Wireless Networks

Spring 2022

Course Description:

Introductory course in mobile, cellular, and wireless networks providing fundamental techniques in architecture, operation and security of second, third, and fourth generation wireless networks. The evolution of wireless networks will be discussed covering infrastructure components, protocols, logical channels, security, and registration procedures. Starting with the technical background, we will cover transmission fundamentals, communication networks, and protocol and TCP/IP Suite. The technologies used will be covered next resulting in the ability to describe the wireless channel, signal encoding, orthogonal frequency division multiplexing, spread spectrum, and coding and error control. The evolution into wireless local and personal area networks covering IEEE 802.11 and 802.15 standards will be covered in order to discuss some of the biggest technology trends and threat areas, the smart home. Wireless network and applications will be covered near the end of the course allowing discovery and discussion of fourth generation systems and long-term evolution. Smart phone technologies, embedded operating systems, location-based services and security throughout all components of mobile technologies will be covered. Pros and cons of security will be discussed and alternate solutions with be theorized.

Course Instructor: Bhanukiran Gurijala, bgurijala@utep.edu

Course Teaching Assistant: David Reyes, dreyes15@miners.utep.edu

Office Hours: MW 10:00 – 11:30 AM

Course Schedule: Tuesdays 6-8:50 PM

Course Text:

- Cory Beard, William Stallings: Wireless Communication Networks and Systems
- Supplementary and online technical articles to be provided during the semester.

Course Hardware:

- https://www.amazon.com/JahyShow®-DVB-T-RTL2832U-Receiver-Compatible/dp/B01H830YQ6/ref=sr_1_20?crid=25XV3SZ1CNEQZ&keywords=rtl+sdr&qid=1639508466&s=electronics&sprefix=rtl%2Celectronics%2C213&sr=1-20
- (Optional) https://hakshop.myshopify.com/collections/wireless-gear/products/yard-stick-one?variant=6651566213

- (Optional)https://www.amazon.com/NooElec-Software-Defined-Antenna-Adapter/dp/B01K1CCHR0

Grading Policy:

- Project: 50%
- Exams: 50%

Homework Assignments:

There will not be any homework assigned, however it is recommended to do the review and problem questions at the end of the chapters covered as they will aid in your preparation for exams.

Exams:

- Exam #1: 15%
- Exam #2: 15%
- Final: 20%

Grading Rules:

- All students will be required to take all exams. If you cannot take the exams when scheduled due to a legitimate reason, the exam can be scheduled to be made up at an earlier or later date.
- Late assignments will not be accepted.

Tentative Syllabus:

- Technical Background
  - Transmission Fundamentals
  - Protocols
  - Networks
- Wireless Communication Technology
  - Overview
  - Generations of Cellular
  - Wireless Channel

    - Signal Encoding
    - Orthogonal Frequency Division Multiplexing
    - Error Control
- Wireless Local and Personal Area Networks
    - Wireless LAN - 802.11
    - Bluetooth
    - Zigbee - 802.15.4
- Wireless Mobile Networks and Applications
    - Cellular Wireless Networks
    - Fourth Generation Systems
    - Mobile Applications and IP
    - Long-Range Communications
- Security in Wireless Technologies
    - Securing Data Transmissions
    - Backwards Compatibility
    - Authentication
- Traffic Analysis

Week Breakdown

Week 1 - Introduction to Wireless Networks, Networking review/Intro

Week 2 - Transmission Fundamentals, Communication Networks

Week 3 - Protocols and the TCP/IP Suite

Week 4 - Overview of Wireless Communications, The Wireless Channel

Week 5 - Exam 1

Week 6 - Orthogonal Frequency Division Multiplexing

Week 7 - Spread Spectrum

Week 8 - Coding and Error Control

Week 9 - Cellular Wireless Networks

Week 10 - Fourth Generation Systems

Week 11 - Exam 2

Week 12 - Mobile IP and Applications

Week 13 - 802.11 and 802.15

Week 14 - Presentations

Week 15 - Presentations

Final Exam