ECE 4715, Communication Systems Laboratory
Fall, 2016

Course Description: This laboratory exposes students to principles and practice of modern analog and digital communication techniques. Laboratory modules focus on baseband communication (analog and digital), sampling and quantization, carrier modulation (AM, FM, QAM, OFDM), as well as measurements of SNR, bit error probability, and the effect of noise and channel distortion.

Exercises are built around Matlab and use of the USRP software radio platform for carrier-based techniques. Students will work in two-person teams, and will submit a written team report following each module. At the end of the semester, each team will craft and implement a communication project of their choice that uses the USRP.

Important background: Coursework in signals and systems, primarily continuous-time; some exposure to probability theory and random variables. Consult instructor if in doubt. Co-requisite: ECE 4710, Communications.

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Texts: Laboratory manual, to be posted on Collab

Outline:

1. Analog Baseband Communication

2. Sampling and Quantization

3. Digital Baseband Communication (two sessions)

4. Introduction to Universal Software Radio Platform (USRP) and Bandpass Signals

5. Amplitude Modulation and Demodulation

6. Angle Modulation and Demodulation (two sessions)

7. Quadrature Amplitude Modulation (two sessions)

8. Orthogonal Frequency Division Multiplexing (OFDM)

9. Open (projects, e.g., OFDM, MIMO, equalization, RF links)

Assessment:

- laboratory preparation (knowing what's going on), includes prelab work (20%)

- laboratory performance (participation, organization in conduct of lab, data taking) (30%)

- written reports (40%)

- final project (10%) (difficulty, completion, report)