

COURSE SYLLABUS

Instructor Scott Bevill
sbevill@coloradomesa.edu

Office CH 326

Office Hours M W 1:00-2:30PM
T R 10:00-11:00AM

Meeting Times TR 11:00 - 12:50 PM

Location CH 310

Credits 2 credit hours

Workload

An undergraduate student in this course should expect to spend a minimum of three hours outside the classroom for every hour in the classroom.

Course Description

ENGR 427 is an upper-division course addressing methods of experimentation and data analysis relevant to mechanical engineering. This course will prepare you to plan and carry out experiments, analyze data, and present findings in written, visual, and oral forms. As such, this is a hands-on course that promotes active learning. You will use LabVIEW software to collect data and will analyze data using LabVIEW, Matlab, and Excel.

There will be a number of homework assignments throughout the semester to prepare you for the three laboratory activities you will do. You will work in pairs (or occasionally in larger groups) on the laboratory activities and subsequent deliverables.

Prerequisites

ENGR 263: Mechanics of Solids
ENGR 317: Fundamentals of Circuits and Electronics
STAT 305: Statistics and Quality Control for Engineering
ENGL 425: Scientific Writing

Textbook

There is no required text for this course.

The suggested textbook is "Theory and Design for Mechanical Measurements, 5th Edition" by Richard S. Figliola and Donald E. Beasley.

Course Website

Course-related communication and materials will be made available through Desire 2 Learn (D2L).

Learning Objectives

Upon completion of this course students should demonstrate the ability to:

1. Select and apply the knowledge, techniques, skills, and modern tools of the discipline to broadly defined engineering technology activities
2. Conduct standard tests and measurements; to conduct, analyze, and interpret experiments; and to apply experimental results to improve processes
 - a. Follow the design of an experiment
 - b. Acquire data on appropriate experimental variables
 - c. Compare experimental data and results to appropriate theoretical models
3. Demonstrate knowledge and competency in instrumentation and sensors

Grading

Course grade will be determined based on performance in meeting the various deadlines, quality of deliverables, and quality of the final product.

The grading breakdown is as follows:

Assignments / Problem Sets	40%
Labs	60%

Letter grades will be assigned as follows:

A	90.00 – 100 %
B	80.00 – 89.99 %
C	70.00 – 79.99 %
D	60.00 – 69.99 %
F	< 60.00 %

Academic Integrity: Students are expected to follow the Colorado Mesa University Student and Academic Policies Guide Code of Conduct and guidelines for academic integrity. If in doubt about a situation, don't hesitate to contact the instructor. More information can be found at http://www.coloradomesa.edu/academics/policies/academic_integrity.html

Accommodations: Every effort will be made to accommodate all students who have conflicts with scheduled exams or assignments due to religious obligations. Please provide notification well in advance (at least two weeks) to allow accommodations to be made.

In coordination with Educational Access Services (EAS), reasonable accommodations will be provided for qualified students with disabilities. Students must register with the EAS office to receive assistance. Please meet with the instructor the first week of class for information and/or contact Dana VandeBurgt, the Coordinator of EAS, directly by phone at 248-1801, or in person in Houston Hall, Suite 108.

Attendance Policy

Particularly since you will be working in small groups, attendance should be considered mandatory for this course. Assignments will be assigned and collected in-class. If personal issues or illness force class absence, notify the instructor and please contact Student Services at 970.248.1366 or on the first floor of Lowell Heiny Hall, Room 107.

From the CMU Student Handbook: “Students are expected to attend all sessions of each course in which they are enrolled. Failure to do so may result in a lowered grade, exclusion from class at the discretion of the instructor, or an administrative drop for non-attended courses. Students should not assume that non-attendance will result in an automatic drop from a class. Instructors may drop any student who fails to regularly attend class meetings prior to the Add/Drop Deadline so that other students may enroll. Instructors may also initiate a drop or withdrawal throughout the semester for a student who fails to attend classes regularly. (“Drops” are up to 15% of class elapsed; “withdrawals” are up to the mid-point of the class.) Not all instructors will exercise this option; therefore, a student should not assume that non-attendance will result in an automatic drop from a class.

