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:
    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

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**Course Originator:** Anne Figone