

EE469 Wireless Data Networks

Credits: 3

Categorization of credits: engineering topic

Instructor(s): Mark Nelson. Yingfei Dong. Revised Jan. 14th, 2021.

Textbook and Other Required Materials:

None required, however material will be derived from *The Essential Guide to Telecommunications*, 5th Edition.

Handouts/Notes and Supplemental Text: will be available on-line or distributed in classes.

Designation: Technical Elective

Catalog Description:

Mobile agent's platforms and systems, mobile agent-based service implementation, middleware, and configuration, wireless local area networks, wireless protocols, network architecture supporting wireless applications, routing protocols in mobile and wireless networks, handoff in mobile and wireless networks.

Pre- and Co-requisites: EE 344 "Networking I" and EE 367 "Computer Data Structures and Algorithms" or consent w/ equivalent of 2 semesters of programming.

Class/Lab Schedule: 3 lecture hours per week.

Topics Covered:

- Terrestrial telecommunications systems
- Voice over IP telecommunications systems
- Cellular voice & data communications (AMPS, GPRS, GSM, LTE and 5G)
- Mobile wireless protocols (Bluetooth, Zigbee, RFID, 802.11)
- Selected topics (telecom systems around the world, nontraditional carriers, software defined radios, mobile encryption standards)

Labs and Exercises:

- Circuit switched lab: Old school telephone service
- Encoding lab
- T1/E1 emulator labs 1 & 2: Dialplans, ISDN messaging & trunk configuration
- VoIP lab 1: Packet capture & analysis of voice call
- VoIP lab 2: Packet capture & analysis of SIP message flow
- GSM labs 1, 2 & 3
- Bluetooth & NFC & RFID lab
- 802.11 lab

Grading: The final grade will be based on:

- Midterm test 1 (20%)

- Midterm test 2 (20%)
- Weekly reading assignments, labs & assessments via Laulima (30%)
- Attendance / participation & Hex Drills (10%)
- Final exam: Comprehensive (20%)

Course Objectives and Their Relationship to Program Objectives:

Students will be able to: 1) understand the fundamentals of network communication methods and differentiate packet-switched and circuit-switched networks; 2) Understand the architectural differences between various generations of terrestrial, mobile and cellular technologies; 3) Identify the security properties and operational attributes of various wireless technologies. 4) Students also learn low-level wireless system skills to enhance their understanding of wireless communications. Class labs will help students to practice their learning and gain solid experiences. [Program Objectives this course addresses: 1, 2, 3, and 5.]

Course Outcomes and Their Relationship to Program Outcomes:

The following are the course outcomes and the subset of Program Outcomes (numbered 1-7 in square braces "[]") they address:

- Understand the fundamental communication system design and methods [1].
- Understand analog-to-digital encoding of voice and digital-to-analog playback [2].
- Understand the basics of practical communication protocols and their implementations [1].
- Understand the basics of Voice over IP protocols and the similarities/differences with traditional telecommunications systems. [1].
- Understand the cellular telecommunications system to include: History, economics, future challenges, ethics [4].
- Learn modern communication modulation approaches and GSM/GPRS cellular voice and data protocol suites, and 5G mobility and the transition from LTE to 5G [1].
- Understand modern codecs and encryption standards [6].
- Learn real system such as smartphones, embedded operating systems and cellular data modems, and technologies to enable mobile data platforms to include: Bluetooth, Zigbee, RFID, 802.11 [1,6]
- Know nontraditional carriers: AIS, Satellites, EPIRB, Inmarsat, etc. [1].

Contribution of Course to Meeting the Professional Component

Computer System, computer networks, communication protocols and systems

Computer Usage:

Heavy computer usage is required.