Course Learning Objectives

Upon completion of the course, students should be able to demonstrate knowledge of

1. Measurement Fundamentals
 - Demonstrate Understanding of the purposes of measurements: comparison with models, performance measurements, process/quality control and physical constant determination.
 - Utilize experiment systems: transduction, signal conditioning, data acquisition and display.
 - Apply statistical concepts to understand variability, error and resolution.
 - Carry out calibration and uncertainty and statistical data analysis.
 - Explore different classes of measurement including stationary and transient systems.
2. Uncertainty in Experimental Measurements and its Propagation
 - Apply uncertainty analysis for real experiments.
 - Compute uncertainty for the following circumstances: design stage, repeated measurements, single measurements, propagation of uncertainty.
 - Apply objective outlier rejection techniques.
3. Confidence Intervals
 - Calculate confidence intervals and use them to make probabilistic statements about data sets.
4. Professional Skills
 - Learn how to work in a careful and orderly fashion.
 - Learn how to systematically record and document experimental activities and results.
 - Learn how to present experimental findings clearly and effectively using written, visual, and oral presentation formats.
 - Improve teamwork and communication skills.

Tentative Course Schedule

A proposed schedule for the semester follows. Assignments may be due on dates other than those listed below—formal assignment of homework and D2L will occur during class meetings and be posted on D2L.

Date	Activity	Due
Week 1		
Tuesday	Syllabus/Introduction/Analyzing photos/report writing Assignment #1	
Thursday	Uncertainty/Error/Propagation of error Assignment #2	
Week 2		
Tuesday	Statistics Review Assignment #3	Assignment #1
Thursday	Statistical Process Control	Assignment #2
Week 3		
Tuesday	Statistical Process Control Assignment #4	Assignment #3
Thursday	SPC Assignment	
Week 4		
Tuesday	Sensors Assignment #5	Assignment #4
Thursday	Sensors Assignment	
Week 5		
Tuesday	LabVIEW Assignment #6	Assignment #5
Thursday	LabVIEW Assignment	
Week 6		
Tuesday	Energy, Power, Transient data collection Assign Lab #1 Assignment #7	Assignment #6
Thursday	Lab 1 – Power/Transient data collection	
Week 7		
Tuesday	Lab 1 – Power/Transient data collection	Assignment #7
Thursday	Lab 1 – Power/Transient data collection	
Week 8		
Tuesday	Lab 1 – Power/Transient data collection	
Thursday	Lab 1 – Power/Transient data collection	

Week 9

Tuesday	Temperature Measurement Assignment #8	
Thursday	Lab 2 – Temperature/Calibration/Response time Lab 2 – Temperature/Calibration/Response time	Lab 1 – Individual report

Week 10

Tuesday	Lab 2 – Temperature/Calibration/Response time	Assignment #8
Thursday	Lab 2 – Temperature/Calibration/Response time	

Week 11

Tuesday	Lab 2 – Temperature/Calibration/Response time	
Thursday	Lab 2 – Temperature/Calibration/Response time	

Week 12

Tuesday	Beams, Strain Gauges Assignment #9	
Thursday	Lab 3 – Strain/Force/Pressure Lab 3 – Strain/Force/Pressure	Lab 2 – Group report

Week 13

Tuesday	Lab 3 – Strain/Force/Pressure	Assignment #9
Thursday	Lab 3 – Strain/Force/Pressure	

Week 14

Tuesday	No class – Thanksgiving Break	
Thursday	No class – Thanksgiving Break	

Week 15

Tuesday	Lab 3 – Strain/Force/Pressure	
Thursday	Lab 3 – Strain/Force/Pressure	

Week 16

Tuesday	Lab 3 – Strain/Force/Pressure	
Thursday	Lab 3 – Strain/Force/Pressure	

Finals Week

As scheduled	Lab 3 – Group Presentations	Lab 3 – Group Pres.
--------------	-----------------------------	---------------------