

Syllabus for ME3513

Measurement Systems

Fall, 2006



Course Information

Instructor: Dr. Maurizio Porfiri
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Office: RH504A
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Office Hours: Tuesday 2:00-3:00

Lectures: Tuesday 11:00-12:50 RH202
Thursday 3:00-3:55 RH503

Webpage: My Poly

Course Goals

The student who completes this course should have a clear understanding of instrumentation fundamentals. We will cover fundamental techniques in the analysis of analog and digital circuits. Elementary techniques for the characterization of systems' responses. Fundamental aspects of data acquisition and data conversion. Introductory concepts of sensors and actuators.

Required Text

Introduction to Mechatronics and Measurement Systems (3rd edition), Hstand and Alciatore, WCB/McGraw-Hill, 2007.

Homework

Homework will be assigned periodically. However, homework will neither be collected nor graded. Students are responsible to do homework on their own. Homework solutions will be posted on the internet after a week.

Exams

There will be two mid-term, a final exam and a set of quizzes. These will be administered in class and will test the student's comprehension and ability to apply material learned in class and through assignments. All tests are in-class, closed book, closed notes. During exams/quizzes, before beginning to solve assigned problems, students should briefly restate the problem and list the data given. Also, students should list the important concepts and formulae used to arrive at the final solution along with detailed work. Every page of every exam/quiz submission should have the student full name and section number. Illegible work and loose sheets will not be graded. Students must complete all exams/quizzes on their own. If a student cannot attend an exam/quiz due to a medical condition, certified by a doctor, he/she must notify the instructor in advance. In such a case, no makeup exam/quiz will be offered. Instead, the weight of the missed exam/quiz will be added to the following exam (if there is one remaining). Unexcused absence from an exam/quiz will result in a grade of 0 for that exam/quiz.

Students are responsible to check their grades on the internet and compare their solutions to those posted. Grades and solutions will be reasonably posted within 48 hours. Exams and quizzes will be returned to the students after approximately a week from the day the grades are posted. Discussion of the grades will only be done during office hours and before the exams/quizzes are returned to the students.

Grading

This is a 3 credits course.

Policy

Homework:	0%
Quizzes:	30%
First Midterm Exam:	20%
Second Midterm Exam:	20%
Final Exam:	30%

Letter Grade Policy

A: 95+, A-: 90+, B+: 87+, B: 83+, B-: 80+, C+: 77+, C: 73+, C-: 70+, D+: 65+, D: 60+, F: <60.

Tentative Lecture Schedule

Students are responsible for reading the listed sections before each lecture. The topics refers to the 2nd edition of the textbook and will be updated to the 3d edition as soon as possible.

Lecture	Reading	Topic of the day
Lecture 1 9/5/06 (T)	Histand 1.1,1.2,2.1,2.2,2.8,5.4	Welcome and motivation. Overview of fundamental electrical elements
Lecture 2 9/7/06 (R)	Histand 2.3	Kirchhoff's laws and circuit analysis
Lecture 3 9/12/06 (T)	Histand 2.3	More on circuit analysis
Lecture 4 9/14/06 (R)	Histand 2.4	Equivalent circuits
Lecture 5 9/19/06 (T)	Histand 2.6	Alternating current circuits
Lecture 6 9/21/06 (R)	Histand 2.7,2.9	Power in electrical circuits. Impedance matching
Lecture 7 9/26/06 (T)	Histand 4.1-4.3	System response and signal analysis

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Tentative Lecture Schedule (Continued)

Lecture	Reading	Topic of the day
Lecture 8 9/28/06 (R)	Histand 4.4-4.6	Properties of systems' responses
Lecture 9 10/5/06 (R)	Histand 4.7,4.8	Dynamic characteristics of systems. Laplace transform
Lecture 10 10/10/06 (T)		More on Laplace Transform
Lecture 11 10/12/06 (R)	Histand 4.9,4.10	Application of Laplace Transform to the solution of ordinary differential equations
Lecture 12 10/17/06 (T)		Frequency response of a system
Lecture 13 10/19/06 (R)	Histand 5.1-5.6	Operational amplifier basic configurations
Lecture 14 10/24/06 (T)	Histand 5.7-5.13	More operational amplifier configurations
Lecture 15 10/26/06 (R)		Review of main topics
Lecture 16 10/31/06 (T)		First midterm exam
Lecture 17 11/2/06 (R)	Histand 5.14	Refined models for operational amplifiers
Lecture 18 11/7/06 (T)	Histand 6.1,6.2,8.1-8.3	Digital Circuits. Data acquisition and quantizing theory. Analog to digital conversion
Lecture 19 11/9/06 (R)	Histand 8.4	Digital to analog conversion
Lecture 20 11/14/06 (T)	Histand 9.1-9.3	Position and speed measurements. Stress and strain measurements
Lecture 21 11/16/06 (R)	Histand 9.4	Temperature measurements
Lecture 22 11/21/06 (T)	Histand 9.5-9.6	Vibration measurements
Lecture 23 11/28/06 (T)	Histand 10.1-10.4	Electric motors
Lecture 24 11/30/06 (R)		Review of main topics
Lecture 25 12/5/06 (T)		Second midterm exam
Lecture 26 12/7/06 (R)	Histand 10.5,10.6	DC and stepper motors

ABET a-k criteria compliance

	<i>a</i>	<i>b</i>	<i>c</i>	<i>d</i>	<i>e</i>	<i>f</i>	<i>g</i>	<i>h</i>	<i>i</i>	<i>k</i>
ME3513	✓		✓	✓	✓	✓	✓		✓	✓

- (a) an ability to apply knowledge of mathematics, science, and engineering
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.