ECE410H1 F - Control Systems  
Fall 2015

COURSE DESCRIPTION:
State space analysis of linear systems, the matrix exponential, linearization of nonlinear systems. Structural properties of linear systems: stability, controllability, observability, stabilizability, and detectability. Pole assignment using state feedback, state estimation using observers, full-order and reduced-order observer design, design of feedback compensators using the separation principle, control design for tracking. Control design based on optimization, linear quadratic optimal control, the algebraic Riccati equation. Laboratory experiments include computer-aided design using MATLAB and the control of an inverted pendulum on a cart.

MAJOR TOPICS (hours tentative):
1. State space models and analysis (10 lecture hours)
2. Controllability (6 lecture hours)
3. Pole Placement (6 lecture hours)
4. Observability and Observers (5 lectures)
5. Control for Tracking (6 lecture hours)
6. Optimal Control (5 lecture hours)

PRESCRIBED TEXT(S):
No required text, course notes provided to students through Blackboard course website.

COMPUTER EXPERIENCE:
Control systems analysis, design, and simulation using MATLAB (an interactive program to solve control design and other engineering problems) on personal computers; writing MATLAB scripts to solve control design problems.

LABORATORY EXPERIENCE:
Control systems analysis, design and simulation using MATLAB on personal computers. Real-time control of a pendulum on a cart using a real-time operating system and data-acquisition boards.