# ELEC4210, Control System Design

## Course Syllabus

1. Instructor: Professor Qiu Li
2. Course Description: In the lectures, the following topics will be covered: time-domain and frequency-domain system modeling and analysis, optimal control, robust control, computer aided control designs, digital control. In the experiments, the students will be asked to design and implement controllers for a magnetic suspension system, an inverted pendulum system, and a tower crane system.
3. weekly schedule:

   Week 1: Stability and Stabilization

   - Routh Criterion
   - Robust Stability
   - Stability of Closed-Loop System
   - Pole Placement Design

   Week 2: Stability and Stabilization

   - All stabilizing Controllers
   - All stabilizing 2DOF Controllers

   Time-Domain Analysis

   - Time-domain Signal and System Norms
   - Computation of the Time-domain 2-norm

   Week 3: Holiday

   Week 4: Stability and Stabilization-Case Studies and Optimal Control

   - Inverted Pendulum System
   - Computation of the Time-domain 2-norm
   - Weighted Optimal 2DOF Controller

   Week 5: Optimal Control

   - Optimal Stabilizing Controller
   - Weighted Optimal Stabilizing Controller
   - Minimum-Energy Stabilization
   - Optimal 2DOF Controller

   Week 6: Optimal Control

   - Optimal 2DOF Controller

- Weighted Optimal 2DOF Controller
- Minimal Error Tracking

Week 7: Robust Control

- Frequency-Domain $\infty$-Norm of Systems
- Uncertain systems

Week 8: Robust Control

- Robust Stability analysis
- Optimal robust stabilization

Week 9: Robust Control

- Optimal Robust Stabilization

Week 10: Holiday

Week 11-13: Lab sections

Week 14: Time-Domain Analysis

- Overshoot

4. Textbook: Introduction to Feedback Control
5. Grading policy: HW 50%, Lab 50%