ECE 3510 Exam 1 Study Guide

First Exam will be on Friday 2/10/17

The exam will be **closed book**, with calculator, but will include the information shown below, if needed.

The exam will cover

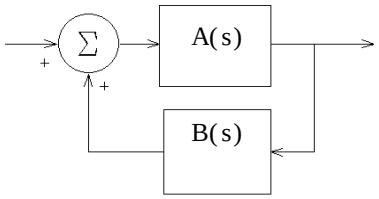
1. Signals and blocks in a feedback loop
2. Laplace transforms
   You may have to find a simple Laplace transform from the basic relation.

   $$F(s) = \int_0^{\infty} f(t)\cdot e^{-s\cdot t}\,dt$$

   You may have to look up and adapt a table entries
3. Inverse Laplace transforms (partial fractions)
4. Relationship of signals to pole locations
5. Boundedness and convergence of signals
6. $H(s)$ of circuits
7. Block Diagrams & their transfer functions

   Including general interconnected systems

   Standard feedback loop transfer function



$$\frac{A(s)}{1 - A(s)\cdot B(s)}$$

8. BIBO Stability
9. Impulse & step responses
10. Steady-state (DC gain) & transient step responses
11. Effects of pole locations on step response
12. Sinusoidal responses, effects of poles & zeros, etc.

    Steady-state AC analysis to get $y_{ss}(t)$
13. Transient response to sinusoidal inputs
14. Effect of initial conditions

$$\mathbf{Y}(s) = \underbrace{\frac{b_2\cdot s^2 + b_1\cdot s + b_0}{s^2 + a_1\cdot s + a_0}}_{\mathbf{H}(s)}\cdot\mathbf{X}(s) + \frac{s\cdot y(0) + \frac{d}{dt}y(0) + a_1\cdot y(0) - b_2\cdot s\cdot x(0) - b_2\cdot\frac{d}{dt}x(0) - b_1\cdot x(0)}{s^2 + a_1\cdot s + a_0}$$

15. Know the advantages of the state-space method

    Easily handles multiple inputs, multiple outputs and initial conditions
    Can be used with nonlinear systems
    Can be used with time-varying systems
    Reveals unstable systems that have stable transfer functions (pole-zero cancellations). You can determine:
    - Controllability: State variables can all be affected by the input
    - Observability: State variables are all "observeable" from the output

    Basis of Optimal and Adaptive control methods
16. Homeworks 1 - 7
17. Labs 1 & 2

Information you will be given (closed book part, if needed)

Euler's equations

Laplace Transform table class handout

You can download old exams from **Homework and Notes** page on class web site.
But remember, they may cover more than we did in our class.

http://www.ece.utah.edu/~ece3510/