The Engineering Technology Department, in cooperation with the Office of Disability Accommodation, complies with the Americans with Disabilities Act in making reasonable accommodations for qualified students with disabilities. Please present your written accommodation request to the instructor prior to the fourth day.

SAFETY CATEGORY: N

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DATE PREPARED: August 26, 2018
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COURSE NUMBER, TITLE AND CREDIT HOURS
MSET 5900.706, Control Systems, 3

COURSE DESCRIPTION
Classical control theory; block diagrams, applications of Laplace transforms, stability
criteria and feedback. Use of computer software to evaluate complex systems.

PREREQUISITES
ELET 3760 – Design of DSP Systems or equivalent

CLASS VENUE:
Lectures are held on Tuesdays and Thursdays 4:00 PM – 5:20 PM in F183 Discovery
Park.
The course will be managed via UNT’s Canvas system:
https://canvas.unt.edu

REQUIRED TEXTBOOK
None.

RECOMMENDED TEXTBOOK
Norman S. Nise, Control Systems Engineering (any edition after the 3rd).

SUPPLEMENTAL TEXTS AND MATERIALS
Additional material will be provided during the course and will be available on Canvas.

COURSE OBJECTIVES
Upon completion of the course the student will be able to:
1. Use Laplace transform techniques and differential equations to model typical
   engineering control systems.
2. Evaluate the transient response, stability, and sensitivity of a control system
   using a transfer function model.
3. Utilize frequency response methods to analyze uncompensated control
   systems.
4. Design, simulate and evaluate controllers according to a response specification
   with lead, lag and gain (P, I and D) compensation.
5. Describe basic digital control systems and related properties.
STUDENT LEARNING OUTCOMES (Course objectives supported)
1. Determine the closed loop transfer function that represents the system from input to output.
2. Predict, for a simplified system model the % overshoot, settling time, and peak time of the closed loop system for a step input.
3. Calculate the step response for a closed-loop system.
4. For a simplified model, design the system gain to meet required transient response specifications.
5. Use the root locus technique to predict system response.
6. Find the range of gain $K$ for stability using the frequency response method.
7. Adjust the PID gains for a specified response. Given the chosen case study, convert the system to a digital system and design the gain to meet a given transient response specification and determine the system stability.

COURSE OUTLINE:
1. System Modeling
2. Time Response
3. Stability Analysis
4. Steady-State Error Analysis
5. Root-Locus Techniques
6. Design via Root Locus Techniques
7. Introduction to the Frequency Domain
8. Introduction to Digital Control

COMPUTER USAGE:
Students are required to prepare designs using computer aided engineering software; run design simulations; prepare reports; and conduct internet research on the computer and associated equipment.
This course provides opportunities for students to take advantage of one or more of several software packages supported by the department in the classroom or in lab experiments, in simulation studies, homework assignments, or in projects.

COURSE EVALUATION
The Student Perceptions of Teaching (SPOT) 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 get from students, as I work to continually improve my teaching. I consider SPOT to be an important part of your participation in this class.

DISABILITIES ACCOMMODATION
The University of North Texas complies with Section 504 of the 1973 Rehabilitation Act and with the Americans with Disabilities Act of 1990. The University of North Texas provides academic adjustments and auxiliary aids to individuals with disabilities, as defined under the law. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable
accommodation of their disabilities. If you believe you have a disability requiring accommodation, please see the instructor and/or contact the Office of Disability Accommodation at 940-565-4323 during the first week of class.

**LIBRARY USAGE:**
Library research assignments requiring a notebook/diary of entries showing dates, times, journals, books, internet resources, and other information researching activities may be required.

**INSTRUCTIONAL OBJECTIVES:**
(See learning outcomes.)

**LEARNING STRATEGIES**
- Lectures (Professor and Guests)
- Student Presentations
- Demonstrations
- Problem Sessions
- Laboratory Assignments
- Outside Reading and Projects
GRADING ELEMENTS AND WEIGHTS:

Pop quizzes: 10%
Project 20%
Test 1 20%
Test 2 20%
Final Exam 30%

Examination schedule:

Test 1 – Tuesday October 2, 4:00 PM – 5:20 PM in F119
Test 2 – Thursday November 15, 4:00 PM – 5:20 PM in F119
Final Exam – Thursday December 13, 1:30 PM – 3:30 PM in F119

A >90%
B 80 – 89%
C 70 – 79%
D 60 – 69%
F <59%

GRADING POLICIES:

1. The student is required to attend all scheduled lectures. The student shall be dropped from the course for three (3) unexcused absences. An excused absence can only be guaranteed by obtaining, in advance, instructor authorization. A student shall be considered absent if twenty or more minutes late to class.
2. All rules relating to academic dishonesty will be enforced in accordance with University policies.
3. State common law and federal copyright laws protect my lectures. They are my own original expression. Whereas you are authorized to take notes in class thereby creating a derivative work from my lecture, the authorization extends only to making one set of notes for your own personal use and no other use. You are not authorized to record my lectures, to provide your notes to anyone else or to make any commercial use of them without expressed prior permission from me.
4. This syllabus is subject to change at any time during the semester with changes to be announced in class.
5. Students should schedule at least one hour per lecture hour for study outside class.
6. Grades are based, in part, on the student's ability to communicate. Well written English is expected in all course work and is a factor in grading.
7. Each student should retain graded lecture notes, pop quizzes, homework, tests, and software-generated files, to document errors in recorded grades.
8. Requests for review of graded work must be submitted during the lecture in which such work is returned to the students. The request should be accompanied by a written justification of the request including any supporting data.
9. The UNT Catalog procedures on cheating and plagiarism 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. This is especially true of files that are generated on the computer. Students who knowingly allow others to use their work are partners in this unethical behavior.

10. There is no limit to the use of calculators for lecture, labs, pop quizzes, formal tests, or final examination.

11. Challenges to the course grade must be presented within 60 days of receipt of grade notices mailed by the university. This will insure that instructor’s records are still available to allow a review of the assigned grade. You should first discuss your complaint with the instructor. If you wish to carry it further, contact the Program Coordinator by calling (940) 565-2022. To further pursue your complaint, contact the Department Chair at (940) 565-2022, but ONLY after first discussing your concern with the previous two individuals.

12. If appropriate, Material Safety Data Sheets (MSDS) are maintained on file in the department for your review. Access to these documents may be provided by the:
   • instructor of this course,
   • Program Coordinator, or
   • Department Secretary.

   Seek initial access through the instructor or Coordinator rather than the secretary.

13. Cheating on quizzes, examinations and laboratory assignments, and plagiarism on various papers and reports are types of disciplinary misconduct for which penalties are assessed under the UNT Code of Student Conduct and Discipline. Major responsibility for implementing the University's policy on scholastic dishonesty rests with the faculty. Be advised that the instructor of this course supports and fully implements this policy. The following actions will be taken when evidence of such misconduct is observed. The student will be presented with the evidence of misconduct and given an opportunity to explain same. Based on the outcome of this private conference, the matter will be either dropped or the student will be given a grade of "F" in the course and be referred to the Dean of Students for further counseling and/or disciplinary action.

14. During tests the use of electronic devices such as cell phones, smart phones, smart watches, pagers, photographic devices and/or other electronic or communication devices is strictly prohibited. Such devices must be turned off during the tests. Use of such a device (other than an emergency situation) will be considered cheating.

15. An I (incomplete) grade is given only for extenuating circumstances and in accordance with University and Departmental Policies.