

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:

Tuesday: 1:00 PM-2:00 PM

Wednesday :1:00 PM-2:00 PM

Note: when emailing the instructor 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 1:50 - 3:30 PM/ Zone 4-202

Laboratory location: Zone 3-120

Laboratory times: Wednesday 1:50 – 5:30 PM

Tuesday 1:00– 3:30 PM (Week 16 to 17 for Final Project)

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

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)

Course Schedule:

Week	Lecture	Lab
2	Sep 6 Course Introduction, Ch. 1	Sep 7 No Lab
3	Sep 13 Ch. 1, Ch. 2	Sep 14 No Lab
4	Sep 20 Ch. 2, Ch. 7	Sep 21 Lab Safety Introduction
5	Sep 27 Ch. 3, Ch. 12	Sep 28 Lab 1
6	Oct 11 Ch. 12	Oct 12 Lab 2
7	Oct 18 Ch. 8	Oct 19 No Lab
8	Oct 25 Ch. 4	Oct 26 Lab 3
9	Nov 1 Ch. 4, Ch. 11	Nov 2 No Lab
10	Nov 8 Ch. 11	Nov 9 Lab 4
11	Nov 15 Midterm Exam	Nov 16 No Lab
12	Nov 22 Ch. 6	Nov 23 Lab 5
13	Nov 29 Ch. 5	Nov 30 Makeup for Lab 5
14	Dec 6 Project Introduction	Dec 7 Project Step 1
15	Dec 13 Course Review	Dec 14 Project Step 2
16	Dec 20 Project Step 3	Dec 21 Project Testing
17	Dec 27 Project Testing	Dec 28 Project Testing
18	Final Exam	

Course Gradings:

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

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.