

ME102A - Introduction to Measurement Systems

Lectures: M&F 9:10-10:00a, 1 LeConte

Labs: M, T, W & Th 2-5p, 122 Hesse

Prerequisite: Eng26 (waived for Junior Transfers), ME C85, ME 104, ME 132 (can be taken as a co-requisite if the schedule allows) EE 16A or 40. Reading and Composition courses completed

INSTRUCTOR

Asst. Prof. S.A. Mäkiharju

6179 Etcheverry Hall, Office hours: M&F 10:30-11:30a or by appointment

Email: makiharju@berkeley.edu (For course related questions, post them on bCourses.)

GSIs

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DESCRIPTION

The objectives of this course are to introduce students to modern experimental techniques for mechanical engineering, and to improve students' written and oral communication skills. Students will be provided exposure to, and experience with, a variety of sensors used in mechatronic systems including sensors to measure temperature, displacement, velocity, acceleration and strain. The role of error and uncertainty in measurements and analysis will be examined. Students will also be provided exposure to, and experience with, using commercial software for data acquisition and analysis.

STUDENT LEARNING OUTCOMES

By the end of this course, students should: know how to use, what can be measured with, and what the limitations are of the basic instruments found in the laboratory: oscilloscope, multimeter, counter/timer, analog-to-digital converter; know how to write a summary laboratory report; understand the relevance of uncertainty in measurements, and the propagation of uncertainty in calculations involving measurements; understand the physics behind the instruments and systems used in the laboratory; know how to program effectively using LabVIEW for data acquisition and analysis.

In brief: Prepare students for experimental work, or its management, in academic or industrial labs.

GRADING

- Lecture participation (5%), 75% attendance rate required for full score (see below for details).
- Lab participation: should attend all. Regardless of reason, to pass 9 of 12 required.
- Homework (20%)
- Technical Communications – lab reports and one oral report (55%)
- In-Lab Practical Exam (5%)
- Final Written Exam (15%)

LECTURE PARTICIPATION

We will be using the i>clicker student response system in class. Experience indicates that their use improves student engagement and learning. We will also use i>clicker to keep track of lecture participation. **For full participation (5% score), you must respond to at least 75% of the questions posed throughout the semester. No partial credit for < 75% participation.** *You may only respond to questions on your own behalf (i.e. do not use a classmate's clicker to fake their attendance).* If you do not have a clicker, purchase the latest model (i>clicker 2), but earlier models should also work. The mobile application REEF Polling will not be used. Register your clicker **only** within bCourses, so we will be able to match your responses with your name.

TEXTBOOK(S) AND OTHER REQUIRED MATERIAL

- T.G. Beckwith, R.D. Marangoni, J.H. Lienhard, “Mechanical Measurements, 6th Ed.,” Pearson, 2006.
 - There are three copies on 2h course reserve at Engineering library
- i>Clicker or i>Clicker2. Every student must bring an i>Clicker with them to each lecture.

HOMEWORK

Homework will be assigned on topics that complement the lab work. Late homework score x0.75 for up to 24h late, x0.5 for 24-48h late, x0.25 for 72h late, x0 for more than 72h late.

LAB TEAMS

Up to 120 students (up to 35 per lab section) will form teams of 3 (with potentially few teams of 2)
=> up to 12 teams per section **maximum**.

During typical lab:

~10 min the GSI(s) will give an introduction to the lab.

~160 min teams conduct the experiment, and on average can have ~20 minutes of individualized guidance from the GSI.

Teaming exercise based on “who am I in one slide” during first lab.

PRELIMINARY LAB SCHEDULE M, T, W & Th 2-5p, 122 Hesse

Note: We are working on new labs. Hence, the schedule may change during the semester!

Week	Dates	Lab	Equipment/Sensors
1	8/23-8/25	No lab, first lecture on 8/25	
2	8/28-9/1	Lab 1 – Intro to 102A lab	Simple circuits; PXI instruments: Power Supply, Waveform Generator, Oscilloscope & Multimeter to produce/measure DC & AC Voltage & Current LabVIEW; Digital data acquisition (DAQ); Spectral Analysis
3	9/4-9/8	No class on Monday - holiday No labs all week!	
4	9/11-9/15	Lab 2 – Vibrating beam	PICK ONE OF THE SHAPES FOR LAB 4! SUBMIT TO 3D PRINT QUE. Start print.
5	9/18-9/22		
6	9/25-9/29	Lab 3 – Image Based Meas.	
7	10/2-10/6		
8	10/9-10/13		
9	10/16-10/20	Lab 4/5.	
10	10/23-10/27	Lab 4/5, cont.	
11	10/30-11/3	Lab 4/5 – Completion	
12	11/6-11/10	Lab 5/4 No class on Friday - holiday	
13	11/13-11/17	Lab 5/4, cont.	
14	11/20-11/24	Lecture on Monday No labs all week! Holiday 11/22-24, W-Fr	
15	11/27-12/1	Lab 5/4 – Completion.	
16	12/4-12/8	RRR week.	
17	12/11-12/15	Final exam week	