ELEG 56903 Wireless Communications
Course Syllabus

General Information:

Instructor: Jingxian Wu
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Phone: (479) 575-6584
Office Hour: Tu. 12:30-1:30

Required Material:

- Software: Matlab with Signal Processing Toolbox

Reference:

- "Wireless Communications: From Fundamentals to Beyond 5G", Andreas Molisch, Wiley, 3rd ed. 2022.
- "Wireless Communications", Andrea Goldsmith, Cambridge University Press, 2005.
- "Principles of Mobile Communication", G.L. Stuber, 2nd ed., Kluwer Academic, 2001.
- "Wireless Communications: principles and practice", T.S. Rappaport, 2nd ed., Prentice Hall, 2002.

Prerequisites:

Signal and System, Probability and Random Process, Communication Theory

- Familiar with Matlab Programming
- Knowledge of linear time invariant system, Fourier series and transform, Laplace transform, time domain and frequency domain representation of signals, power spectrum density, and energy spectrum density of deterministic signals
- Knowledge of discrete and continuous random variable, probability mass function, probability density function, moments of random variables, moment generating function
- Knowledge of random process, wide sense stationary random process, auto-correlation function, power spectrum density of random signals
- Knowledge of digital modulation and demodulation
- Knowledge of optimum receiver design

Learning Objectives:

To understand the theory of wireless propagation environment and wireless communication systems, to be able to design and analyze optimum receivers for various wireless communication in fading channel, to understand the theories and practice of diversity, multiple input multiple output (MIMO) system, space time coding, spread spectrum modulation, orthogonal frequency division multiple access, to be able to simulate and design wireless communication systems.

Grading:

- Test 1 30%
- Test 2 30%
- Homework 20%
- Projects 20%

- A: $90 \leq \text{grade} \leq 100$
- B: $80 \leq \text{grade} < 90$
- C: $70 \leq \text{grade} < 80$
- D: $60 \leq \text{grade} < 70$
- F: $0 \leq \text{grade} < 60$

- Due dates for homework and lab report will be strictly enforced. Late submission within one week after due date will receive a 20% grade deduction, and no credit if submitted after one week from the due date.
- If for some legitimate reason (sickness, death in the family, etc.), you cannot

take an **exam** on the scheduled day, you must notify the instructor **prior** to the exam.

Online Resources:

- Course materials (Slides, Homework, Projects, References, etc) can be found at https://wuj.hosted.uark.edu/teaching/eleg5693/eleg5693.html
- Please check course website **at least once per week** for updates.

Academic Honesty:

Each University of Arkansas student is required to be familiar with and abide by the University's 'Academic Integrity Policy' which may be found at http://provost.uark.edu/
Students with questions about how these policies apply to a particular course or assignment should immediately contact their instructor.

Tentative Schedule:

- Week 1: Overview of Wireless Communications
- Week 2: Math review
- Week 3: Propagation and Noise
- Week 4: Propagation and Noise; Digital Modulation
- Week 5: Digital Modulation
- Week 6: Source and Channel Coding
- Week 7: Source and Channel Coding
- Week 8: Equalization
- Week 9: Equalization
- Week 10: MIMO
- Week 11: MIMO
- Week 12: Orthogonal Frequency Division Multiplexing
- Week 13: Orthogonal Frequency Division Multiplexing
- Week 14: Spread Spectrum and CDMA
- Week 15: Wireless Networks
- Week 16: Review

Project Schedule:

- Project 1: Simulator of Fading
- Project 2: BER of 8PSK in Fading
- Project 3: Convolutional Coding and Decoding
- Project 4: Space-Time Block Code
- Project 5: Orthogonal Frequency Division Multiplexing

The above schedule is subject to change without prior notice.