

SE 320 Control Systems

Lecture: TR 12:30 pm – 1:50 pm,
Materials Science & Eng Bld, Room 119

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References: *Control Systems: An Introduction*
Hassan K. Khalil, Michigan State University.
<https://control.eecs.umich.edu/>

Feedback Control Systems, Fifth Edition
Charles L. Phillips & John M. Parr, Prentice-Hall publ

Important Dates: Mid-term Exam 1: 12:30 pm – 2:00 pm, Thursday, October 1.
Mid-term Exam 2: 12:30 pm – 2:00 pm, Thursday, November 12.
Final Exam: 8:00 am–11:00 am, Tuesday, December, 15.
All exams are in class and closed notes.

Modifications: The instructors reserve the right to modify any and all parts of this syllabus throughout the semester. Any modifications will be announced to the students and posted on Canvas.

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:** CS 101 or CS 124, MATH 285, and TAM 212; credit or concurrent registration in ECE 211.
- **Lab:** The lab sessions will begin the week of September 28. More information about the labs can be found at: <https://coecl.ece.illinois.edu/se320>

Tentative Course Outline

- Introduction and motivation
- Laplace Transforms
 - Examples, Properties of Laplace Transforms, Inverse Laplace Transform, Differential Equations and Transfer Functions
- **Control System Modeling**
 - Transfer Function Models
 - * Electric circuits, Mechanical Systems, Gears, & Electromechanical systems
 - Block Diagrams
 - Linearization
- **Control System Analysis**
 - Stability
 - * BIBO Stability & Routh-Hurwitz Criterion
 - Dynamic Response
 - Step Response
 - * First-Order & Second-Order Transfer Functions, Effect of Zeros, Higher-Order Transfer Functions Approximation
 - Feedback Control Systems
 - * The Root Locus Method, Steady-State Error, Effect of Disturbance, Plant Parameter Uncertainty, & Measurement Noise
 - Frequency Response Methods
 - * Polar plots, Bode plots, Nyquist Criterion, & Stability Margins
- **Control system Design**
 - Time-Domain Design
 - * Design Specifications, Gain Adjustment, Lead and PD Controller, Lag and PI Controller, & Lead-Lag and PID Controller
 - Frequency Domain Design
 - * Design Specifications, Gain Adjustment, Lead Compensation, Lag Compensation, Lead-Lag Compensation

Assignment and Exams

- Homework assignments and their corresponding solutions will be posted on Canvas. All homework assignments must be submitted electronically through Canvas by the specified deadline.
- Homework assignments will include a combination of analytical and computational problems. Computational problems must be implemented using MATLAB. Please set up MATLAB as early as possible using the instructions provided in the link.
- **No late homework submissions will be accepted.** Students are expected to present their solutions clearly and legibly. Unclear or incomplete work may result in a reduction in credit.
- For homework problems involving MATLAB, students must include screenshots of their code and the corresponding outputs (e.g., numerical vectors, plots, or other relevant results). The final submission must consist of a single PDF containing the solutions to the analytical problems, together with the required MATLAB code screenshots and outputs. It is the student's responsibility to ensure that the submitted PDF is accessible and can be opened on different computers.
- Homework assignments may be discussed with other students. However, each student must submit **independent write-ups** and **independent code** for computational assignments. Submissions may be checked for similarity.
- **The use of external solution sources, including AI tools such as ChatGPT, is not permitted for homework assignments.** Any violations will be addressed in accordance with the UIUC Student Code, § 1-402, regarding academic dishonesty.
- There will be two in-class midterm examinations during the semester. The first midterm examination will be held on **Thursday, October 1, 2026, from 12:30 pm to 2:00 pm**. The second midterm examination will be held on **Thursday, November 12, 2026, from 12:30 pm to 2:00 pm**. Both examinations will be held in the Material Science & Engineering Building, Room 119.
- There will be one in-class final examination at the end of the semester on **Tuesday, December, 15 from 8:00 am to 11:00 am**. The examination location will be announced at a later date on Canvas.
- All examinations will be conducted in class and will be closed-note. Students will be permitted to use one 8.5" × 11" sheet of handwritten formula notes, with content on both sides. The formula sheet must be submitted with the examination.
- Students who require academic accommodations must submit the appropriate accommodation documentation no later than **September 14, 2026**.

