University of North Texas  
College of Engineering  
Department of Engineering Technology (ETEC)

ELET 4720 Control Systems

Catalog 15-16  Classical control theory; block diagrams, applications of Laplace transforms, stability criteria and feedback. Use of computer software to evaluate complex systems. This course practices ETEC OpenLab Format: at least 30% of the assignments are completed in the lab or at home using proper technology. Pre-requisite: ELET 3760

Lab Use  This course provides opportunities for students to take advantage of various software and hardware packages such as Matlab/Simulink and NI/Quanser, supported by the department in the classroom or in lab experiments, in simulation studies, homework assignments, or in projects.

Text  Control Systems Engineering, Wiley, 7E by NISE for University of North Texas  
ISBN: 978-1-118-17051-9

Instructor  Enrique Barbieri, Ph.D  
Professor, Engineering Technology Office Hours: TW 4:00-5:00 pm or by appointment (F115)

COURSE OBJECTIVES
These are reflected in the Chapter Learning Outcomes listed at the beginning of each textbook chapter. The major topics are system modeling, differential equations, Laplace transforms, transfer functions, block diagrams, time response, BIBO stability, steady-state errors, performance specs, Root-Locus techniques, and control system design via Root-Locus.

ETAC/ABET Student Outcomes supported by this course
a. An ability to select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly-defined engineering technology activities.

b. An ability to select and apply a knowledge of mathematics, science, engineering, and technology to engineering technology problems that require the application of principles and applied procedures or methodologies.

d. An ability to design systems, components, or processes for broadly-defined engineering technology problems appropriate to program educational objectives.

f. An ability to identify, analyze, and solve broadly-defined engineering technology problems.

j. A knowledge of the impact of engineering technology solutions in a societal and global context.

Student Learning Outcomes
1. Comprehension/Analysis: Identify and distinguish open and closed loop control systems, system elements, inputs/outputs and their mathematical relations with transfer functions, block diagrams and state variables. Solve linear, time-invariant, ordinary differential equations. Relate time-domain performance specs to system requirements in the complex plane. (ABET b, f)

2. Application: apply Root-Locus techniques in the analysis of closed-loop control systems; demonstrate an ability to use software packages such as Matlab/Simulink. (ABET a, b)

3. Synthesis/Application: design closed-loop feedback control systems that meet given specs and are safe for society; use Root-Locus techniques and software packages such as Matlab/Simulink. (ABET a, b, d, f, j)
CLASS POLICIES

1. **Syllabus updates.** Announced changes may be made to this syllabus during the semester.
2. **Academic Dishonesty.** The UNT policies on academic dishonesty will be enforced. It is the students’ duty to protect their work so it is not available to others for submission as their efforts. Students who knowingly allow others to use their work are partners in this unethical behavior. The use of computing, communication, or other electronic devices may be disallowed during class and/or exams. The instructor also has the discretion to assign a failing grade to portions of an assessment, a whole assessment, or the whole course depending on the severity of the event.
3. **ADA Accommodations.** Students in need of academic accommodations for disability can refer to the UNT Policy manual for initiating the required arrangements based on ADA terms.
4. **Course evaluations** are a requirement for all organized classes at UNT. This survey will be made available at the end of the semester, providing you a chance to comment on how this class is taught. I am very interested in the feedback I receive from students, as I work to continually improve this course and my teaching. I consider this evaluation to be an important part of your input to this class.
5. **No late work/makeups will be considered. An exception requires a sound and verifiable excuse.** Examples of unacceptable excuses: my alarm did not go off; my PC has a virus.

On Work and Academics “Work, sleep, friends – choose two (author unknown)”
A typical 3-credit class, meeting 3 hours per week, may require on average 5-7 additional hours of work per week that includes reading/catching up from the previous class and revising notes; preparation for the next class meeting, that is, reading ahead and formulating questions; solving additional practice problems; preparing for lab work (for example, pre-lab designs) and writing lab reports (applicable to courses with a lab component); and taking care of homework assignments. The total is 8-10 hours per week per course. Hence, a student taking a full-time load of say 12 credits (four 3-credit classes) requires on average 32-40 hours of academic work per week leaving time for socializing and even some part-time work; this is why it is called a full-time academic load. Trying to fit a full-time or even a substantial part-time job always takes a toll especially during exams and project due-dates. My advice is that your academic load needs to be carefully balanced with all other non-academic activities, and accept the fact that if you work, then you must be a part-time student.

