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

ELET 4720 Control Systems

Catalog 12-13  ELET 4720. Control Systems. 4(3;3) hours. Classical control theory; block diagrams, applications of Laplace transforms, stability criteria and feedback. Use of computer software to evaluate complex systems. Prerequisites: ELET 3700 and ELET 3740.

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

Text Control Systems Engineering, Wiley, 3rd Edition (or newer)  
Author: Norman S. Nise

Instructor  Enrique Barbieri, Ph.D  
Professor and Chair, Engineering Technology  
Office F115 ~ Office Hours: TBD

COURSE OBJECTIVES: ETAC/ABET Program Outcomes and Program Educational Objectives supported.

1. Understand open and closed loop control systems. (a, b, f)
2. Understand the transfer function of transient and steady state circuits. (b, c)
3. Understand Laplace transforms in circuits and systems solutions. (b, c, f)
4. Comprehend differential equations in the time-domain to the frequency-domain. (b, c, d, f)
5. Comprehend transfer function equations in the frequency-domain to differential equations in the time-domain (a,b,c)
6. Understand transient and steady state circuits. (a, b, c, d, f)
7. Understand project reporting with suitable references. (e,f,g,h,k)
8. Participate effectively in groups with emphasis on listening, critical thinking and responding. (e, f, g, h, k)
9. Comprehend B2spice, LabView, and MatLab SimuLink, or SystemView software to solve homework problems. (a, b, c, d, f)

STUDENT LEARNING OUTCOMES: (Course Objectives Supported)

a) Analyze control systems under steady-state sinusoidal conditions. (1, 2)
b) Determine the steady-state transfer function and show how it relates to the Laplace transform function. (2, 3)
c) Determine feedback and stability requirements of control systems. (2, 3)
d) Determine the inverse transform of a circuit and find the time domain equation of the current or voltage. (5).
e) Determine the transform of a circuit from the time domain equation of the current or voltage. (4).
f) Administer a Laplace transformation on an electrical circuit with or without initial conditions. (3)
g) Analyze functions of electronic circuits and feedback systems using Laplace Transforms. (3)
h) Write the transfer function of a given electrical circuit or system. (3)
i) Demonstrate the operation of laboratory instrumentation. (6)
j) Write a well-researched and grammatically correct technical report on the experiment being orally presented and assigned laboratory experiments. (7)
k) Prepare and present a PowerPoint presentation incorporating the objectives, circuitry and expected results of the assigned laboratory experiment. (8)
l) Solve electronic circuits and control system transfer function problems with B2spice, MatLab, Slimulink, LabView, and SystemView software to analyze electronic circuits and control system transfer functions. (9)

TOPICS COVERED

UNIT I System modeling
UNIT II Time response
UNIT III Stability Analysis
UNIT IV Steady-State Error Analysis
UNIT V Root-Locus Techniques
UNIT VI Design via Root Locus techniques
UNIT VII Introduction to frequency-domain, digital, modern, and optimal control
CLASS POLICIES

1. This syllabus is subject to change during the semester with changes to be announced in class.
2. The UNT Catalog procedures on academic dishonesty will be vigorously enforced. It is the duty of all students 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.
3. 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. The Student Evaluation of Teaching Effectiveness (SETE) is a requirement for all organized classes at UNT. This short survey will be made available to you 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 my teaching. I consider the SETE to be an important part of your participation in this class.
5. The use of communication, computing, or other electronic devices including laptops may be disallowed during class and/or exams at the discretion of the instructor.
6. No late homework can be accepted. No makeup exams can be given. An exception to this policy requires a verifiable and sound excuse.

Grading & Instructor’s Expectations:
Students are expected to attend every class. The student’s abilities will be demonstrated via homework, projects, quizzes, exams, and lab projects. A final exam and at least one semester exam will be scheduled. Successful students attempt to solve many more problems than those assigned for credit to develop the practice and the necessary skills. Assigned Homework is due the following week 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 a very good Homework grade; however, quizzes and exams will give you the opportunity to demonstrate your individual understanding of the course material. **ASSUMING** that: problems are clearly stated and its 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 students attempt to solve many more problems than those assigned for credit to develop the practice and the necessary skills. Assigned Homework is due the following week at the start of class (unless otherwise specified) at which time solutions may be distributed and discussed.

Final Grading:
To earn an “A” (above 90%) the student does outstanding work demonstrating excellence in his/her understanding of the course material as shown by homework, quiz, project, and exam performances. To earn a “B”, (above 80%) the student demonstrates good or above average performance to earn graduate college credit.

Weights: Homework 15%; Midterm Exam(s) 25%; Lab Performance 20%; Project 15%; Final Exam 25%.