Syllabus

Course Information

Course Information

Course Number: ESET 462
Course Title: Control Systems
Sections: 501-506
Lecture Time: TR 11:10AM - 12:25 PM
Location: ZACH441

Laboratory: RDMC 302 T 8:00-10:30AM (sec. 501), T 5:00-7:30PM (sec. 502), W 8:00-10:30AM (sec. 503), W 11:00AM-1:30PM (sec. 504), R 8:00-10:30AM (sec. 505), F 8:00-10:30AM (sec. 506).

Credit Hours: 4

Instructor Details

Instructor: Dr. Wei Zhan
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Office Hours: by appointment

Course Description

Components, principles, and techniques fundamental to automated control systems. Study of transfer functions, network analysis using Laplace transforms, Z transforms, feedback control systems theory, digital computer simulation, and computer-based controls systems.

Course Prerequisites

ESET 359, ESET 369 (C or better)

Course Learning Outcomes

At the completion of this course, students will be able to:

- define and use the terminology associated with control systems;
- explain the mathematical model for first and second degree plant transfer function;
- design closed-loop control systems for simple applied engineering problems;

- employ virtual instrumentation software platforms to simulate closed-loop control systems;
- identify, define and explain classical and digital control systems.

Textbook and/or Resource Materials

Textbook: Control System Technology, by Curtis D. Johnson and Heidar Malki, ISBN-13978-0130815309, Prentice Hall, 2002.

Students unfamiliar with LabVIEW and MATLAB are advised to spend some self-study time with material such as the online tutorial available at:

https://lumen.ni.com/nicif/us/academiclv3hr/content.xhtml (https://lumen.ni.com/nicif/us/academiclv3hr/content.xhtml) ,

https://www.mathworks.com/help/matlab/getting-started-with-matlab.html (https://www.mathworks.com/help/matlab/getting-started-with-matlab.html)

Grading Policy

In this course, homework assignments, laboratory assignments, teaching, attendance and exams will be used for evaluation of your performance.

Mid Term Exam (1)	20
Final Exam	45
Quizzes	5
Final Project	15
Homework	7
Laboratory	8
Total	100

A: 90%-100%, **B:** 80%-89%, **C:** 70%-79%, **D:** 60%-69%, **F:** <60%, incomplete Lab, or a D/F score in Lab.

A curve may be applied to individual and/or cumulative grades at the discretion of the instructor.

Grades for Stacked Course – For students who are taking this course as a stacked course (ESET 662), you will have a special assignment. The score for the assignment will be used, replacing the laboratory score, to calculate your final grade.

Laboratory

Main purpose of doing the laboratory assignments is to reinforce the principles taught in the theory class. Hence labs are designed in tandem with the course schedule. These labs also lay the foundation for the projects which covers a significant portion of the labs. Students are expected to come to lab on time and complete the tasks on the same day. The reports are expected in the format described in the lab handout. Reports are normally due the following week. Late reports will not be accepted.

Labs are not optional. A missed lab will result in an 'F' in the class. Also, a failing grade in the lab will result in an 'F' in the class.

Late Work Policy

- *Submitting a deliverable after the established deadline is defined as late submission.*
- *No late submission will be accepted.*
- *Work submitted by a student as makeup work for an excused absence is not considered late work and is exempted from the late work policy. (See **Student Rule 7 (https://student-rules.tamu.edu/rule07/)**).*

Course Schedule

Week	Lecture	Lab
1	Class Policy, Objectives, Open-loop and Closed-Loop	Lab safety; Course project: team formation, brainstorm
2	Transfer Functions, Block-Diagram	Lab1. Introduction to LabVIEW control Toolbox
3	Laplace Transforms & Properties	Lab2. 1st Order and 2nd Order System Dynamic Response in Time Domain
4	Inverse Laplace, Real, Identical Roots	Lab3. 1st Order and 2nd Order System Dynamic Response in Frequency Domain
5	First Order System, Time Constant, Final Value Theorem	Lab4. Rootlocus Command in Matlab
6	PID control design for First Order System	Lab5. DC Motor in Control System
7	Inverse Laplace, Imaginary Roots, 2nd Order Systems	Lab6. RC Circuit Step Response + PID
8	Damping Ratios, Natural Frequency. Overdamped, underdamped, Critically Damped. Settling Time, Overshoot, Rise Time	Course project
9	Problem Solving / Review; Midterm Exam (Oct. 28)	

10	Continuous PID Controller Design for Second Order System	Lab7. Bode Diagram and Delay in Control System
11	Continuous PID Control Design (Continued)	Course project
12	Higher Order Systems. Root Locus Design. Bode Plot.	Course project
13	Digital Control System, Z-Transform Properties	Course project
14	Discrete Closed-loop Control System	Course project
15	Problem Solving / Final Exam Review	Final Project Presentation

Final Exam

Dec. 10th, 3:00PM-5:00PM.

University Policies

This section outlines the university level policies. The TAMU Faculty Senate established the wording of these policies.

