications supported by these technologies</p> <p>a. To be aware of the use and function of typical test equipment used in this field including: power meters, spectrum analyzers, and RF sniffer software like WireShark</p> <p>a. To be able to demonstrate the ability to correctly evaluate the proper operation of a wireless network</p>