

**College of San Mateo**  
**Official Course Outline**

1. **COURSE ID:** ELEC 441    **TITLE:** Sensors and Data Transmission Systems  
**Units:** 4.0 units    **Hours/Semester:** 48.0-54.0 Lecture hours; and 48.0-54.0 Lab hours  
**Method of Grading:** Letter Grade Only  
**Prerequisite:** ELEC 111, completion of or concurrent enrollment in ELEC 112.

2. **COURSE DESIGNATION:**

**Degree Credit**  
**Transfer credit:** CSU

3. **COURSE DESCRIPTIONS:**

**Catalog Description:**

A practical course in industrial measurement of temperature, flow, pressure, and level focusing on their physical basis and fundamental laws. Application concepts in industrial instrumentation systems, sensor troubleshooting, and factors with influence sensor and system accuracy, performance, and calibration are described while stressing basic sensor theory of operation, faults, and calibration. A materials fee as shown in the Schedule of Classes is payable upon registration.

4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**

Upon successful completion of this course, a student will meet the following outcomes:

1. Describe the basic concepts of temperature.
2. Identify typical temperature sensors and describe their operation.
3. Perform the calibration of and describe how to troubleshoot various temperature sensors.
4. Describe the basic concepts of pressure.
5. Identify typical pressure sensors and describe their operation.
6. Perform the calibration of and describe how to troubleshoot various pressure sensors.
7. Describe the basic concepts of flow.
8. Identify typical flow sensors and describe their operation.
9. Perform the calibration of and describe how to troubleshoot various flow sensors.
10. Describe the basic concepts of level.
11. Identify typical level sensors and describe their operation.
12. Perform the calibration of and describe how to troubleshoot various level sensors.
13. Describe various feedback and control modes.
14. Identify instrumentation symbols and diagrams.
15. Describe mechanical and electrical connections to industry standard.
16. Identify instrument errors.
17. Describe the concept of data transmission.
18. Identify typical data transmitters and describe their operation.
19. Perform the calibration of and describe how to troubleshoot various data transmitters.

5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**

Upon successful completion of this course, a student will be able to:

1. Describe the basic concepts of temperature.
2. Identify typical temperature sensors and describe their operation.
3. Perform the calibration of and describe how to troubleshoot various temperature sensors.
4. Describe the basic concepts of pressure.
5. Identify typical pressure sensors and describe their operation.
6. Perform the calibration of and describe how to troubleshoot various pressure sensors.
7. Describe the basic concepts of flow.
8. Identify typical flow sensors and describe their operation.
9. Perform the calibration of and describe how to troubleshoot various flow sensors.
10. Describe the basic concepts of level.
11. Identify typical level sensors and describe their operation.
12. Perform the calibration of and describe how to troubleshoot various level sensors.
13. Describe various feedback and control modes.
14. Identify instrumentation symbols and diagrams.
15. Describe mechanical and electrical connections to industry standard.

16. Identify instrument errors.
17. Describe the concept of data transmission.
18. Identify typical data transmitters and describe their operation
19. Perform the calibration of and describe how to troubleshoot various data transmitters.

## 6. COURSE CONTENT:

### Lecture Content:

1. Pressure measurement
2. Level measurement
3. Flow measurement
4. Temperature measurement
5. Weight measurement
6. Principles of calibration
7. Calibrating pressure and temperature instruments
8. Calibrating flow and level instruments
9. Feedback control
10. Process control modes
11. Process characteristics
12. Process variables
13. Instrumentation symbols
14. Instrument loop diagrams
15. Process and instrumentation diagrams
16. Mechanical connections
17. Electrical connections
18. Primary calibration standards
19. Pneumatic test equipment
20. Electronics test equipment
21. Instrument errors
22. Instrument calibration

## 7. REPRESENTATIVE METHODS OF INSTRUCTION:

Typical methods of instruction may include:

- A. Other (Specify): 1. Lectures; 2. Analytical problem sets; 3. Essay question sheets; 4. Topic reading assignments; 5. Assigned computer simulation activities; 6. System construction and troubleshooting activities.

## 8. REPRESENTATIVE ASSIGNMENTS

Representative assignments in this course may include, but are not limited to the following:

### Writing Assignments:

Weekly handouts and worksheets.

### Reading Assignments:

Weekly reading assignments from text.

## 9. REPRESENTATIVE METHODS OF EVALUATION

Representative methods of evaluation may include:

- A. 1. Graded problem sets; 2. Graded homework word problems; 3. Computer based simulation activities; 4. Quizzes; 5. Midterm exam; 6. Final exam

## 10. REPRESENTATIVE TEXT(S):

Possible textbooks include:

- A. Kirk, Weedon, and Kirk.. *Instrumentation*, 5th ed. ATP, 2010
- B. Kirk. *Instrumentation Work book*, 5th ed. ATP, 2010

**Origination Date:** April 2016  
**Curriculum Committee Approval Date:** May 2016  
**Effective Term:** Fall 2016  
**Course Originator:** Steven Gonzales