GRADING AND EXPECTATIONS
Students are expected to attend every class. The student’s abilities will be demonstrated via homework, projects, quizzes, exams, and projects. A final exam and at least two semester exams will be scheduled. Successful students attempt to solve many more problems than those assigned for credit to develop the practice and necessary skills. Homework is due at the start of class (unless otherwise specified) at which time solutions may be distributed and discussed. You are encouraged to work in groups and learn from each other. Individual work must be turned in for grading. You are responsible for understanding the techniques; avoid simply copying the group’s work as this practice typically results in disaster during the exams. Typically, students earn very good marks on homework and projects; however, quizzes and exams give you the opportunity to demonstrate your individual understanding of the course material, hence most of the grade is based on this type of assessment.

**HOMEWORK** Assuming that problems are clearly stated and their solution presented in a professional manner (no scratch work should be turned in) on 8½ paper, single-sided, your name, course and assignment number written at the top of the first page, THEN:

- All problems correct: 10 pts
- Few **minor** algebra mistakes leading to incorrect answers: 7 – 9 pts
- Several algebra mistakes or **conceptual** errors leading to incorrect answers: 4 – 6 pts
- **Missing** or **wrong** assignment problems, or non-compliance with format: 0 – 4 pts
Final Grading:
To earn an “A” (above 90%) the student does outstanding work, demonstrates excellence in understanding the course material as shown by performance. To earn a “B”, (above 80%) the student demonstrates good or above average performance. To earn a “C” (above 70%) the student demonstrates a sufficient acquisition of knowledge.

Cumulative Points & Weights:
The table below lists all possible items that earn points toward the final grade and the equivalent % weight. The actual total number of points may be less than the maximum depending on the number of items assigned:

<table>
<thead>
<tr>
<th>Item</th>
<th>Points (max)</th>
<th>%</th>
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<tbody>
<tr>
<td>Homework</td>
<td>50</td>
<td>10</td>
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<tr>
<td>Project</td>
<td>100</td>
<td>20</td>
</tr>
<tr>
<td>Tests, Quizzes</td>
<td>200</td>
<td>40</td>
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<tr>
<td>Final test</td>
<td>150</td>
<td>30</td>
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<tr>
<td>Total (max)</td>
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<td>100</td>
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<tr>
<td>Demonstrated Participation/Progress/Improvement (Instructor’s discretion)</td>
<td>50</td>
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Summary of Calendar FALL 2015
http://catalog.unt.edu/content.php?catoid=13&navoid=974#fall_2015
August 24, 2015 First class day (Monday)
August 21–28, 2015 Student-requested schedule changes may be made during add(drop.
August 28, 2015 Last day for change of schedule other than a drop. (Last day to add a class.)
September 7, 2015 Labor Day (university closed)
September 8 – November 2, 2015 Student may drop a course with written consent of instructor.
October 2, 2015 Last day for change in pass/no pass status.
October 2, 2015 Last day to drop a course or withdraw from the university with a grade of W for courses a student is not passing. After this date a grade of WF may be recorded.
October 5 – November 20, 2015 Instructors may drop students with a grade of WF for nonattendance.
November 9, 2015 Beginning this date a student who qualifies may request a grade of I, incomplete. (See "Grading system" in the Academics section of this catalog.)
November 20, 2015 Last day to withdraw from the semester. Process must be completed by 5 p.m. in the Dean of Students Office.
November 26-29, 2015 Thanksgiving break (university closed)
November 28 - December 4, 2015 Pre-finals week
December 3, 2015 Last class day
December 4, 2015 Reading day (no classes)
December 5-10, 2015 Final examinations
December 11-12, 2015 Graduation
December 24, 2015 – January 1, 2016 Winter break (university closed)

Final Exam Schedule – Discovery Park
http://registrar.unt.edu/exams/final-exam-schedule/fall

Final Exam on Monday Dec 7, 2:00PM-4:00PM