REVIEW FOR EE 317 MIDTERM EXAM #2 (Spring 2001)

- Make sure you are still familiar with all of the material covered on Exam #1 (listed after the Exam #2 material). The material covered on Exam #2 builds on the earlier material!

Fourier Series
- Exponential form
- Trigonometric form (use requires signal to be real-valued)
- Combined trigonometric form (use requires signal to be real-valued)

Conversions of coefficients from one form to another
Definitions of "weight," "coefficient," "phase shift," and "harmonic"
"Time domain" *vs.* "Frequency domain"
Derivations (the major points, not the details) of formulas for coefficients
Derivation of Fourier series for specific waveforms,
- including reduction of complicated expressions to simpler ones;
- *e.g.*, $\exp(-jn\pi) = (-1)^n$, $\exp(-jn\pi/2) = (-j)^n$, etc.

Euler's formula, formulas for sine and cosine in terms of complex exponentials
Magnitude and phase spectra
Simplifications when signal is an even ("cosine-like") or odd ("sine-like") function
Properties of Fourier series
- Linearity (superposition)
- Amplitude shift (offset)
- Time shift (leading to phase shift in frequency domain)

Fourier Transform
Transform integral formulas
- Forward (*t*-domain to T-domain)
- Inverse (T-domain to *t*-domain)

Periodic *vs.* aperiodic signals
Frequency content information from Fourier transform
Magnitude and phase spectra
Properties of Fourier transform
- Linearity
- Fourier transforms of periodic signals
- Convolution
- Symmetry
- Time shift
- Frequency shift
- Time scaling
- Combination of time shifting and scaling
- Integration
- Differentiation
- Duality

Parseval's theorem
Energy signals, energy spectral density
Power signals, power spectral density
Fraction of energy/power content of a signal over a finite bandwidth

Applications of Fourier transform
Ideal filters
Types of filters (Lowpass, Highpass, Bandpass, Bandstop)
Real filters
Phasors *vs.* Fourier transforms
Transfer (or frequency response) function
Energy/power transfer through filter ($|H(T)|^2$)
Cut-off (3-dB) frequency
Definition of attenuation
Phase shift through filter

Material Covered on Exam #1:

Definitions of continuous-time vs. discrete time signals and systems
    (also, analog vs. digital)
Transformations of continuous-time signals
    Time-reversal
    Time-scaling
    Time-shifting
    Combinations of time-reversal, scaling, and shifting
    Amplitude-scaling
    Amplitude-shifting
    Amplitude-reversal (inversion)
Characteristics of even, odd, and periodic signals
Sums of periodic signals with unequal frequencies
Singularity functions
    Unit step
    Rectangular pulse (rect function)
    Unit ramp
    Unit impulse function, including its properties
Mathematical representations of functions (especially piecewise linear functions)
Block diagrams of systems
Properties of Continuous-Time systems
    Memory
    Invertibility and inverse systems
    Linearity
    Time-invariance
    Causality
    Stability (BIBO)
Linear Time-Invariant (LTI) systems – why convolution applies
Convolution – mathematical and graphical solutions
Finding h(t) for an LTI system – basic approaches
Properties of Convolution – commutative, associative, and distributive
Properties of LTI systems
    Memory
    Invertibility
    Causality
    Stability (BIBO)