ECE 3510 Exam 1 Study Guide

First Exam will be on Wednesday 2/7/24

The first part may be **closed book**, **no-calculator, no sheet.**.

When you hand in the first part you will get the second part, which will be **closed book, Colored sheet, & Calculator** OK.

NOTE: You will be asked to sign an agreement at the time of the exam.

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 one or more 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

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.