

**UNIVERSITY OF MASSACHUSETTS
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING**

ECE 581

FEEDBACK CONTROL SYSTEMS (II)

SPRING, 2007

Class Hours: M-W-F 10:10 - 11:00 AM LGRC A201
Professor: Doug Looze, looze@ecs.umass.edu
Office: KEB 113F Phone: (413) 545-0973

Course Site: <http://www.ecs.umass.edu/ece581/>
This site contains all the course material to date. It includes this syllabus, the problem sets, and the class lecture notes. Log on under the user name *anonymous*, and use your email address as the password. Most browsers do this automatically. There is also a link on the department course webpage.

Textbook: Franklin, Powell and Emami-Naeini, *Feedback Control of Dynamic Systems*, 4th Edition, Prentice-Hall, 2006 (required).

References: Ogata, *Modern Control Engineering*, Prentice-Hall, 2002.
Dorf and Bishop, *Modern Control Systems*, Prentice-Hall, 2005.
The Student Edition of Matlab Release 14 (with the Control System Toolbox), The Mathworks, 2004.

Exams: There will be one midterm given during the semester and a final exam given during exam week. The midterm exam will be 2 hours long. Tentatively, the midterm exam will be given on Wednesday, March 28. The midterm exam will be 35% of the course grade. The final exam will be worth 35% of the course grade. A review session will be scheduled prior to each exam.

Homework: There will be approximately 8 assignments which will be due at the lecture on the specified date. **Late homework will not be accepted** - regardless of the excuse. So be sure to bring your homework to class. Homework will constitute 30% of the grade.

Objectives:

1. Understand the principles and objectives underlying feedback control, and how these affect the architecture of the control system.
2. Understand and be able to apply analysis tools to determine control system performance.
3. Design a feedback control system to achieve specified objectives.
4. Modify basic analysis and design tools to handle industrial and nonlinear systems.

OUTLINE

1. Design of continuous-time control systems (16)
 - a) Review of analysis tools
 - b) Design objectives
 - c) Compensation techniques
2. Digital Feedback Systems (13)
 - a) Digital control system architecture
 - b) Z-transform
 - c) Digital control system design
3. Industrial Process Design (2)
 - a) PID revisited
 - b) Tuning rules
4. Nonlinear feedback systems (6)
 - a) Simple nonlinearities
 - b) Describing functions
 - c) Applications
5. Advanced Applications (4)
6. Review and exams (1)

Professional Component: Credits of engineering science 2;_ Credits of design 1.

Table 1. Relationship of Course Objectives to ABET EC2000 Program Outcomes

PROGRAM OUTCOMES	COURSE OBJECTIVES			
	1	2	3	4
a. Able to apply knowledge of mathematics, science, and engineering	X	X	X	X
b. Able to design and conduct experiments, as well as to analyze and interpret data		X		
c. Able to design a system, component, or process to meet desired needs within realistic constraints	X	X	X	X
d. Able to function on multi-disciplinary teams	X			
e. Able to identify, formulate, and solve engineering problems	X	X	X	X
f. Understands professional and ethical responsibility				
g. Able to communicate effectively	X			
h. Understands the impact of engineering solutions in a global, economic, environmental, and societal context				
i. Recognizes the need for, and is able to engage in, life-long learning				
j. Has knowledge of contemporary issues				
k. Able to use the techniques, skills and modern engineering tools necessary for engineering practice	X	X	X	X

Prepared by: D. P. Looze

Date: 1/25/07