ME 374 -- System Dynamics Analysis and Design

Instructors: I. Y. (Steve) Shen Office: 313 Mechanical Engineering Building Phone Number: 543-5718 Email: ishen@u.washington.edu Office Hour: 1:30 - 2:30 pm, M, Tu, W and Th Last Time I Taught ME 374: Spring 2008 Other Undergraduate Course I Taught Recently: ME 230, Spring 2011 Textbook: System Dynamics--An Introduction, by Derek Rowell & David N. Wormley Course Notes: Available in UW bookstore Prerequisite: MATH 307 (ODE), MATH 308 (linear algebra), EE 215 (circuits), ME 230 (dynamics), and ME 373 (systems)

How Does It Work

Lectures: M,Tu,W,F, 11:30-12:20, Sieg 134, by I. Y. (Steve) Shen
TA: Robert Manson (mansonr@uw.edu), Ya-Fang Chen (yfcheng@uw.edu) Michael Au Yeung (wantai@uw.edu), Chi Hou Lei (leichi@uw.edu)
Recitations: AA: M, 2:30-4:20, MEB 234, by Michael Au Yeung AB: Tu, 8:30-10:20, MEB 102, by Robert Manson AC: Tu, 2:30-4:20, MEB 234, by Ya-Fang Chen AD: Th, 2:30-4:20, MEB 234, by Ya-Fang Chen AE: Th, 8:30-10:20, MEB 234, by Robert Manson AF: W, 2:30-4:20, MEB 234, by Robert Manson AF: W, 2:30-4:20, MEB 234, by Robert Manson AF: W, 2:30-4:20, MEB 243, by Michael Au Yeung
Laboratory: in MEB 115, TA by Lei

Procedure: In each recitation session, the class is divided into two halves. One half will stay in the recitations, and the other half will go to MEB 115 for lab. After one hour, the two classes will switch. There are only 4 labs this quarter.

How to Get Help

Mr. Robert Manson, Office Hours: W 9:30-10:30, F 9:30-11:30 (MEB 236). Ms. Ya-Fang Chen, Office Hours: W 12:30-1:30, 4:30-5:30, Th 4:30-5:30 (MEB 236). Mr. Michael Au Yeung, Office Hours: Th 10:30-1:30 (MEB 236). Mr. Chi Hou Lei, Office Hours: W 10:30-11:30 (MEB 236). ME 374 Web Site: <u>http://courses.washington.edu/mengr374/sp12/</u>

General Policy

Homework: Weekly homework will be due every Friday <u>in class</u>; 4-6 problems per week. A short lab summary is also due immediately after the lab. No late homework will be accepted. Notify the instructor in case of emergency. Homework solution will be available every Friday on the web. Please write down the Section Number on your homework. Grading Policy: Homework (15%), Lab Report (5%), Two Midterms (25% each), Final (30%). Last Day of Lecture: 6/1/2012, Friday

Final Exam Time: 6/6/2012, Wednesday, 2:30-4:20 pm

My Experience with ME 374

What do we learn in ME 374?

• Determine the response of the system by solving the ODE's or the state equations.

What are the challenges of ME 374?

- All the contents are highly mathematical.
- It is quite difficult to understand the physics behind the mathematics.
- It has too much material to cover.
- False expectation -- effort: 2 hrs/credit, expected grade: 3.4.

How could I get a good grade?

- Come to the lectures and read the class notes.
- Have a good study habit.
- Do homework problems yourself.
- Review lecture notes and do some problems before any exam.
- Make sure that you truly understand the physics.
- Remember this is a 5-credit course.

Syllabus

Week	Date	Section	Topics
1	3/26-3/30	Appendix	Introduction, Eigenvalues & Eigenvectors
		A.5	Examples, Modal matrix
			Diagonalization and Jordan Form
		10.2	Homogeneous Solutions
2	4/2-4/6	10.2-10.4	State transition matrix
		8.4.1	Particular solution
		10.5	Stability of state equations
			Review of complex variables
3	4/9-4/13	12.1	Heuristic example 1: definition of transfer
			functions
		12.4	Heuristic example 2: amplitude and phase
		12.3	Heuristic example 3: poles and zeros
			(Lab #1: solving state equations)
4	4/16-4/20		Examples and implications
		12.6,12.7	Connection to block diagrams
			Connection to state equation
			Putting pieces together: the big picture
			4/20: No class, COE Discovery Days
5	4/23-4/27	13.2	Impedances and Admittances
		13.3	Elements in series and in parallel
		13.4	One-port and two-port elements
			Relating impedance to transfer function
	4/20 5/4		Midterm #1, 4/27, Friday
6	4/30-5/4	14.1-14.4	Frequency response functions: definition
			Relation to transfer functions
		14.5	First order systems
1	5/7-5/11	14.5	Second order systems: examples
		14.6	Bode plots and examples
0	E /1 4 E /10	15.0	(Lab #2: first-order frequency response)
8	5/14-5/18	15.2	Fourier series, Examples
		15.2	Revisit frequency response function
		15.5	Wildterm #2, 5/18, Friday $(L_1 h_1 + H_2)$
0	5/21 5/25	15 4	(Lab #5: second-order frequency response)
9	5/21-5/25	15.4	Concept of spectrum
			Applications of Equipret transforms
			(Lab #4: second order periodia time response)
10	5/28 6/1	15.6	Memorial Day: 5/28 Monday
10	5/20-0/1	15.0	L aplace transforms: motivation
		157	Definition and properties
		1.5.1	Finding solutions of ODE*
	6/6 Wad		Final avam 2:30 4:20 pm
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