

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.)

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Office Hours: Mon, Tue, Wed 1:00 - 2:00 PM

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: Tuesday 4:45 - 6:25 PM/ Zone 4-203

Laboratory location: Zone 3-120

Laboratory times: Tuesday 10:15-11:55 AM
Tuesday 1:50 – 3:30 PM

Catalog Description:

This course is the first in a sequence of courses that pertain to engineering laboratory measurements. Its primary objective is to provide fundamental knowledges of mechanical measurements. This encompasses aspects such as measurement system components, data acquisition, standards, instrument calibration, signal characteristics, measurement system behavior, signal conditioning, statistical treatment of data, uncertainty analysis, and technical report writing.

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

Textbook:

Theory and Design for Mechanical Measurements, 7th Edition, Figliola and Beasley, Wiley, 2019.

Website: <https://pibb.scu.edu.cn/>

Topics Covered:

Laboratory 1: Introduction to Instrumentation and Data Acquisition

Data Acquisition (Ch. 2)

Sampling Concepts (Ch. 7)

Laboratory 2: Use of Accelerometers in the Measurements of Dynamic Systems

Measurement System Behavior (Ch. 3)

Accelerometers (Ch. 12)

Laboratory 3: Temperature Sensors and Statistical Analysis of Data

Measurement System Behavior (Ch. 3)

Finite Statistics (Ch. 4)

Uncertainty Analysis (Ch. 5)

Temperature Measurements (Ch. 8)

Laboratory 4: Use of Strain Gages to Determine the Strain in Cantilever Beams

Strain Gages, Resistance Bridges, Bridge Constants (Ch. 11)

Apparent Strain, Temperature Compensation (Ch. 11)

Laboratory 5: Characteristics of Passive & Active Filters

Filters and Amplifiers (Ch. 6)

Aliasing (Ch. 7)

Course Schedule:

Week	Lecture	Lab
1	Sep. 5 Course Introduction	Sep. 12 Lab Safety Introduction
2	Sep. 12 Ch. 1, Ch. 2	Sep. 19 No Lab
3	Sep. 19 Ch. 2, Ch. 7	Sep. 26 Lab 1
4	Sep. 26 Ch. 3	Oct. 3 National Holiday
5	Oct. 3 National Holiday	Oct. 10 No Lab
6	Oct. 10 Ch. 12	Oct. 17 Lab 2
7	Oct. 17 Ch. 4	Oct. 24 No Lab
8	Oct. 24 Midterm Exam	Oct. 31 No Lab
9	Oct. 31 Ch. 8	Nov. 7 Lab 3
10	Nov. 7 Ch.4	Nov. 14 No Lab
11	Nov. 14 Ch. 11	Nov. 21 Lab 4
12	Nov. 21 Ch. 6	Nov. 28 Lab 5
13	Nov. 28 Project Introduction	Dec. 5 Project Step 1
14	Dec. 5 Final Exam Review	Dec. 12 Project Step 2
15	Dec. 12 Final Exam	Dec. 19 Project Step 3
16	Dec. 19 Project Step 3	Dec. 26 Project Testing
17	Dec. 26 Project Testing	

Course Gradings:

- Attendance 10 %
- Studio 10 %
- Lab reports 30 %
- Group project 20 %
- Midterm exam 15 %
- Final exam 15 %

Note: 3-student group for studio, lab reports and project submission, every group member receive the same score

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.