

Syllabus

ENME 2820: Mechanical Engineering Lab II Spring 2015

**University of Denver
Mechanical and Materials Engineering Department**

**Meets: 101 CMK Lecture M 8:00-8:50,
Section 1: M Lab: 9:00-11:50, 111 MET,
Section 2: R Lab: 9:00-11:50, 111 MET,
(3.0 Credit hours), Undergraduate Required MME Course**

Instructor: Dr. Jason Roney
Office: 204 CMK
Telephone: 303-871-2252
Email: jason.roney@du.edu

Course Description:

This course is the second in a series of mechanical engineering laboratory courses. This course is differentiated from the first course in that it requires independent experimental design by student teams. Using experimental equipment available in heat transfer, fluid mechanics, solid mechanics, thermodynamics, and measurement and control, the student team is required to design experiments to solve given problems which will be unique to each team. This course encourages students to develop experimental design and research techniques while continuing to improve skills in fundamental lab notebook keeping, uncertainty analysis in measurements, data acquisition, data analysis, report writing, oral presentations, and laboratory safety and procedures.

Prerequisites: ENME 2810, Mechanical Engineering Laboratory I

Textbook:

Figliola, and Beasley, Theory and Design of Mechanical Measurements, 5th ed., John Wiley & Sons, 2010. ISBN# 978-0470547410.

Mechanical Engineering Capstone Laboratory General Topics:

- Laboratory Safety
- Experimental Design
- Equipment Calibration
- Data Acquisition
- Data Analysis
- Uncertainty Analysis
- Measurement Systems and Devices
- Laboratory Notebook Keeping
- Technical Reports and Presentations

- Complimentary Theoretical Analysis and Numerical Experiments
- Research Techniques

Approximately four open-ended experiments will be completed during the quarter. The students teams will have up to two 3-hour lab sessions to complete their research and lab work. A problem will be assigned to each student team for every two week period. Each team will have a unique experimental problem. This first 3-hour session might involve the student researching and gathering information relevant to their problem. They may also began to explore the equipment while under Teaching Assistant and Instructor supervision. The students are then required to come to the next session with a well designed approved pre-lab protocol before beginning their measurements that will solve their given problem.

At the end of each of these experiments the students will be required to provide a formal written technical report, with some reports requiring a class oral or written presentation.

Course Objectives: The student will

1. Enhance their understanding of mechanical engineering phenomena through open-ended independent experiments.
2. Learn how to design, plan, and execute experiments relevant to mechanical engineering systems
3. Improve communication of technical results in oral and written form.
4. Experience an integrated laboratory experience that encompasses mechanical engineering concepts, experimental techniques, measurement, and data analysis.
5. Learn how to research information from scientific and engineering literature including basic concepts from prerequisite courses for experimental problem solving.

Lecture

Date	Approx. Lecture	Labs	HW Assignment
23-Mar	Syllabus, Lab Groups, Intro. Laboratory Safety, Lab Notebooks	Labs Do Not Meet	Read CH 1
30-Mar	Protocol Format, Formal Reports	Experiment I , 111 MET	
6-Apr	Overview of Calibration, Uncertainty Analysis	Experiment I, 111 MET	HW#1, Read CH 5
13-Apr	Design of Experiments, Modeling and Simulation	Experiment II , 111 MET	HW#1 Due, Read CH9 CH10
20-Apr	Fluids Measurements I	Experiment II, 111 MET	
27-Apr	Fluids Measurements II	Experiment III , 111 MET	HW # 2
4-May	Oral Report Poster Format	Experiment III, 111 MET	Read CH8
11-May	Temperature Measurements I, Data Acquisition	Experiment IV , 111 MET	HW#2 Due HW#3
18-May	Course Evaluations , Lab Team and Self Evaluations/	Experiment IV, 111 MET	
25-May	No Class, Memorial Day	Labs Do Not Meet	HW#3 Due

**Book and Supplemental Material will be used to cover this material.

Lab Section 1: Monday

Experiments	Time	Protocol Time	Data Acquire	Write-up	Present	Notebook
Experiment I	2 weeks	March 30	April 6	Formal (April 13)	No	Yes
Experiment II	2 weeks	April 13	April 20	Formal (April 27)	No	Yes
Experiment III	2 weeks	April 27	May 4	Formal (May 11)	Yes, Oral May 11	Yes
Experiment IV	2 weeks	May 11	May 18	Formal (May 29)	Yes, Poster Week May 29	Yes

Lab Section 2: Thursday

Experiments	Time	Protocol Time	Data Acquire	Write-up	Present	Notebook
Experiment I	2 weeks	April 2	April 9	Formal (April 16)	No	Yes
Experiment II	2 weeks	April 16	April 23	Formal (April 30)	No	Yes
Experiment III	2 weeks	April 30	May 7	Formal (May 14)	Yes, Oral May 14	Yes
Experiment IV	2 weeks	May 14	May 21	Formal (May 29)	Yes, Poster Week May 29	Yes

Separate handouts are given that explain the lab protocol, lab notebooks, lab formal reports, and presentations. This material will also be covered in the class lecture.

Grading: All Write-Ups are Team Efforts

Experiment I : 20% Written Summary/Protocol 10% Written Report 90%	Experiment II: 20% Written Summary/Protocol 10% Written Report 90%
Experiment III: 25% Written Summary/Protocol 10% Oral Presentation 40% Written Report 50%	Experiment IV: 25% Written Summary/Protocol 10% Oral Presentation 40% Written Report 50%

Misc. : Individual Work

Notebook: 5%

HW: 5%

Peer Evaluation (Poor Peer Evaluation can Cost a Whole Letter Grade).

Lab Attendance (Poor Lab Attendance will Cost a Whole Letter Grade).

Late Policy : 10% penalty if not turned in during lab period, 25% one calendar days late, 50% two calendar days late, no late work after three calendar days.

Lab Attendance: Lab attendance is mandatory--proof of lab attendance will be provided by a signed notebook which must be signed by lab TA or the Professor before leaving lab.