ECE 560/561 Control Systems Principles, Spring 2020

Course Instructor: Dr. Tamer Inanc,
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Office Hours: Wednesdays between 2:00 – 3:00 PM

Lectures: MWF between 11:00 – 11:50 AM in Rm. Lutz 306

Labs: Mondays, Tuesdays or Wednesdays between 4:30 – 7:00PM in Rm. WS226

Course webpage: http://blackboard.louisville.edu

Required Textbook:
N. S. Nise, "Control Systems Engineering," John Wiley and Sons, 7th edition.

References:
1. C.L. Phillips and J. M. Parr, Feedback Control Systems, 5th edition, Prentice Hall, 2011
2. G. F. Franklin, J. D. Powell and A. Emami–Naeini, Feedback Control of Dynamic Systems, Addison Wesley, 8th Ed
3. K. Ogata, Modern Control Engineering, 5th Ed., Prentice–Hall
4. K. Ogata, MATLAB for Control Engineers, Prentice Hall, 2008

Course Prerequisite: ECE 420 (Concepts of Signals and Linear Systems)

Course Objectives:
To provide students with foundations of linear control systems, formulation of the linear control problem by classical and state space methods, frequency response and time response analysis and synthesis techniques, stability and system performance specifications.

Course Content:
1. Mathematical models of systems
2. Control system specifications, polynomial inputs, system type
3. Routh-Hurwitz stability criterion
4. Root locus plot
5. Bode plot
6. PID compensation
7. Lead and lag compensation
8. Introduction to State Space Methods

Please note that instructor may change the order of the subjects, add and remove topics as we progress during the semester.

Learning Outcomes: Upon successful completion of the course, a student should be able to:

1. Demonstrate finding mathematical models of systems,
2. Analyze percent overshoot, settling time, peak time, and steady-state errors of closed-loop systems,
3. Analyze stability of closed-loop systems utilizing the Routh-Hurwitz criterion,
4. Draw root locus plots for closed-loop systems,
5. Draw Bode plots for closed-loop systems,
6. Design cascade compensators for desired closed-loop behavior.

Grading Policy: *The same grade will be assigned based for ECE560 and ECE561* on the combination of

Two Exams (total)	40%
Final Exam	20%
Homework	20% (15% for grad credit students)
Lab. Projects	20%

Once all assignments are completed, the final grade will be rounded up to the nearest integer and a letter grade will be assigned according to the following scale:

Final Grade	100-97	96-93	92-90	89-87	86-83	82-80	79-77	76-73	72-70	69-67	66-63	62-60	0-59
Letter Grade	A+	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Graduate Credit Requirements:
Students taking ECE560/561 toward their graduate degree are asked to do additional work which includes an oral presentation of current research paper of their choice on class related topic and/or additional work in the labs. This will be 5% of their grades (homework will be 15% for those students).

Exam Dates:

1. **First Exam: TBA in class.**
2. **Second Exam: TBA in class.**

Exams will be closed book and notes. However, you will be allowed to bring one sheet of self–prepared notes (8 1/2 X 11, both sides, hand written) to each exam. Conflict exams will only be given in accordance with University Policies. The final exam will be comprehensive and it will be administered according to the university final exam schedule.

Computer Use: Quite a few homework assignments and lab. projects will involve the use of the mathematical computing software known as MATLAB (http://www.mathworks.com).

Homework Guidelines: Students are permitted, and in fact encouraged to consult with each other on the general principles involved in solving the homework problems and projects. However, they must apply these principles on their own and must hand in assignments that are based solely on their own individual work. Students that copy work from others or share solutions with others will receive no credit for the whole assignment in question. Make sure your homework is neat, readable, no stamp-sized drawings, etc. and proceeds logically to the solution – if I can't read it or make sense of it, you will NOT get the points!

Late Homework: To be fair to all students, late homework will NOT be accepted.

Laboratory Projects: As part of this class, there will be three or four laboratory projects. The projects will be performed in groups of three students. Each team will need to provide a written project report for each lab following the lab project guidelines, which will be distributed later in the class.

Please report any problems early in the semester. Project report guidelines will be given later on. One important point is that students must pledge the following for each lab. report:

The group members have worked together and face to face at all stages of this project work. The contributions of members to the report and to the codes are equal.
(Initials of group members)

Solutions: These will be distributed in class and/or posted on Black Board.

Blackboard and email: This course will have a Blackboard site and you will be expected to utilize the site to receive course information, including assignments. You should check this site daily throughout the semester. I will only use your UofL email address that's made present through the blackboard site. No exceptions will be made. I do not use the grade posting aspect of blackboard.

Course Attendance: Lectures will roughly follow the order of textbook topics. However, reading the textbook is not a substitute for coming to lecture, since the lectures will cover some topics that are not in the text, and will cover others in an innovative fashion relative to the text. Students that miss lecture are responsible for obtaining notes from a classmate. Class attendance is not mandatory but it is strongly encouraged and you are responsible for all materials covered in the class.

Disabilities: The University of Louisville is committed to providing access to programs and services for qualified students with disabilities. Students with disabilities, who need reasonable modification to complete assignments successfully and otherwise satisfy course criteria, are encouraged to meet with the instructor as early in the course as possible to identify and plan specific accommodations. Students are asked to supply a letter from the appropriate university disability coordinator, **Disability Resource Center (Robbins Hall, 852.6938)**, certifying their eligibility, and any other documentation that will assist in planning of modifications.

Academic dishonesty: All aspects of the UofL and ECE policies on academic dishonesty will be strictly enforced. Cheating on a test or project/homework will result in immediate removal from the class roll and an "F" for the course.

Title IX/Clery Act Notification
Sexual misconduct (including sexual harassment, sexual assault, and any other nonconsensual behavior of a sexual nature) and sex discrimination violate University policies. Students experiencing such behavior may obtain **confidential** support from the PEACC Program (852-2663), Counseling Center (852-6585), and Campus Health Services (852-6479). To report sexual misconduct or sex discrimination, contact the Dean of Students (852-5787) or University of Louisville Police (852-6111). **Disclosure to University faculty or instructors** of sexual misconduct, domestic violence, dating violence, or sex discrimination occurring on campus, in a University-sponsored program, or involving a campus visitor or University student or employee (whether current or former) is **not confidential** under Title IX. Faculty and instructors must forward such reports, including names and circumstances, to the University's Title IX officer. For more information, see the Sexual Misconduct Resource Guide.
http://louisville.edu/hr/employeerelations/sexual-misconduct-brochure

Please note that this is NOT a web–based instruction course. Announcements in class supersede material posted on the black board. The class web–page on black board may NOT contain the latest information.