Baylor University

ELC 5396 **Wireless Communication and Networking** Fall 2017

35383	ELC 5396-04	Special Topics in Engineering	3	TR	ROGERS 312	12:30 PM-1:45 PM

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Course website: http://www.profdong.com/elc5396_fall2017.html
Office Hours: TR 3:00 PM – 5:00 PM; other by appointment

Course Description:

This course is designed to serve as a graduate-level course on wireless communication and networking. Students are expected to be familiar with the basic knowledge of communication systems and digital communications. The course covers topics of:

Fundamentals and PHY:

- Channel modeling, characterization and estimation
- Modulation, coding, diversity, equalization, synchronization
- OFDM, multi-carrier modulation, waveform design
- Interference modeling, management, cancellation and alignment
- MIMO, massive MIMO and cloud-RAN
- Cooperative, device-to-device and multi-hop communication
- Cognitive radio, spectrum sensing
- Energy efficient and energy harvesting PHY layer design
- Joint information and energy transmission
- PHY layer security and privacy

MAC and Wireless Networks:

- Wireless MAC protocols for 5G: design, analysis, and optimization
- MAC protocol for energy harvesting wireless networks
- MAC design for multitier cellular/small cell networks
- Multiple access in machine-to-machine communication
- Wireless network functions virtualization
- Routing in wireless networks
- Cognitive radio and networking
- Resource management and optimization

Concurrent Topics:

- Context and location-aware wireless services and applications
- Wireless body area networks and e-health services
- Intelligent transportation systems
- Dynamic sensor networks for urban applications

Prerequisite: ELC 4350 – Principles of Communication
(Optional) ELC 5396 – Digital Communication

Textbooks:

Note: The textbooks are recommended. Classes are based on recent topics and some handouts will be available in the classroom.

Recommended: Fundamentals of Wireless Communication
Authors: David Tse and Pramod Viswanath
Cambridge University Press, 2005

Recommended: Wireless Communication
Author: Andrea Goldsmith
Cambridge University Press, 2005

Recommended: Digital Communications
Authors: John Proakis and Masoud Salehi
McGraw-Hill Science/Engineering/Math; 5th edition, 2007

Computer Usage:

MATLAB and Simulink Communications Toolbox (available on computers of College of Engineering and Computer Science)

We will use computers extensively to program and verify homework assignments. Various software tools are available at the ROGERS computer center. To effectively implement and analyze digital communications algorithms, we will program in MATLAB (or Python, C if you so prefer).

Classroom Demonstration and Experiment:

Classroom demonstration and experiment will be carried out with the NI/Ettus Research's Universal Software Radio Peripheral (USRP) testbed. It is a flexible transceiver that connects to a standard PC and makes a wireless prototyping system. Another experiment and research testbed we can use is the Wireless Open Access Research Platform (WARP).

The demonstration and experiment will be in the Cyber-Physical Systems Research Lab, BRIC 2111.05. I will inform you when we need to move a class from Rogers ECS Building to BRIC some weeks.

Reading Assignment:

There will be frequent reading assignments. Reading assignments include textbook reading and research paper reading. The outcome of your reading assignments will be evaluated through classroom discussions.

Homework and Exams:

There will be homework assignments every two to three weeks. Homework may include written problems and computer programming problems.

There will be two in-class midterm exams. The dates for the exams are as follows.

- Midterm Exam 1 Tuesday, Oct. 17, 2017
- Midterm Exam 2 Thursday, Nov. 16, 2017

Term Project:

There will be a term project which is in addition to the two midterm exams. Each project can be done by a single person or a team of two people. For each project, we will discuss and determine on a topic that is relevant to cutting-edge researches on wireless communication and networking. The outcomes of the project can be simulation results or experiment results.

Performance Evaluation:

- Reading Assignments 10%
- Homework and Experiment 20%
- Midterm Exam 1 20%
- Midterm Exam 2 20%
- Term Project 30%