

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

1. **COURSE ID:** ELEC 442    **TITLE:** Electronic and Pneumatic Process Control Systems  
**Units:** 4.0 units    **Hours/Semester:** 48.0-54.0 Lecture hours; 48.0-54.0 Lab hours; and 96.0-108.0 Homework hours  
**Method of Grading:** Letter Grade Only  
**Prerequisite:** ELEC 441
  
2. **COURSE DESIGNATION:**  
**Degree Credit**  
**Transfer credit:** CSU
  
3. **COURSE DESCRIPTIONS:**  
**Catalog Description:**  
A practical course in industrial electronic and industrial pneumatic control systems. Calibration theory, a review of transmitter calibration, electronic systems, pneumatic systems, controller operation, control loop theory, PID, loop tuning, and control loop troubleshooting are stressed.
  
4. **STUDENT LEARNING OUTCOME(S) (SLO'S):**  
Upon successful completion of this course, a student will meet the following outcomes:
  1. Perform the calibration of and describe how to troubleshoot electronic and pneumatic temperature controllers.
  2. Perform the calibration of and describe how to troubleshoot electronic and pneumatic pressure controllers.
  3. Perform the calibration of and describe how to troubleshoot electronic and pneumatic flow controllers.
  4. Describe various feedback control modes (PID), describe the methods used for control loop tuning, and perform P, PI, and PID loop tuning.
  5. Identify system errors and troubleshooting techniques.
  
5. **SPECIFIC INSTRUCTIONAL OBJECTIVES:**  
Upon successful completion of this course, a student will be able to:
  1. Perform the calibration of and describe how to troubleshoot electronic and pneumatic temperature controllers.
  2. Perform the calibration of and describe how to troubleshoot electronic and pneumatic pressure controllers.
  3. Perform the calibration of and describe how to troubleshoot electronic and pneumatic flow controllers.
  4. Describe various feedback control modes (PID), describe the methods used for control loop tuning, and perform P, PI, and PID loop tuning.
  5. Identify system errors and troubleshooting techniques.
  
6. **COURSE CONTENT:**  
**Lecture Content:**
  1. Principles of calibration
  2. Primary calibration standards
  3. instrument errors
  4. review on instrument calibration
  5. feedback control
  6. transmitters
  7. controllers, indicators, and recorders
  8. basic principles of loop tuning
  9. instrument loop troubleshooting
  10. pneumatic instrument theory
  11. air supplies and regulators
  12. pneumatic transmitters and recorders
  13. pneumatic controllers
  14. relays and transducers
  15. basic and transducers
  16. basic control valves
  17. body and trim maintenance
  18. actuator maintenance

19. positioner maintenance
20. Pneumatic test equipment

**Lab Content:**

The lab content reinforces the lecture content and materials in a practical, applied manner.

**7. REPRESENTATIVE METHODS OF INSTRUCTION:**

Typical methods of instruction may include:

- A. Lecture
- B. Other (Specify): Lectures, analytical problem sets, essay question sheets, topic reading assignments, and assigned computer simulation activities.

**8. REPRESENTATIVE ASSIGNMENTS**

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

**Writing Assignments:**

Case studies with detailed analysis. Written exams.

**Reading Assignments:**

Read assigned chapters from textbook and supplemental materials given in class.

**9. REPRESENTATIVE METHODS OF EVALUATION**

Representative methods of evaluation may include:

- A. Class Participation
- B. Class Performance
- C. Class Work
- D. Exams/Tests
- E. Group Projects
- F. Homework
- G. Papers
- H. Quizzes
- I. Written examination

**10. REPRESENTATIVE TEXT(S):**

Possible textbooks include:

- A. Kuphaldt, Tony . *Lessons in Industrial Instrumentation*, ed. Creative Commons, 2016

Other:

- A. Topic appropriate chapter selections from the Control Guru's Practical Process Control website available at <http://www.controlguru.com/pages/table.html>
- B. Topic appropriate articles published in the online edition of Control Engineering magazine available at <http://www.controeng.com>
- C. Hardware appropriate user's manuals and company produced setup and operation oriented You Tube videos available at [www.omega.com/technicalsupport](http://www.omega.com/technicalsupport)

**Origination Date:** September 2016

**Curriculum Committee Approval Date:** October 2016

**Effective Term:** Fall 2017

**Course Originator:** Anne Figone