SE 320
Control Systems

TR 12:30pm - 1:50pm
Location: 2310 Everitt Laboratory

Instructor: Prof. Yingying Li, (*yl101@illinois.edu*)
Office Hours: Thursdays, 2pm-3pm
Location: Coordinated Science Lab: Room 347

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Required Text: *Feedback Control Systems:* Fifth Edition,
by Charles L. Phillips and John M. Parr, Prentice-Hall publ.

Specific Course Information:

- **Course Description:** Fundamental control systems and control systems technology. Sensors, actuators, modeling of physical systems, design and implementation of feedback controllers; operational techniques used in describing, analyzing and designing linear continuous systems; Laplace transforms; response via transfer functions; stability; performance specifications; controller design via transfer functions; frequency response; simple nonlinearities.
- **Prerequisites:** CS101, MATH 285, & TAM212, Credit or Concurrent registration in ECE211.
- **Labs:** Labs will not start immediately. The first lab session is on Sept 30. Prof. Daniel Block will be your instructor for the lab sessions.

Assignments:

- There will be **6 homeworks** posted approximately every other week. Homeworks and their solutions will be posted in Canvas.illinois.edu. The students should return their answers by the specified deadline by scanning or taking a photo of their solutions and uploading them on Canvas. **Four** questions will be selected **randomly** from each assignment for grading. Solutions for all questions will be provided. You will need Matlab to solve some questions.
- **No late homeworks** will be accepted. However, each student's lowest homework score will be dropped before course grades are computed. It is important to write your solution clearly as it may affect your grades. No collaboration or other solution sources are allowed on the problems assigned for homeworks or exams. Otherwise, UIUC student code § 1-402 on academic dishonestly will be followed.

Exams:

- There will be **two in-class midterm exams** during the semester. The midterms will be in-class, closed-book, and 80 minutes. TENTATIVE DATES: October 10nd and Nov 21st.
- There will be approximately 5 in-class **quizzes** held roughly every-other week; these will be announced the lecture prior to the quiz date (makeups only if prior notification of valid excuse provided).
- There will be **one final exam** on Dec 17th, 8:30am-11am, 150 minutes. (The time for the final exam is according to https://registrar.illinois.edu/final-exam-scheduling-guidelines/). Location TBD.
- For both the midterms and the final exam,
  - The exams are closed book, closed notes, closed homeworks. Only notes on both sides of a single A4 sheet is allowed for each exam (cheat sheet).
  - You are expected to submit the cheat sheet at the end of each exam.
  - You may use your calculator provided it has no wi-fi capabilities.
  - No cellphones allowed during the test.

See next page for course outline.

TENTATIVE COURSE OUTLINE:

Reading	Topics	Lectures
Chapter 1:	Introduction to Control Systems	Week 1
Appendix B:	Laplace Transforms definition of Laplace transform and inverse Laplace transform; examples of common transforms; properties and theorems	Weeks 1-2
Chapter 2: **Sec. 1-3; 5-12**	Mathematical models for physical systems circuits, mechanical systems, electromechanical systems transformers and gears, more examples	Weeks 2-4
Chapter 4:	System Responses to Inputs responses in time-domain and frequency domain; design specifications	Weeks 4-5
Chapter 5:	Closed-loop Systems stability; transient response and steady state response; sensitivity	Weeks 5-7
Chapter 6:	Stability Analysis history and notions of stability; Routh-Hurwitz criterion; roots of the characteristic equation	Weeks 8-9
Chapter 8:	Frequency Response Analysis Frequency responses; Bode diagrams; Nyquist Criterion	Weeks 10-12
Chapter 9:	Frequency Response Design gain compensation; lag and lead compensation; lag-lead compensation PID design and implementation	Weeks 13-14

See next page for grading rules.

Course Grade Composition:

Item	% of grade
Homework	20%
Quizzes	10%
Midterm 1	15%
Midterm 2	15%
Final Exam	20%
Lab Report	20%

- Total Score ≥ 94: A+, Total Score ≥ 87: A, Total Score ≥ 83: A-
- Total Score ≥ 78: B+, Total Score ≥ 74: B, Total Score ≥ 70: B-
- Total Score ≥ 67: C+, Total Score ≥ 64: C, Total Score ≥ 60: C-
- Total Score ≥ 50: D, Total Score < 50: F.