ESE 340 Basic Communications

Course Objective

This course will start from basic communications theory and focus on the wireless communications. The use of wireless communications has expanded dramatically worldwide. Cell phones are ubiquitous. Mobile terminals have expanded from carrying voice principally to sending, receiving, processing and storing data and images. Wi-Fi, an example of a wireless local area network has caught on spectacularly, joining the major cellular networks deployed throughout the world. Wireless communications has changed our everyday life and is applied to enable intelligent transportation systems, smart grid, smart cities, pervasive healthcare, pervasive computing, etc. This course provides a basic introduction to this booming field. Students are expected to come away with a thorough grounding in the fundamental aspect of wireless communications, as well as the understanding of the principles of operation of second-, third- and fourth- generation cellular systems and wireless LANs.

Course Description

This course covers materials in the area of basic communications and wireless communications: wireless channels, modulation techniques, basic coding techniques, multiple access schemes, channel allocation, power control, accessing and scheduling techniques, resource management, handoff, and admission control. It reviews the design and provides basic analysis on the current cellular systems, wireless local and personal area networks

Course Outline

- Overview of wireless techniques
- Characteristics of the mobile radio environment–propagation phenomena
- Cellular concept and channel allocation
- Dynamic channel allocation and power control
- Modulation techniques (including OFDM)
- Multiple access techniques: FDMA, TDMA, CDMA; system capacity comparisons
- Coding for error detection and correction
- Second-generation, digital, wireless systems
- Performance analysis: admission control and handoffs
- 2.5G/3G Mobile wireless systems: packet switched data
- Wireless local and personal area networks

Prerequisites

ESE306, ESE 305 or ESE337 are recommended (can take at the same time) or permission of instructor. Basic knowledge on probability and signal processing is expected.

Course Benefits

- Obtain fundamental knowledge on wireless communications, one of the quickest growth areas that transforms almost all fields. It serves as the basis for a broad range of wireless applications, mobile and pervasive computing.

Lecturer	Professor Xin Wang	
	Class location:	Light Eng 154
	Class time:	Tue: 2:30-3:50 pm
	Office hours:	Tue: 11:30 am – 1:30 pm; Th: 4:00 – 6:00 pm
	Office phone:	+1 (631) 632 8402
	Email address:	x.wang@stonybrook.edu
Credits for course:	3	
Textbook:	• Mischa Schwartz, Mobile Wireless Communications, Cambridge University Press, 2005.	
Reference text(s): (for the class)	Lecture notes: Posted on blackboard • Theodore Rappaport, Wireless Communications, Principles and Practice, Second Edition, Prentice Hall, 2002. • David Tse, Pramod Viswanath, Fundamentals of Wireless Communications, Cambridge University Press, 2005. • Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2005. • Vijay K. Garg, Wireless Network Evolution: 2G to 3G, Prentice Hall, 2001. • John G. Proakis, Digital Communications, 4th ed., Boston : McGraw-Hill, c2001.	

Reference text(s) (for general computer networks)	James F. Kurose and Keith W. Ross, Computer Networking: A Top-Down Approach Featuring the Internet, Addison Wesley, 2016. ISBN 0-201-477114. Class notes, copies of slides and reference documents will be available whiteboard. There is also a general list of Internet resources.
Assignments:	Several homework assignments.
Project(s):	Select from a list of suggested topics, or discuss with the instructor. ☐ Single or group of two. ☐ Thoroughly search and read papers on a selected topic, and write a survey paper. ☐ Delivery: final report on the surveyed topic, in technical report format.
Midterm exam:	Time TBD
Grading:	Assignments 20%, midterm 30%, final 30%, project 20%. No late homework will be accepted.

Outcome of ESE 340

The course targets to equip students with basic communication knowledge. With the team oriented project on state of art research in the field, the students are trained with team work and communication skills, independent research capability, and writing skills to critically survey the research field.

Students will acquire all the following capability as a result of the course:

1. an ability to apply knowledge of mathematics, science, and engineering;
2. an ability to identify, formulate, and solve engineering problems;
3. an ability to communicate effectively;
4. an ability to understand current research issues; and
5. an ability to conduct research.