ME 1041: Mechanical Measurements 1

(Modifications to this syllabus may be required during the semester. Any changes to the syllabus will be posted on the course website and announced in class)

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Office Hours: Tuesdays and Thursdays
11:00am – 2:00pm

Lecture Times:
Mondays 1:50pm – 3:30pm, Room 3-105

Laboratory Times
Thursdays in Room 3-120, 9:30pm – 11:30pm (Group 1)
1:30pm – 3:30pm (Group 2)
3:45pm – 5:45pm (Group 3)

Catalog Description: 3 Credits; this course is the first in a sequence of courses that pertain to engineering laboratory measurements. This course aims to provide a basic knowledge of measurement systems that include instruments used to collect data, sensors used to monitor mechanical systems, tools used to condition measurements signals and statistics for analyzing experimental data. Laboratory exposure is an important component in this course that will help prepare students for the second course in the sequence, ME 1042, in which laboratory assignments become more involved. Prereq: ENGR 0145, Co-Req: MEMS 0031, MEMS 1034

Course Objectives:

- Develop an understanding of a laboratory environment and safe practice techniques.
- Learn how to organize experimental procedure and operate laboratory equipment.
- Become familiar with common laboratory tools like power supplies, multimeters, oscilloscopes, data acquisition units, strain gages, etc.
- Learn how to effectively analyze data sets and apply statistical techniques (i.e. Uncertainty Analysis and Variance).
- Design and implement an experimental approach for hypothesis testing.

Required Text:

Theory and Design for Mechanical Measurements, 6th Edition, Figliola and Beasley, Wiley, 2015.

Course Outline:

Laboratory 1: Introduction to Instrumentation and Data Acquisition
Data Acquisition (Ch. 2)
Measurement System Behavior (Ch. 3)
Laboratory 2: Temperature Sensors and Statistical Analysis of Data
Temperature Measurements (Ch. 8)
Finite Statistics (Ch. 4)
Uncertainty Analysis (Ch. 5)
Laboratory 3: Use of Accelerometers in the Measurements of Dynamic Systems
Accelerometers (Ch. 12)
Uncertainty Analysis (Ch. 5)
Laboratory 4: Use of Strain Gages to Determine the Strain in Cantilever Beams
Strain Gages, Resistance Bridges, Bridge Constraints (Ch. 11)
Apparent Strain, Temperature Comparison (Ch. 11)
Laboratory 5: Characteristics of Passive & Active Filters
Filters and Amplifiers (Ch. 6)
Impedance Matching, Aliasing (Ch. 7)

Examination Schedule:

Midterm Exam Monday May 6th
Final Exam on Monday June 10th

Exams will be during normal lecture time.

Course Grading:

Studio	10%
Pre-Lab Assignments	5%
Lab Reports	30%
Midterm Exam	15%
Group Project	20%
Final Exam	20%

Grading Scale: A 10-point scale will be used as a baseline for final grades (A, A- > 90, 89 > B+, B, B- >80, etc.). An additional curve may be applied, as determined by the overall final grade distribution of the class. Grades of A-, B+, B-, etc. will be determined at the instructor's discretion.

Course Schedule:

Week 1	February 25th	February 28th
	Course Introduction, Ch. 1, Ch.2	Lab Safety Introduction
Week 2	March 4th	March 7th
	Ch. 2, Ch. 3	Lab 1
Week 3	March 11th	March 14th
	Ch. 3	No Lab
Week 4	March 18th	March 21st
	Ch. 8, Ch. 4	Lab 2
Week 5	March 25th	March 28th
	Ch. 4, Ch. 5	No Lab
Week 6	April 1st	April 4th
	Ch. 12	Lab 3
Week 7	April 8th	April 11th
	Ch. 4, Ch. 5	No Lab
Week 8	April 15th	April 18th
	Ch. 11	Lab 4
Week 9	April 22nd	April 25th
	Ch. 11	No Lab
Week 10	April 29th	May 2nd
	No Class	No Class
Week 11	May 6th	May 9th
	Midterm Exam	No Lab
Week 12	May 13th	May 16th
	Ch. 6	Lab 5
Week 13	May 20th	May 23rd
	Ch. 7	No Lab
Week 14	May 27th	May 30th
	Project Introduction	Project Step 1

Week 15	June 3rd	June 6th
	Final Exam Review	Project Step 2
Week 16	June 10th	June 13th
	Final Exam	Project Step 3
Week 17	June 17th	June 20th
	Project Testing	Project Testing
Week 18	June 24th	June 27th
	End of Semester	End of Semester

Class Policies: Regular class attendance is expected and encouraged. Each student is responsible for all of the material presented in class and in the reading assignments. Exams will emphasize treatment of material covered in lectures. In general, no late assignments will be accepted or makeup exams given. Exceptions will be made for a valid excuse consistent with University Policy. If you cannot attend an exam or meet a due date, you must contact the instructor prior to the exam or due date. Arrangements will be made for students on a case by case basis. (Failure to contact the instructor prior to the exam or assignment due date will result in a zero on that exam/assignment.)

Laboratory Policies: Students must attend all scheduled labs. Exceptions will be made for a valid excuse consistent with University Policy. If you cannot attend a laboratory, you must contact the instructor prior to the lab session in order to reschedule. While in the laboratory, all safety guidelines and procedures must be followed. Failure to comply with safe laboratory practices will result in removal from the course.

Academic Integrity Policy: "Violations of academic integrity include, but are not limited to, cheating, plagiarism, or misrepresentation in oral or written form. Such violations will be dealt with severely, in accordance with University policy. Plagiarism means representing someone else's idea or writing as if it were your own. If you use someone else's ideas or writing, be sure the source is clearly designated." It is expected that students adhere to the academic integrity policy that is presented in the Student's Honor Code of Conduct / Student Handbook.