EEE 304 Signals and Systems II (4 hours) [F,S]

Course (Catalog) Description:

Communication, signal processing, control systems, continuous, discrete transforms, sampling theorem, analog, digital modulation, filter design, signal processing applications, state space concepts.

Lecture, laboratory. Pathway course, required for all systems majors/minors (select 4 out of 6).

Prerequisite:
EEE 203.

Textbook:
Openheim & Willsky w/ H. Nawab, *Signals and Systems*, 2nd ed., Pearson 1997.

Supplemental Materials:
Lab textbooks on MATLAB and LABVIEW.

Coordinator:
Area committee on communications, signal processing, and control.

Prerequisites by Topic:
1. Continuous transform of Laplace and Fourier
2. Discrete Fourier transform and z-transform.

Course Objective:
Students can apply system techniques to analyze and design communication, signal processing, and control systems.

Course Outcomes:
1. Students are proficient in frequency domain techniques.
2. Students understand the digitization of analog signals through sampling and quantization.
3. Students understand analog communications and elementary digital communications.
4. Students further their understanding of z-transform
5. Students can apply FFT and z-transform for signal processing.
6. Students understands structure and design of digital filters
7. Students can analyze control systems and their stability.
8. Students can synthesize simple control system applications.

Course Topics:
1. Review of Laplace transform, CTFT, DTFT, and z-transform. Nyquisit sampling theorem (2 weeks)
2. Analog AM and FM modulation (2 weeks)
3. Sketches of digital modulation (1 week)
4. Structure and design of digital filters (1.5 weeks)
5. Applications of z-transforms for digital signal processing (1.5 weeks)

6. Stability of control systems. Synthesis of control systems (1.5 weeks)
7. Tests, quizzes, and examinations (2 weeks)

Computer Usage:
Use of MATLAB and/or LABVIEW for simulation and design of communication, signal processing, and control systems.

Laboratory Experiments:
Students meet weekly for a three-hour laboratory under the guidance of a TA. Experiment topics are:
1. Continuous and discrete time spectral measurements
2. Digitization of signals
3. Analog modulation systhesis
4. Digital modulation synthesis
5. Digital filter design
6. Digital signal processing application
7. Control application synthesis. Stability experimentation.

Assessment: Through homeworks, quizzes, tests and final exam.

Course Contribution to Engineering Science and Design:
EEE304 contributes to engineering science through system analysis, problem solving, computer solutions, and synthesis of communication, signal processing and control systems.

Course Relationship to Program Outcomes:
a: During both the instruction and the lab the students study problems in the systems area that are open-ended and more complex. Differential equations and system theory (transforms, frequency domain methods) are taught in depth. Basic system analysis is a fundamental skill needed in industry and this course provides perspectives on the complexity and integration of real-life applications.
e: Additional practice in problem solving is obtained through open-ended lab exercises.
k: The course provides extensive lab experience on contemporary system synthesis techniques and hands-on familiarity with the use of modern computational tools (MATLAB, LABVIEW).

Person preparing this description and date of preparation: K. Tsakalis, September 8, 2008, June 2015.