

ME 1041 Mechanical Measurements 1

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

Instructor: Qi (Michael) Lu, Ph.D.
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Office hours:
Mon 2:00 - 4:00 PM
Tue 4:30 - 5:30 PM

Lab engineer: Dong Liang
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Teaching assistant: Hailing Tian
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Laboratory times:
Wed 8:30 – 10:30 AM (Group 1)
Wed 10:30 – 12:30 AM (Group 2)
Teaching assistant office hour: Wed 4:30 – 5:30 PM

Teaching assistant: Guanbo Chen
Email: chenguanbo007@qq.com
Laboratory times:
Thu 8:30 – 10:30 AM (Group 3)
Thu 10:30 – 12:30 AM (Group 4)

Note: when emailing the instructor, lab engineer or the teaching assistants, please

- Include the course number, your name and your student number in the subject field of your message;
- And use your university email account.

Lecture time/location: Tue 10:15 - 11:55 AM/Online or Zone 4-212

Laboratory location: Zone 3-120

Laboratory times: Wed 8:30 – 10:30 AM (Group 1)
Wed 10:30 AM – 12:30 PM (Group 2)
Thu 8:30 – 10:30 AM (Group 3)
Thu 10:30 AM – 12:30 PM (Group 4)

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.

Course Objective:

At the completion of this course, students will be able to

- 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.

Prerequisites:

ENGR 0145 Statics and Mechanics of Materials 2, MEMS 0031 Electric Circuits, ME 1014 Dynamic Systems

Textbook:

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

Website: <https://learn.scupi.cn/>

Topics Covered:

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)

Course Schedule:

Week	Lecture	Lab
1	February 25 Course Introduction, Ch. 1	February 26, 27 Lab TBD
2	March 3 Ch. 2, Studio 1	March 4, 5 Lab TBD
3	March 10 Ch. 3, Studio 2	March 11 Lab Safety Introduction
4	March 17 Ch. 8, Ch. 4	March 18, 19 Lab TBD
5	March 24 Ch. 4, Studio 3	March 25, 26 Lab TBD
6	March 31 Ch. 12, Ch. 5	April 1, 2 Lab TBD
7	April 7 Ch. 3, Studio 4	April 8, 9 Lab TBD
8	April 14 Ch. 11	April 15, 16 Lab TBD
9	April 21 Ch. 11, Studio 5	April 22, 23 Lab TBD
10	April 28 Midterm Review	April 29, 30 Lab TBD
11	May 5 Midterm Exam	May 6, 7 Lab TBD
12	May 12 Ch. 6, Ch. 7	May 13, 14 Lab TBD
13	May 18 Ch. 7, Studio 6	May 19, 20 Lab TBD
14	May 26 Ch. 4, Ch. 5, Project Introduction	May 27, 28 Project Step 1
15	June 2 Studio 7, Final Exam Review	June 3, 4 Project Step 2
16	June 9 Final Exam	June 10, 11 Project Step 3
17	June 16 Project Testing	June 17, 18 Project Testing
18	End of Semester	

Course Gradings:

- Studio 10 %
 - Pre-lab assignments 5 %
 - Lab reports 30 %
 - Midterm exam 15 %
 - Group project (3-4 students) 20 %
- Note: every group member receives the same score
- Final exam 20 %

Grading Scale:

Letter	A	A-	B+	B	B-	C+	C	C-	D+	D	F
Percentage (%)	100~90	89~85	84~80	79~76	75~73	72~70	69~66	65~63	62~61	60	<60

Class Policies:

- On-time attendance at all class activities is expected. Student is responsible for any material that was covered, and any changes to the exam dates and homework assignments announced in class.
- In general, no late assignment or make up exams will not be accepted. If you have a serious conflict with an exam schedule, you must discuss it with the instructor and **take the exam early**. Failure to contact the instructor prior to the exam or assignment due date will result in a **zero** on that exam/assignment. Exams missed due to a serious illness or a family emergency (these must be documented) will be dealt with on a case-by-case basis according to the University Policy.
- Any questions regarding the grading discrepancy should be brought up within a week of returning the homework or exam.
- 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.

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.