ENEE 601 SIGNAL AND LINEAR SYSTEMS THEORY

SYLLABUS (Fall 2006)

Course Description: This is a first semester, required, graduate course for electrical engineering (EE) majors that covers the fundamentals of signal and linear systems theory. The course will address both continuous-time and discrete-time representations and both time-invariant and time-variant systems. Topics covered include: (1) Fundamental linear space and matrix concepts; (2) Signal representations, properties, transforms, and sampling; (3) System representations, properties, and transforms; and (4) New transforms and representations, e.g., joint-domain transforms and multirate/filterbank representations. The goal of this course is to provide the beginning EE graduate student with the foundations and tools of signal and linear system theory, particularly the time-variant case in both continuous-time and discrete-time, necessary for subsequent courses in the overall electrical engineering program, in general, and the communications and signal processing subprogram, in particular, and for conducting research in related areas. Co-requisite: ENEE 620. (3 Credits)

I. Mathematical Notation and Review (2 wks)
Basic linear space concepts; vectors, matrices, quadratic forms, matrix calculus; eigenvalues & eigenfunctions; Fourier, Laplace, & z-transforms; correlation.

II. Signals and Sequences: Representations & Properties (3 wks)
Representations and domains of continuous-time (CT) & discrete-time (DT) signals; conversion between CT & DT signals; sampling theorems; fundamental signals.

III. Linear Systems: Representations & Properties (5 wks)
Differential & difference equations; state-variable equations; input-output representations (impulse response, transition matrix, transfer function); time-variant & time-invariant; linear feedback; signal-graph concepts; stability.

IV. Advanced Topics: New Transforms & Representations (3 wks)
Multirate & filterbank representations; joint-domain transforms (wavelet, Gabor (STFT), Wigner, Zak, Frames).


Grading: Hmwk ~ 20% Exams/Projects ~ 40% Final ~ 40%

Class Meetings: TuTh 4 -5:15pm, Room TBA

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