

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, Wed 2:00 - 5:00 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 10:15 - 11:55 AM/ Zone 3-106

Laboratory location: Zone 3-120

Laboratory times: Thursday 1:50 – 3:30 PM
Thursday 3:40 – 5:30 PM
Friday 08:15-09:55 AM
Friday 10:15-11:55 AM

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)

Aliasing (Ch. 7)

Course Schedule:

Week	Lecture	Lab
1	Feb 22 Course Introduction	Feb 24, 25 Lab Safety Introduction
2	Mar 1 Ch. 1, Ch. 2	Mar 3, 4 No Lab
3	Mar 8 Ch. 2, Ch. 7	Mar 10, 11 Lab 1
4	Mar 15 Ch. 12, Ch. 3	Mar 17, 18 No Lab
5	Mar 22 Ch. 3	Mar 24, 25 Lab 2
6	Mar 29 Ch. 8	Mar 31, Apr 1 No Lab
7	Apr 5 National Holiday	Apr 7, 8 No Lab
8	Apr 12 Ch. 4	Apr 14, 15 Lab 3
9	Apr 19 Ch. 5	Apr 21, 22 No Lab
10	Apr 26 Midterm Exam	Apr 28, 29 No Lab
11	May 3 Ch. 11	May 5, 6 Lab 4
12	May 10 Ch. 4, Ch. 5	May 12, 13 No Lab
13	May 17 Ch. 6	May 19, 20 Lab 5
14	May 24 Project Introduction	May 26, 27 No Lab
15	May 31 Project Step 1	Jun 2, 3 Project Step 1
16	Jun 7 Project Step 2	Jun 9, 10 Project Step 2
17	Jun 14 Project Step 3	Jun 16, 17 Project Step 3
18	Jun 21 Final Exam	Jun 23, 24 Project Testing

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.