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: Dr. Dong Liang

Office: N-512
Email: dongliang@scupi.cn

Grade TA: Junce Pu

Email: 2135841858@qq.com

Office hours:
Tuesday & Wednesday: 8:00-10:00 AM

Lab TA: Rongyi Pu; Yanlei Zhou
Email: 1826297899@qq.com;
Felicia20021217@outlook.com

Lab Engineer: Willow Hu

Office: N-305

Email: willow.hu@scupi.cn

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 10:15-11:55 AM / SCUPI Building N-214 **L**

aboratory location: SCUPI Building Mechanical Measurement Lab N-206**L**

aboratory times: Tuesday 2:00-3:40 PM

Tuesday 10:15-11:55 AM (Week 16 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.

Course Objective:

This course aims to provide a well-founded, fundamental background in the theory of engineering measurements and hands-on experience with common laboratory instrumentation. Integrated throughout are the necessary elements to conduct engineering measurements through the design of measurement systems and measurement test plans, with an emphasis on the role of statistics and uncertainty analyses in that process.

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Learning Outcomes:

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

- Develop an understanding of a laboratory environment and safe practice techniques.
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions.
- Become familiar with common laboratory tools like power supplies, multimeters, oscilloscopes, data acquisition units, strain gages, etc.
- Collaborate effectively as a team to plan tasks and achieve objectives.

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)

Laboratory 6: Comparison of roughness measurement techniques

Finite Statistics (Ch. 4)
Uncertainty Analysis (Ch. 5)

Group Final Project

Course Schedule:

Week	Lecture	Lab
1	Sep 9 Course Intro., Ch. 1	Sep 9 No Lab
2	Sep 16 Ch. 1, Ch. 2	Sep 16 Lab Safety Intro.
3	Sep 23 Ch. 2, Ch. 7	Sep 23 Lab 1
4	Sep 28 Ch. 3	Sep 28 No Lab
5	Sep 30 Ch. 12, Group 1	Sep 30 No Lab
6	Oct 14 Ch. 8	Oct 14 Lab 2
7	Oct 21 Ch. 4 , Group 2	Oct 21 No Lab
8	Oct 28 Ch. 4, Course review	Oct 28 Lab 3
9	Nov 4 Midterm Exam	Nov 4 No Lab
10	Nov 11 Ch.11, Group 3	Nov 11 Lab 4
11	Nov 18 Ch. 6	Nov 18 No Lab
12	Nov 25 Ch. 6, Group 4	Nov 25 Lab 5
13	Dec 2 Ch. 5	Dec 2 No Lab
14	Dec 9 Project Introduction, Group 5	Dec 9 Lab 6
15	Dec 16 Course review, Group 6	Dec 16 Final Project-Step 1
16	Dec 23 Final Project-Step 2	Dec 23 Final Project-Step 3
17	Dec 30 Final Exam	

Course Gradings:

- Attendance   10%
- Studio   10 %
- Lab reports+Group project   30 %
- Midterm exam   25%
- Final exam   25 %

Note: 3-student group for studio, lab reports and project submission, every group member receive the same score. Groups will present lab reports in turns (marked in syllabus).

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, 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.** Absence from any lab project will result in a score of **zero** for that project. 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.
- Late submission of a lab report within one week will result in an **20%** deduction of the total marks. Late submission of a lab report exceeding one week will result in a **50%** deduction of the total marks.
- 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.