

Instrumentation

Outline of Instruction

Course Information

Project Type	Course
Organization	Monroe County Community College, Applied Science and Engineering Technology
Developers	Mike Taylor and Mike Taylor
Development Date	1/31/2012
Course Number	ELEC 136
Instructional Level	Associate Degree
Instructional Area	Electronics and Computer Technology
Division	Industrial Technology
Potential Hours of Instruction	60
Total Credits	3

Description

Measuring and Test equipment (M&TE) is a vital part of almost all industry. This course examines the characteristics and limitations of common instruments. A major focus is on calibration techniques and standards for such equipment. Topics covered include safety, lab techniques, AC and DC meters, digital multimeters, bridges, signal-processing circuits, and typical instruments for measuring parameters such as Torque, Pressure, Temperature, Dimensional, Mass, Force, and various others.

Major Units

- 1.Introduction to Instrumentation & Metrology
- 2.Metrology & Standards Organizations
- 3.Instrument Usage and Measurements, Measurement Theory
- 4.Meter circuits and loading
- 5.Meter frequency response and capacitive loading
- 6.Transducer types and characteristics
- 7.Bridge circuits and their applications
- 8.Theory and Calibration of Force, Torque, Pressure, Temperature, Electronic, Dimensional, and other physical measurement and Test equipment

Types of Instruction

Instruction Type	Contact Hours	Credits
Classroom Presentation	45	3

Textbooks

Jay L. Bucher. *The Metrology Handbook* .

Learner Supplies

Scientific Calculator.

Protoboard.

Prerequisites

ELEC-125

Exit Learning Outcomes

General Education Outcomes

- A. Communicate information in writing using the rules of standard English
- B. Apply mathematical approaches to the analysis of numerical information
- C. Demonstrate an understanding of the process of scientific inquiry
- D. Use computer technology to communicate information

Course Outcomes

1. **Design and construct a dc voltmeter or ammeter of any specified range from a microammeter**
2. **Given a voltage-divider diagram, a signal frequency, and a meter type (VOM, DVM, or oscilloscope), determine whether meter loading will invalidate the reading**
3. **Determine the voltage across the components of a Wheatstone-bridge circuit**
4. **Select and apply measurement and test equipment to measure temperature, pressure, force, torque, mass, dimensional properties, electronic properties, and other physical properties.**
5. **Identify and have a general familiarity with gas, liquid, and ultrasonic liquid flow, humidity, dew point, luminous intensity, sound level, vibration, time and frequency, relative density, hardness testing, altitude, and submarine depth M&TE.**
6. **Convert between various engineering units of typical measurement parameters and determine whether each of these is a fundamental unit or a derived unit**
7. **Calibrate and verify operation of measurement and test equipment for temperature, pressure, force, torque, mass, dimensional properties, electronic properties, and other physical properties.**
8. **Explain primary and secondary measurement standards, organizations responsible for maintaining such standards, and how such standards are used for traceability of equipment calibration.**
9. **Apply various software packages to assist in the calibration process.**
10. **Calculate and compare accuracies by utilizing %IR, %FS, PPM and a combination of these methods of describing M&TE, and describe how accuracy is related to measurement uncertainty**