

	Course	MECH 4310 Systems and Controls
	Professor	J.M. Hilkert
	Term	SP 2013
	Meetings	2:30-3:45 Tue-Thur ECSS 2.312

Professor's Contact Information

Office Phone 972-883-4681
Office ECSN 2.504
Email Address hilkert@utdallas.edu
Office Hours 10:00-11:30 MWF or by apt

TA: Marlon Hodge
Email Address mxh121830@utdallas.edu
Office ECSS 3.619
Office Hours Mondays 11:30 a.m. ~ 1:30 p.m. + Wednesdays 4:30 p.m. ~ 6:30 p.m.

Pre-requisites, Co-requisites, & other restrictions

Pre Req: MECH 3302 & MECH 3310. Pre or Co Req: MECH 4110

Course Description

MECH 4310 Systems and Controls (3 semester hours) Lecture course. Introduction to linear control theory. General structure of control systems. Mathematical models including differential equations, transfer functions, and state space. Control system characteristics. Transient response and steady-state error. Control system analysis. Performance, stability, root-locus method, Bode diagram, and Nyquist plot. Control system and compensation design.

Learning Outcomes

- Derive and analyze dynamic models of mechanical, electrical and electromechanical systems using differential equations, transfer functions and state-matrices. ABET outcomes a,e, k.
- Explain the concept, operation and purpose of representative feedback control systems ABET outcomes e, j
- Analyze the stability and performance of control systems in the time domain. ABET outcomes a,e, k
- Analyze the stability and performance of control systems in the frequency domain. ABET outcomes a,e
- Design a feedback controller for representative dynamic systems. ABET outcomes a,e,k

Required Texts & Materials

Feedback Control of Dynamic Systems – 6th Ed. by Franklin, Powell & Emani-Naeini. Access to Matlab / Simulink (note: access is available in the computer lab).

Matlab / Simulink student edition

Suggested Texts, Readings, & Materials

Matlab / Simulink User Guides & Tutorials

(http://www.mathworks.com/academia/student_center/tutorials)

Control Tutorials for Matlab – University of Michigan (available online at <http://ctms.engin.umich.edu/CTMS>)

Assignments & Academic Calendar [*Topics, Reading Assignments, Due Dates, Exam Dates*]

Weeks 1-6 Component / system modeling block diagrams, transfer functions and frequency response. Review of Laplace transforms and complex numbers. Intro to control systems, linearity & superposition. System response to input commands, disturbances and noise. PID controllers. REF: Text chap's 1-4 and app A.

Exam # 1 Feb 19

Weeks 7-13 Stability analysis and system design. Root locus, Nyquist & Bode analysis. Compensator design. Discrete equivalent design. REF: Text chap's 5-6 & sects 4.41 and 8.1-8.5

Exam #2 Apr 4

Weeks 14-17 Continuation of system design. Intro to state variables, canonical matrix forms and state feedback control techniques. Special topics as time permits. REF: Text chaps 6 & 7.

Final Exam 2:00-4:45 PM, May 7 (note: a comprehensive final will be given)

Note: the descriptions and timelines above are guidelines subject to change at the discretion of the professor

Course Policies

Grading (credit) Criteria	<p>Students are expected to attend class and are responsible for all text book material as well as all lecture material.</p> <p>graded assignments 15 % (approx. 6 HW sets + pop quizzes) 1st Exam 25 % 2nd Exam 25 % Final Exam 35 %</p> <p>Targeted grade ranges: A 90-100% B 80-89% C 70-79% D 60-69% F Below 60%</p>
Make-up Exams	Not given except for extreme circumstances and with proper documentation.
Extra Credit	Bonus work may be assigned
Late Work	Not accepted except for extreme circumstances
Special Assignments	Instructors discretion
Class Attendance	Students are expected to attend class. Roll will be taken on occasion & pop quizzes will be given
Classroom Citizenship	Students are expected to comply with all Professional / University standards (see http://go.utdallas.edu/syllabus-policies)