Miami Dade College

GENERAL INFORMATION	
Course Prefix/Number: EST2520C	Course Title: Process Measurement Fundamentals
Number of Credits: 3	
Degree Type	☐ B.A. ☐ B.S. ☐ B.A.S ☐ A.A. ☒ A.S. ☐ A.A.S. ☐ C.C.C. ☐ A.T.C. ☐ V.C.C
Date Submitted: 09-05-2007	Effective Year/Term: 2007-2
☒ New Course Competency ☐ Revised Course Competency	
Course to be designated as a General Education course (part of the 36 hours of A.A. Gen. Ed. coursework): ☐ Yes ☒ No	

The above course links to the following General Education Outcomes:

☐ Communication	☐ Social Responsibility
☒ Numbers / Data	☐ Ethical Issues
☒ Critical thinking	☒ Computer / Technology Usage
☐ Information Literacy	☐ Aesthetic / Creative Activities
☐ Cultural / Global Perspective	☐ Environmental Responsibility

Course Description:

This course is designed for students who will be supporting industrial equipment processes. Students learn how to perform the typical measurements made in industrial measurement and control loops. Topics include the basic physics involved in the measurements, as well as the common types of sensors used in industry with emphasis on pressure, temperature, flow, level, and analytical measurement theory. Co-requisites: EET 1141C. Laboratory fee. A.S. degree credit only. (2 hr. lecture; 2 hr. lab)

Prerequisite(s):	Co-requisite(s): EET1141C

Course Competencies:

Competency 1. The student will demonstrate an understanding of the concepts of process measurement by:

1. Defining the dynamic characteristics of a process, including: dead time, time constant, rise time, and settling time.
2. Defining process measurement.
3. Identifying terminology associated with measurement.
4. Describing the principles involved in measuring processes.
5. Discussing the principles and physical laws used in the measurement of pressure, temperature, flow, level, and analytical processes.
6. Contrasting inferred and direct measurements.

Competency 2. The student will demonstrate an understanding of the instruments used to measure processes by:

1. Defining and explaining basic concepts used in instrumentation.
2. Describing the uses and functions of instrumentation systems and the specific instruments used to measure pressure, temperature, flow, and level respectively in power plant systems.
3. Describing the basic operations and uses of indicators, sensors, relays, transducers, amplifier and transmitters as applied to process measurement.

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4. Defining common terminology, including range, span, measured variable, accuracy, reference accuracy, resolution, sensitivity, dead band, hysteresis, linearity, conformity, static calibration errors, and dynamic response.
5. Drawing and labeling the block diagram of a basic instrument channel.
6. Calibrating process measurement devices for pressure, temperature, flow, and level using a variety of state-of-the-art calibration equipment.
7. Determining the dynamic response of an instrument.
8. Interpreting a graph showing the input vs output characteristics of an instrument to determine dead time, time constant, rise time, and settling time.

Competency 3. The student will demonstrate an understanding of the principles of temperature and the application of temperature measuring by:

1. Defining temperature and describing the process of heat transfer in terms of conversion, conduction, and radiation.
2. Describing the relationship between temperature and heat.
3. Defining common terminology, concepts and principles used in temperature measurement, including the meaning of response time, stem loss, and radiation error.
4. Identifying the scales that are used to measure temperature.
5. Identifying common temperature measuring instruments and describing how they are used and the principles of operation for each type of instrument.
6. Installing temperature measurement instruments.
7. Troubleshooting temperature measuring devices to determine operating problems using common field testing devices.
8. Calibrating a temperature transmitter.
9. Describing the principles of thermocouple operations, testing thermocouples using fixed point and comparison methods, identifying and correcting errors.

Competency 4. The student will demonstrate an understanding of the basic principles of pressure measurement by:

1. Defining pressure.
2. Measuring the pressure exerted by a liquid.
3. Defining common terminology, concepts, and principles used in pressure measurement and explaining the processes involved in pressure measurement.
4. Defining gage, vacuum, and absolute pressure and explaining how each type is measured.
5. Identifying the variables that affect pressure and explaining how those factors influence pressure changes and fluctuations.
6. Identifying the instruments, tools, and test equipment used to measure and adjust pressure levels.
7. Identifying the reference points for pressure measurements.
8. Converting various units of pressure measurement to psig, psia, InH20, and InHg using a conversion table.
9. Calculating differential pressure.
10. Calibrating a pressure transmitter.
11. Taking pressure readings, recording measurements, and making adjustments.
12. Employing basic troubleshooting techniques to detect and isolate pressure-related problems.

Competency 5. The student will demonstrate an understanding of flow measurement by:

1. Identifying the properties of fluids (viscosity, laminar, turbulent flow) and the variable factors that affect flow (temperature, velocity, etc.).
2. Defining common terminology and concepts used in flow measurement.
3. Identifying the units used to measure flow and performing calculations.

4. Identifying the variables that affect flow and explaining how those factors affect flow in industrial systems.
5. Describing the procedures involved in measuring flow.
6. Identifying types of flow measurement sensors and devices and describing how they are used to measure flow.
7. Describing the operation of flow sensors.
8. Calculating and solving laminar and turbulent flow problems using the Reynolds Number.
9. Calibrating a flow transmitter.
10. Reviewing flow measurements and pressure scales and adjusting to given specifications.
11. Differentiating between open and closed channel flow, explaining the similarities and differences, and describing how each is measured.

Competency 6. The student will demonstrate an understanding of the basic principles of level measurement by:

1. Defining level measurement and explaining its importance in industrial system operations.
2. Defining common terminology and concepts used in level measurement.
3. Explaining the differences between direct and indirect level measurement and describing types and applications of these methods.
4. Listing the common measurement units of level.
5. Identifying the instruments, tools, and test equipment used to measure and adjust level, and describing how and when to use each type respectively.
6. Describing non-invasive measurement methods that use ultrasonic and radiation detectors.
7. Calculating level using various methods, including hydrostatic head, differential pressure, and electrical capacitance or resistance.
8. Performing level measurements in open and closed tank applications.