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
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Classroom Presentation | 45 | 3

Textbooks

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