# ECE 3510 Exam 1 Study Guide — First Exam will be on Friday 2/5/10

The first part will be **closed book**, **no-calculator,** but will include the information shown below, if needed.

When you hand in the first part you will get the second part, which will be **open book, notes, & calculator**.

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.
   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
13. Effect of initial conditions
    Look at Bodson p.43
14. 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 control methods
15. Homeworks 1 - 7
16. Labs 1 & 2

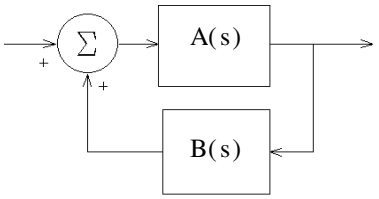
Information you will be given
(closed book part, if needed)

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

Euler's equations

Laplace Transform table class handout

Standard feedback loop transfer function




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

(Won't be in closed-book part)

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