Grading Decomposition

Item	% of Grade
Homework Assignments	15
Midterm Exam 1	20
Midterm Exam 2	20
Final Exam	30
Lab Reports	15

- Total Score ≥ 94 : A+, Total Score ≥ 87 : A, Total Score ≥ 82 : 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

Total scores greater than or equal to $x.5$ will be rounded to $x + 1$, and will be rounded to x , otherwise.

Campus Policies

Emergency Response Recommendations: Emergency response recommendations can be found at the following website:

www.police.illinois.edu/em/

You are encouraged to review this website and the campus building floor plans website within the first 10 days of class:

www.police.illinois.edu/em/mitigation/emergency-action-plans/

Academic Integrity: Students are expected to adhere to the Student Code:

studentcode.illinois.edu/

and in particular, *Article 1, Part 4: Academic Integrity and Procedure*.

Academic dishonesty will result in a sanction proportionate to the severity of the infraction, with possible sanctions described in 1-404 of the Student Code (<https://studentcode.illinois.edu/article1/part4/1-404/>).

Every student is expected to review and abide by the Academic Integrity Policy as defined in the Student Code: <https://studentcode.illinois.edu/article1/part4/1-401/>. As a student it is your responsibility to refrain from infractions of academic integrity and from conduct that aids others in such infractions.

A short guide to academic integrity issues may be found at <https://provost.illinois.edu/policies/policies/academicintegrity/students-quick-reference-guide-to-academic-integrity/>. Ignorance of these policies is not an excuse for any academic dishonesty. It is your responsibility to read this policy to avoid any misunderstanding. Do not hesitate to ask the instructor(s) if you are ever in doubt about what constitutes plagiarism, cheating, or any other breach of academic integrity.

In this course you are expected to produce your own work in all assignments.

Religious Observances: In the case of missed activity for religious observations, please visit:

odos.illinois.edu/resources/students/religious-observances

Please make requests for accommodations as early as possible in the semester.

Privacy & FERPA: Any student who has suppressed their directory information pursuant to Family Educational Rights and Privacy Act (FERPA) should self-identify to the instructor to ensure protection of the privacy of their attendance in this course. See

registrar.illinois.edu/academic-records/ferpa/

for more information on FERPA.

Accommodations: To obtain disability-related academic adjustments and/or auxiliary aids, students with disabilities must contact the course instructor and the as soon as possible. To ensure that disability-related concerns are properly addressed from the beginning, students with disabilities who require assistance to participate in this class should contact Disability Resources and Educational Services (DRES) and see the instructor as soon as possible. If you need accommodations for any sort of disability, please speak to me after class, or make an appointment to see me or see me during my office hours. DRES provides students with academic accommodations, access, and support services. To contact DRES you may visit 1207 S. Oak St., Champaign, call (217) 333-1970, or e-mail disability@illinois.edu. For more information, please visit:

dres.illinois.edu/

Misconduct Reporting: The University of Illinois is committed to combating sexual misconduct. Faculty and staff members are required to report any instances of sexual misconduct to the University's Title IX and Disability Office. In turn, an individual with the Title IX and Disability Office will provide information about rights and options, including accommodations, support services, the campus disciplinary process, and law enforcement options. A list of the designated University employees who, as counselors, confidential advisors, and medical professionals, do not have this reporting responsibility and can maintain confidentiality, can be found here:

wecare.illinois.edu/resources/students/

Other information about resources and reporting is available here:

wecare.illinois.edu/