

ME 1042 Mechanical Measurements 2

(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: Wed, Fri 2:00 - 4:00 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;
- Use your university email account.

Lecture time/location: Thu 08:15 - 11:55 AM/Zone 3-102 (odd weeks)

Laboratory location: Zone 3-113/116

Laboratory times: Mon 8:30 AM– 10:00 AM

Mon 10:00 AM– 11:30 AM

Mon 1:30 PM – 3:00 PM

Mon 3:00 PM – 4:30 PM

Thu 1:30 PM – 3:00 PM

Thu 3:00 PM – 4:30 PM

Catalog Description:

3 Credits; this course is the second in a sequence of courses that pertain to engineering laboratory measurements. This course aims to advance the understanding of measurement systems and analyzing experimental data. Students will test laboratory scaled mechanical engineering systems and apply fundamental knowledge from mechanical engineering topics to analyze and rate those systems. Laboratory exposure is an important component in this course that will help prepare students for future laboratory setting environments.

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 advanced engineering laboratory tools and how engineering systems are tested.
- Learn how to effectively analyze data sets and apply statistical techniques (i.e.

- uncertainty analysis).
- Design and implement an experimental approach for hypothesis testing.

Prerequisites:

ME 1041 Mechanical Measurements 1

Textbook:

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

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

Topics Covered:

For the following four topics, you will need to choose **three out of four**.

Topic 1: Theory of Machines

Forced and Free Vibrations
Geared Systems

Topic 2: Control System

Automated Level Control using Programmable Logic Controllers (PLCs)
Fundamentals of Feedback Control
PD Control of Unstable Systems

Topic 3: Solid Mechanics

Uniaxial Tension Test of Materials
Heat Treatment of Materials

Topic 4: Thermal & Fluid Labs

Fluid Mechanics
Bench-top Heat Exchangers
Radiation Heat Transfer

Course Schedule:

| Week | Lecture | Lab |
|------|---|---|
| 1 | September 2 Course Introduction Forced and Free Vibrations Part I | September 2 Lab Introduction and Safety Forced and Free Vibrations Part I |
| 2 | September 9 No Lecture | September 6, 9, 13 Forced and Free Vibrations Part I |

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|----|--|--|
| 3 | September 16 Forced and Free Vibrations Part II Gear Systems | September 16, 18 Forced and Free Vibrations Part II Gear Systems |
| 4 | September 23 No Lecture | September 23, 27 Forced and Free Vibrations Part II Gear Systems |
| 5 | September 30 Exam I PLC Tank | September 30, October 16 PLC Tank |
| 6 | October 7 No Lecture | October 9, 11 PLC Tank |
| 7 | October 14 Control Theory Unstable Systems | October 14, 18 Control Theory Unstable Systems |
| 8 | October 21 No Lecture | October 21, 25 Control Theory Unstable Systems |
| 9 | October 28 Exam II Heat Treatment | October 28, November 1 Heat Treatment |
| 10 | November 4 No Lecture | November 4, 8 Heat Treatment |
| 11 | November 11 Fracture Mechanics Fluid Mechanics | November 11, 15 Fracture Mechanics Fluid Mechanics |
| 12 | November 18 No Lecture | November 18, 22 Fracture Mechanics Fluid Mechanics |
| 13 | November 25 Exam III Heat Exchangers Part I | November 25, 29 Heat Exchangers Part I |
| 14 | December 2 No Lecture | December 2, 6 Heat Exchangers Part I |
| 15 | December 9 Heat Exchangers Part II Radiation | December 9, 13 Heat Exchangers Part II Radiation |
| 16 | December 16 No Lecture | December 16, 20 Heat Exchangers Part II Radiation |
| 17 | December 23 Exam IV | |

Course Grading:

- Studio 15 %
- Lab reports 40 %
- Note: group submission for studio and lab reports.**
- Exam I 15 %
- Exam II 15 %
- Exam III 15 %
- Exam IV 15 %

Note: take three out of four exams based on topics selected. The total weight of exams is 45%.

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.
- Late submission for studio or homework is calculated based on the following equation

$$\text{Late submission full mark} = 100\% \times r^n$$
 $r = 0.8$: discounted return coefficient; n : number of late weeks and n is an integer number which will be round up, e.g. $n = 1$ for the late submission within a week
- Any questions regarding the grading discrepancy should be brought up **within a week** after returning the homework, report 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.