Fall
2022

SCUPI
Sichuan University - Pittsburgh Institute

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.)

Instructor: Qi (Michael) Lu, Ph.D.
Office: Zone 4-218
Email: qi.lu@scupi.cn

Lab Engineer: Willow Hu
Office: Zone 3-321B
Email: willow.hu@scupi.cn

Grading Teaching Assistant:
Damon Chen DamonChen333@163.com

Lab Teaching Assistants:
Hao Ji 2427230275@qq.com
Zhe Chen 874298978@qq.com

Office Hours: Wed 1:50 - 5:30 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 10:15 - 11:55 AM/Zone 3-311
Laboratory location: Zone 3-113/116
Laboratory times: Mon 8:15 AM– 9:55 AM
Mon 10:15 AM– 11:55 AM
Mon 13:50 PM – 15:30 PM
Mon 15:40 PM – 17:30 PM
Wed 8:15 AM– 9:55 AM
Wed 10:15 AM– 11:55 AM

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, 7th Edition, Figliola and Beasley, Wiley, 2019.

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

Topics Covered:

Topic 1: Solid Mechanics and Design
Geared Systems
Forced and Free Vibrations
Uniaxial Tension Test of Materials
Heat Treatment of Materials

Topic 2: Control System
Automated Level Control using Programmable Logic Controllers (PLCs)
Fundamentals of Feedback Control
PD Control of Unstable Systems
Robot Manipulator Control

Topic 3: Thermal & Fluid Labs
Fluid Mechanics
Bench-top Heat Exchangers
Radiation Heat Transfer

Course Schedule:

Week	Lecture	Lab
2	September 8 Course Introduction	September 12, 14 Lab Introduction and Safety
3	September 15 Gear Systems	September 19, 21 Gear Systems
4	September 22 Forced and Free Vibrations	September 26, 28 Forced and Free Vibrations W1
5	September 29 Uniaxial Tension Test	October 3, 5 National Holiday (TBD)
6	October 6 National Holiday (TBD)	October 10, 12 Forced and Free Vibrations W2 Uniaxial Tension Test W1

7	October 13 Heat Treatment of Materials	October 17, 19 Uniaxial Tension Test W2 Heat Treatment of Materials W1
8	October 20 Midterm Exam I	October 24, 26 Heat Treatment of Materials W2
9	October 27 Programmable Logic Controllers	October 31, November 2 Programmable Logic Controllers
10	November 3 Fundamentals of Feedback Control	November 7, 9 Fundamentals of Feedback Control
11	November 10 Unstable Systems	November 14, 16 Unstable Systems
12	November 17 Robot Manipulator Control	November 21, 23 Robot Manipulator Control
13	November 24 Midterm Exam II	November 28, 30 No Lab
14	December 1 Fluid Mechanics	December 5, 7 Fluid Mechanics W1
15	December 8 Heat Exchangers	December 12, 14 Fluid Mechanics W2 Heat Exchangers W1
16	December 15 Radiation	December 19, 21 Heat Exchangers W2 Radiation W1
17	December 22 Final Exam Review	December 26, 28 Radiation W2
18	Final Exam (TBD)	

Course Gradings:

- Studio 5 %
- Lab notebook 5 %
- Lab reports 30 %
- Midterm exam I 20 %
- Midterm exam II 20 %
- Final exam 20 %

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

  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.