ECE 3510 Exam 1 Study Guide

First Exam will be on Wednesday 2/6/19

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

NOTE: You will be asked to sign an agreement at the time of the exam. An example is on the back of this page.

The exam will cover

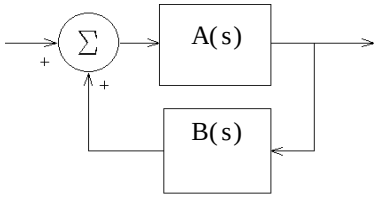
1. Signals and blocks in a feedback loop
2. Laplace transforms
   You may have to find a simple Laplace transform from the basic relation.
   $$F(s) = \int_0^{\infty} f(t)\cdot e^{-s\cdot t}\,dt$$
   You may have to look up and adapt a table entries
3. Inverse Laplace transforms (partial fractions)
4. 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
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

Euler's equations

Laplace Transform table class handout

Standard feedback loop transfer function



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

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/