Instructor: Zaher M. Kassas

Office: RFM 5248
Phone: 512-245-1984
Email: zkassas@ieee.org
Web Page: Available through TRACS
Office Hours: Mon., 5:00pm–6:30 pm, and by appointment
Teaching Assistant: Bryant R. Bamburg, bb1309@txstate.edu
TA Office Hours: Wed., 5:00pm–6:00 pm at RFM 5246 and Thu., 2:00–3:00 pm at RFM 1239
Problem Solving Session: Thu., 5:00-6:00 pm at RFM 5246

Lectures: Mon., 6:30pm–9:30pm, RFM 5242

Text: R.C. Dorf and R.H. Bishop, *Modern Control Systems*, Eleventh edition, Pearson Prentice Hall, 2008. This text has the following companion website, which contains practice exercises and numerous useful background material: http://wps.prenhall.com/esm_dorf_modctrlsys_11

Prerequisites: MATH 3323, PHYS 1430, and TECH 2332

Course Objective: To develop an understanding of the theory of automated control systems and its applications. Topics covered include: systems modeling, stability analysis, time and frequency domain feedback control design techniques, digital control, and transducer and sensor technology.

Homework Assignments: Homework assignments will be assigned on a regular basis and will be due at the beginning of the lecture. Late submissions will **not be accepted** (unless it is the result of an officially excused absence). You may discuss homework problems with other students, but you are **not** allowed to copy from others. If you decide to discuss your solutions with other student(s), you must provide the name(s) of the students with which you have worked. University disciplinary procedure will be invoked if any form of cheating is detected. The lowest homework assignment grade will be dropped.

Exams: There will be three midterm exams and a final. These exams are scheduled during class time as indicated in the course calendar. Missed exams may **not** be made up (unless it is the result of an officially excused absence).

Attendance and Course Policy: Attendance is expected. You are responsible for material covered in class and in the reading assignments.

Grading:

Homework Assignments	10%
Projects	30%
Midterm Exams	30%
Final Exam	30%

Final Grade Assignment:

A	90–100 %
B	80–89 %
C	70–79 %
D	60–69 %
F	0–59 %

Software Packages: Some of the topics introduced in class will be demonstrated through computer-aided control systems design (CACSD) software packages. We will be adopting the LabVIEW environment for this purpose. In particular, we will be using the LabVIEW Control Design and Simulation Module, LabVIEW PID Toolkit, and LabVIEW System Identification Toolkit.

Suggested References:

- K. Ogata, *Modern Control Engineering*, Fourth Edition, Prentice Hall, 2001
- K. Astrom and R. Murray, *Feedback Systems: An Introduction for Scientists and Engineers*, First Edition, Princeton University Press, 2008. This text is available to download from `http://www.cds.caltech.edu/~murray/amwiki`
- G.F. Franklin, J.D. Powell, and M.L. Workman, *Digital Control of Dynamic Systems*, Third Edition, Prentice Hall, 1997
- R.E. Ziemer, W.H. Tranter, and D.R. Fannin, *Signals and Systems: Continuous and Discrete*, Fourth Edition, Prentice Hall, 2001
- R.S. Figliola, *Theory and design for mechanical measurements*, Fourth Edition, Wiley, 2006
- A. Wheeler, R. Gangi, *An Introduction to Engineering Experimentation*, Second Edition, Prentice Hall, 2004
- E. Doebelin, *Measurement Systems - Application and Design*, Fifth Edition, McGraw-Hill, 2004

Tentative Topical Coverage:

Week	Date	Topics	Chapters
1	01/25	Introduction, Concepts of measurement systems, Metrology and metrological assurance, Instrumentation technologies and evaluation of uncertainty	Notes
2	02/01	Sensors technology: motion & dimensional/strain measurements, measuring position & velocity of linear and rotational quantities	Notes
3	02/08	Sensors technology: force, pressure, shaft power, and temperature	Notes
4	02/15	**Midterm Exam 1**, Signal processing, Data acquisition, Automation of measurements and calibration	Notes
5	02/22	Introduction, Mathematical models of systems, Linear differential equations, Nonlinear differential equations & linearization, Laplace transforms	1, 2
6	03/01	Transfer functions, Electrical & mechanical systems, Block diagrams, State-space models	2, 3
7	03/08	**Spring Break**	
8	03/15	Feedback control systems characteristics: disturbance rejection, noise attenuation, and sensitivity analysis; Performance of of feedback control systems: LTI systems response to test input signals	4, 5
9	03/22	Performance of of feedback control systems: First-order, second-order, and higher-order systems; Transient response analysis; Basic system identification	5
10	03/29	**Midterm Exam 2**, Introduction to CACSD	
11	04/05	Stability analysis: Routh-Hurwitz stability criterion, Stability of state-space systems,	6
12	04/12	Root locus design method	7
13	04/19	Frequency response analysis, PID control, Lead and lag compensators	8, 9, 10
14	04/26	**Midterm Exam 3**, Controllability and observability, Design of full-state feedback control systems and observers	11
15	05/03	Digital systems, z-transform, Discretization methods, Digital control systems	13
16	TBD	**Final Exam**	