

**COMMONWEALTH GRADUATE ENGINEERING PROGRAM
DISTANCE LEARNING COURSE PLANNING SHEET
UNIVERSITY OF VIRGINIA**

Course: ECE 613 – Communication Systems Engineering
Semester: Fall 2008
Instructor: Stephen G. Wilson
Phone No.: 434-924-6091
Office Address: University of Virginia; Dept. of Electrical and Computer Engineering;
Thornton Hall C318; Charlottesville, VA 22903
E-Mail Address: steve_wilson@virginia.edu

Textbook(s): (Student to purchase)

Haykin, *Communication Systems*, 4th Edition, J. W. Wiley (required)
Lecture notes (optional) are available from University Bookstore (434-924-1066)

Reference(s): Limit 4

Computer Needs:

Computer Capability:

Software required:
Provided?

Other:

ECE 613, Communication Systems Engineering – Fall, 2008

Course Description: This course provides a survey of theory and applications relevant to modern communication systems, and attempts to bring students with an undergraduate background in electrical engineering to the state-of-technology. The course covers concepts in deterministic and random signal analysis, link engineering and noise calculations, analog modulation and detection (amplitude and angle modulation), sampling and quantization, digital transmission theory and an overview of satellite systems and spread spectrum systems. Coverage is primarily on the ‘physical’ layer of communication systems, as opposed to networking issues. More advanced treatment of digital communication, including coding techniques, is provided in ECE 712, scheduled for Spring, 2009. Reasonable proficiency with Matlab for simulation of communication systems will be developed through demos and homework assignments.

Important background: Coursework in signals and systems, primarily continuous-time; some exposure to probability theory and random variables.

Instructor: Stephen G. Wilson, Professor of Electrical and Computer Engineering, C-319, Thornton Hall, steve_wilson@virginia.edu, 434-924-6091

Texts: Haykin, *Communication Systems*, 4th edition, J.W. Wiley, required
Lecture notes (optional) are available at Newcomb Hall Bookstore.

Outline:

1. The generic communication system: fundamental questions, and tools of analysis

2. Elements of signal and system theory (review)
3. Link power analysis: guided wave and free-space propagation laws; antenna gain and beamwidth; link equation, power budgets; extension to wireless propagation models
4. Random signals; probability, characterization of random variables, and stochastic processes, Wiener filter
5. Amplitude modulation: DSB-SC, DSB-AM, SSB; spectrum and SNR behavior in noise
6. Angle modulation: FM, PM; spectrum properties and SNR behavior in noise
7. Sampling (incl bandpass sampling) and quantization; PCM applications
8. Baseband digital transmission; matched filter, probability of error, eye pattern, Nyquist pulse shaping, equalization
9. Digital carrier transmission: PSK, FSK, QPSK, QAM; error probability; power spectrum
10. Satellite systems (time permitting), or
11. Spread spectrum technology (time permitting)

Assessment:

- homework about 7 sets (30%);
- end-of-term project report (10%);
- mid-term exam (25%);
- final exam (30%);
- instructor's evaluation (5%).