Fall
2023

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

Lab Teaching Assistants:
Zhe Chen 874298978@qq.com

Xue Ding 1298844294@qq.com

Office Hours: Mon, Tue, Wed 1:00 - 2:00 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: Wed 8:15 - 9:55 AM/Zone 4-204

Laboratory location: Zone 3-113/116

Laboratory times: Wed 10:15 – 11:55 AM
Wed 1:50 – 3:30 PM
Wed 3:40 – 5:30 PM

Catalog Description:

This course is the second in a sequence of courses that pertain to engineering laboratory measurements. Builds on the fundamental knowledge provided in Mechanical Measurements 1, it equips students with the proficiency needed to adeptly devise and execute experiments concerning complex mechanical systems. The objective is to ascertain distinct attributes of those systems, which encompasses an in-depth grasp of statistical concepts, error analysis, computer-based data acquisition methods, and technical writing.

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)

Prerequisites:

ME 1041 Mechanical Measurements 1

Textbook:

Theory and Design for Mechanical Measurements, 7th Edition, Figliola and Beasley, Wiley, 2019.

References:

Equipment manuals from the vendor
Design of Machinery: An Introduction to the Synthesis and Analysis of Mechanisms and Machines, 4th Edition, Norton, Robert L, McGraw-Hill Education, 2020.
Mechanics of Materials, 10th Edition, Hibbeler, R. C., Pearson, 2015.
Mechanical Vibrations, 6th Edition, Singiresu S. Rao, Pearson, 2018.
Programmable Logic Controllers, 5th Edition, Frank D. Petruzella, 2015
Modern Robotics: Mechanics, Planning, and Control, 1st Edition, Lynch, Kevin M., and Frank C. Park. University Press, 2021.
Fluid Mechanics: Fundamentals and Applications, 1st Edition, Çengel, Yunus A., and John M. Cimbala, McGraw-Hill Higher Education, 2006.
Fundamentals of Heat and Mass Transfer, 8th Edition, Bergman, Theodore L. and Lavine, Adrienne S, Wiley, 2017.
Heat And Mass Transfer: Fundamentals and Applications, 5th Edition, Çengel, Yunus A., and Afshin J. Ghajar, McGraw-Hill Education, 2020.

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

Topics Covered:

Topic 1: Solid Mechanics and Design
Geared Systems
Forced and Free Vibrations
Uniaxial Tension Test 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

Fall
2023

SCUPI
Sichuan University - Pittsburgh Institute

Course Schedule:

Week	Lecture	Lab
1	Sep. 6 Course Introduction	Sep. 6 Lab Introduction and Safety
2	Sep. 13 Gear Systems	Sep. 13 Gear Systems
3	Sep. 20 Forced and Free Vibrations	Sep. 20 Forced and Free Vibrations W1
4	Sep. 27 Uniaxial Tension Test	Sep. 27 Uniaxial Tension Test W1 Forced and Free Vibrations W2
5	Oct. 4 Exam Review	Oct. 4 Uniaxial Tension Test W2
6	Oct. 11 Midterm Exam I	Oct. 11 No Lab
7	Oct. 18 Programmable Logic Controllers	Oct. 18 Programmable Logic Controllers
8	Oct. 25 Fundamentals of Feedback Control	Oct. 25 Fundamentals of Feedback Control
9	Nov. 1 Unstable Systems	Nov. 1 Unstable Systems
10	Nov. 8 Robot Manipulator Control	Nov. 8 Robot Manipulator Control
11	Nov. 15 Exam Review	Nov. 15 No Lab
12	Nov. 22 Midterm Exam II	Nov. 22 No Lab
13	Nov. 29 Fluid Mechanics	Nov. 29 Fluid Mechanics W1
14	Dec. 6 Heat Exchangers	Dec. 6 Fluid Mechanics W2 Heat Exchangers W1
15	Dec. 13 Radiation	Dec. 13 Heat Exchangers W2 Radiation W1
16	Dec. 20 Exam Review	Dec. 20 Radiation W2
17	Dec. 27 Final Exam	

Course Gradings:

- Attendance 10 %
- Studio 10 %
- Lab reports 50 %
- Midterm exam I 10 %
- Midterm exam II 10 %
- Final exam 10 %

Note: 4-student group for studio and lab reports submission, every group member receives 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.
- Late submission for studio or homework is calculated based on the following equation

  Late submission full mark = 100% × 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.