***[NOTE**: Faculty members should not change the written statements. A faculty member may add separate paragraphs if additional information is needed.]*

Attendance Policy

The university views class attendance and participation as an individual student responsibility. Students are expected to attend class and to complete all assignments.

Please refer to **Student Rule 7 (https://student-rules.tamu.edu/rule07/)** in its entirety for information about excused absences, including definitions, and related documentation and timelines.

Makeup Work Policy

Students will be excused from attending class on the day of a graded activity or when attendance contributes to a student's grade, for the reasons stated in Student Rule 7, or other reason deemed appropriate by the instructor.

Please refer to **Student Rule 7 (https://student-rules.tamu.edu/rule07/)** in its entirety for information about makeup work, including definitions, and related documentation and timelines.

Absences related to Title IX of the Education Amendments of 1972 may necessitate a period of more than 30 days for make-up work, and the timeframe for make-up work should be agreed upon by the student and instructor" **(Student Rule 7, Section 7.4.1 (https://student-rules.tamu.edu/rule07/)).**

"The instructor is under no obligation to provide an opportunity for the student to make up work missed because of an unexcused absence" **(Student Rule 7, Section 7.4.2 (https://student-rules.tamu.edu/rule07/)**).

Students who request an excused absence are expected to uphold the Aggie Honor Code and Student Conduct Code. **(See Student Rule 24 (https://student-rules.tamu.edu/rule24/)).**

Academic Integrity Statement and Policy

"An Aggie does not lie, cheat or steal, or tolerate those who do."

"Texas A&M University students are responsible for authenticating all work submitted to an instructor. If asked, students must be able to produce proof that the item submitted is indeed the work of that student. Students must keep appropriate records at all times. The inability to authenticate one's work, should the instructor request it, may be sufficient grounds to initiate an academic misconduct case" (**Section 20.1.2.3, Student Rule 20 (https://aggiehonor.tamu.edu/Rules-and-Procedures/Rules/Honor-System-Rules)**).

You can learn more about the Aggie Honor System Office Rules and Procedures, academic integrity, and your rights and responsibilities at **aggiehonor.tamu.edu (https://aggiehonor.tamu.edu/)** .

Americans with Disabilities Act (ADA) Policy

Texas A&M University is committed to providing equitable access to learning opportunities for all students. If you experience barriers to your education due to a disability or think you may have a disability, please contact Disability Resources office on your campus (resources listed below). Disabilities may include, but are not limited to attentional, learning, mental health, sensory, physical, or chronic health conditions. All students are encouraged to discuss their disability related needs with Disability Resources and their instructors as soon as possible.

Disability Resources is located in the Student Services Building or at (979) 845-1637 or visit ***disability.tamu.edu*** **(https://disability.tamu.edu/)** **.**

Title IX and Statement on Limits to Confidentiality

Texas A&M University is committed to fostering a learning environment that is safe and productive for all. University policies and federal and state laws prohibit gender-based discrimination and sexual

harassment, including sexual assault, sexual exploitation, domestic violence, dating violence, and stalking.

With the exception of some medical and mental health providers, all university employees (including full and part-time faculty, staff, paid graduate assistants, student workers, etc.) are Mandatory Reporters and must report to the Title IX Office if the employee experiences, observes, or becomes aware of an incident that meets the following conditions **(**see **University Rule 08.01.01.M1 (https://rules-saps.tamu.edu/PDFs/08.01.01.M1.pdf)**):

- The incident is reasonably believed to be discrimination or harassment.
- The incident is alleged to have been committed by or against a person who, at the time of the incident, was (1) a student enrolled at the University or (2) an employee of the University.

Mandatory Reporters must file a report regardless of how the information comes to their attention – including but not limited to face-to-face conversations, a written class assignment or paper, class discussion, email, text, or social media post. Although Mandatory Reporters must file a report, in most instances, a person who is subjected to the alleged conduct will be able to control how the report is handled, including whether or not to pursue a formal investigation. The University's goal is to make sure you are aware of the range of options available to you and to ensure access to the resources you need.

Students wishing to discuss concerns in a confidential setting are encouraged to make an appointment with ***Counseling and Psychological Services*** **(https://caps.tamu.edu/)** *(CAPS).*

Students can learn more about filing a report, accessing supportive resources, and navigating the Title IX investigation and resolution process on the University's ***Title IX webpage*** **(https://titleix.tamu.edu/)** ***.***

Statement on Mental Health and Wellness

Texas A&M University recognizes that mental health and wellness are critical factors that influence a student's academic success and overall wellbeing. Students are encouraged to engage in healthy self-care by utilizing available resources and services on your campus.

Students who need someone to talk to can contact ***Counseling & Psychological Services (https://caps.tamu.edu/)*** *(CAPS) or call the* ***TAMU Helpline (https://caps.tamu.edu/helpline/)*** *(979-845-2700) from 4:00 p.m. to 8:00 a.m. weekdays and 24 hours on weekends. 24-hour emergency help is also available through the National Suicide Prevention Hotline (800-273-8255) or at* ***suicidepreventionlifeline.org*** **(https://suicidepreventionlifeline.org/)** ***.***

Technology Requirements

- Students will need internet access for quizzes during lecture time.