

MAE 170  
Experimental Techniques (4 units)

**Class/Laboratory Schedule:** two hours lecture, three hours lab, seven hours outside preparation.  
12 hours/week total

**Course Coordinator(s):** Farhat Beg, Nicholas Boechler, Javier Garay, Ratnesh Lal

**Textbooks/Materials:**

1. Introduction to Experimental Techniques by Wheeler and Ganji

**Catalog Description:** Principles and practice of measurement and control and the design and conduct of experiments. Technical report writing. Lectures relate to dimensional analysis, error analysis, signal-to-noise problems, filtering, data acquisition and data reduction, as well as background of experiments and statistical analysis. Experiments relate to the use of electronic devices and sensors.

**Prerequisites:** Phys. 2CL  
Recommended: MAE 140 or ECESS

**Course Type:** Required

**Performance Criteria:**

Objective 1

1.1 There is a series of questions in each lab that test whether the student succeeded in properly performing the lab. An in-class lab practical given at the end of the quarter, further tests the hand-on laboratory skills the students are expected to master

Objective 2

2.1 There is a series of questions in each lab that test whether the student understands the fundamental physical principles involved in each experiment. The written final also contains questions concerning the underlying physics when appropriate

Objective 3

3.1 There are weekly LabView assignments during the course and a LabView program to write as part of the in-class lab practical.

Objective 4

4.1 The students must prepare a laboratory report for each experiment.

## Objective 5

5.1 Continuous assessment by interacting with students and monitoring their lab notebooks. This task is performed by teaching assistants.

### B.4.4.2.3 Laboratory Experience

In MAE 170 Experimental Techniques during the junior year, all engineering students learn fundamental measurement techniques in electronics, mechanics, fluid flow, and heat transfer.

The

use of computers in data acquisition, including LabView software, is presented.

### B.4.4.2.5 Oral and Written Communication

## **Course Objectives:**

**(Numbers in parentheses refer to the specific MAE Program Outcomes)**

1. To introduce students to the "art" of scientific measurements, data and error analysis. (1, 6, ME10)
2. To revisit some of the basic physics concepts associated with heat transfer, oscillating springs, strain, and diffraction. (1, 6, ME10)
3. To familiarize students with LabView (data acquisition/analysis software). (1, 2, 6, ME8, ME9)
4. To learn to write a technical laboratory report. (3)

## **Course Topics:**

1. Intro to Instrumentation and LabView
2. A/D Conversion and Sampling Rates
3. Filters and resonant circuits
4. Operational Amplifier and Wheatstone Bridge Circuits
5. Temperature Measurements and Heat Transfer Coefficients
6. Measurements of Pressure and Acceleration
7. Measurement of Strain
8. Feedback control of servo motor