UNIVERSITY OF MASSACHUSETTS
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

ECE 580 **FEEDBACK CONTROL SYSTEMS (I)** **FALL, 2019**
MIE 444 **AUTOMATIC CONTROLS**

Class Hours: Tu-Th 2:30 PM – 3:45 PM

Professor: Weibo Gong **Office:**KEB211E **Phone:**(413) 545-0384 **email:** gong@ecs.umass.edu

Office Hours: TTh 3:45 – 5:15PM

TA Office Hours: Bo Guan: Mon 5:00 – 7:00PM; Mohammad Khosravi: Wed 5:00 – 7:00PM

Course Web Page: https://moodle.umass.edu/ (login using OIT ID)
The moodle page contains all the course material to date, including this syllabus, the problem sets, and the lecture notes.

Textbook: Franklin, Powell and Emami-Naeini, *Feedback Control of Dynamic Systems*, 8th Edition, Pearson, 2019. (Referred to as FPE)

References: Ogata, *Modern Control Engineering*, Prentice-Hall, 2009.

Exams: There will be one midterm exam on the evening of Wednesday, October 23 from 7–9 PM at the Integrated Learning Center S 331, and a final exam given during exam week (December 18, 3:30-5:30 PM at Marston 132). The midterm exam will be 30% of the course grade. The final exam will be worth 40% of the course grade.

Homework: There will be approximately 7 assignments that will be due at the beginning of the lecture on the specified date. **Late homework will not be accepted** – regardless of the reason. Homework will constitute 30% of the grade.

Objectives:
1. Understand and be able to represent dynamic response.
2. Understand the principles and objectives underlying feedback control, and how these affect the architecture of the control system.
3. Understand and be able to apply analysis tools do determine control system performance.
4. Design a feedback control system to achieve specified objectives.

Common Sense Rules:

You are encouraged to work together, however, submitted assignments should reflect your own effort and have your imprint which I can easily differentiate from all other submissions.

The university academic honesty policy can be found at www.umass.edu/dean_students/codeofconduct/acadhonesty. The penalty for academic dishonesty is failure in the course and referral to the Academic Honesty Board.

Inclusivity: The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued or respected for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing, speak with Assistant Dean Paula Rees (rees@umass.edu, 413.545.6324, Marston 128), or submit your concern through the College or Engineering Climate Concerns and Suggestions on-line form (tinyurl.com/UMassEngineerClimate). We are all members of an academic community with

a shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect.

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

ABET Outcome	Course Objectives			
	1	**2**	**3**	**4**
a) Apply knowledge of math, science & engrg.	X	X	X	X
b) Design & conduct experiments; analyze & interpret data			X	
c) Design a system, component or process to meet desired needs	X	X	X	X
d) Function on multi-disciplinary teams				
e) Identify, formulate, solve engineering problems	X	X	X	X
f) Understand professional, ethical responsibility				
g) Ability to communicate effectively				
h) Understand impact of engineering soln. in global & societal context				
i) Need to continue life-long learning				
j) Knowledge of contemporary issues				
k) Ability to use techniques, skills and tools needed for engrg. practice	X	X	X	X

OUTLINE

1.	System response a) Laplace Transforms b) Time Response c) Stability d) Frequency response	Review FPE Chapters 1–3	(1)*
2.	Control System Objectives a) Potential for Control b) Performance i) Measures ii) System type	FPE Chapter 4.1–4.2	(3)
3.	Classic PID Control a) Proportional, Integral and Differential Elements b) Effects on system response c) PID tuning rules	FPE Chapter 4.3	(3)
4.	Root locus	FPE Chapter 5	(2)
5.	Frequency Response Analysis a) Bode diagrams b) Nyquist diagrams c) Stability margins	FPE Chapter 6.1–6.4	(5)
5.	Design of control systems a) Design objectives b) Compensation techniques c) Computer implementation	FPE Chapter 6.6-6.7, 8.1–8.3	(12)
6.	Exam		(1)

* Approximate number of 75 min. lectures.