

PELLISSIPPI STATE COMMUNITY COLLEGE  
MASTER SYLLABUS

**INSTRUMENTATION TECHNOLOGY**  
**EET 2235**

**Class Hours: 2**

**Credit Hours: 3**

**Laboratory Hours: 3**

**Date Revised: Spring 2017**

**Catalog Course Description**

Instrumentation technology provides a comprehensive coverage of components, circuits, instruments, and control techniques used in the process control technology field. This course is ideal for students and technicians who will be installing, troubleshooting, repairing, tuning, and calibrating instrumentation devices in manufacturing. A module on motion control measurement and drives is included.

**Prerequisites**

EET 1012

**Corequisites**

None

**Textbook(s) and Other Course Materials**

Fundamentals of Instrumentation , NJATC, Thomson Learning.

**Week/Unit/Topic Basis**

Week Topic

1. Introduction to Industrial Control Systems
2. Instrumentation Symbology & Drawings
3. Instrumentation Calibration
4. Interfacing Devices
5. Pressure Measurement
6. Temperature Measurement
7. Flow Measurement
8. Level Measurement
9. Industrial Instrumentation
10. Controller Operation
11. Process Control Methods
12. Instrumentation Loop
13. Loop Testing

14. Review
15. Final Exam

### **Engineering Technology General Outcomes (Educational objectives)**

- I. Apply basic engineering theories and concepts creatively to analyze and solve technical problems
- II. Utilize with a high degree of knowledge and skill equipment, instruments, software, and technical reference materials currently used in industry.
- III. Communicate effectively using developed writing, speaking, and graphics skills.
- IV. Assimilate and practice the concepts and principles of working in a team environment.
- V. Obtain employment within the discipline or matriculate to a four year program in engineering or industrial technology

### **Engineering Technology Concentration Competencies**

NOTE: At the program level all 6 competencies apply to roman numerals I – V of the Engineering Technology General Outcomes (Educational objectives) listed above.

Students will

- A. Apply the knowledge, techniques, skills, and modern tools for the concentration of study to specifically defined engineering technology activities
- B. Demonstrate the knowledge of mathematics, science, engineering and technology to engineering technology problems using developed practical knowledge
- C. Conduct and report the results of standard tests and measurements, and conduct, analyze and interpret experiment or project results
- D. Function effectively as a member of a technical team
- E. Identify, analyze and solve specifically defined engineering technology-based problems
- F. Employ Written, oral and visual communication in a technical environment

### **Course Goals**

NOTE: Capital letters after course goals reference the competencies of the Engineering Technology concentrations listed above.

The course will

1. Enhance student understanding of the basic concepts of open- and closed-loop systems common to motion and process control. (A, B, C, E)

2. Enhance student understanding of basic instrumentation symbology. (F)
3. Enhance student understanding of the basic signal and circuit types used in instrumentation technology, as well as a variety of instrument specifications. (A, B, C, E)
4. Enhance student understanding of the scientific fundamentals of pressure, temperature, flow, and level measurements as well as the operation of instruments used to make the measurements. (A, B, C)
5. Enhance student understanding of the principles of limit and position detection, speed detection, and other similar measurements. (A, B, C)
6. Enhance student understanding of information on production processes and the instruments used to monitor, control, and manipulate process variables, such as pressure, temperature, level, and flow. (A, B, C)
7. Enhance student understanding of information about instrumentation drawings used in automation systems such as symbols, Tag Numbers, Functional Identifiers, Line Symbols, and Title Blocks. (F)
8. Enhance student understanding of various control techniques, such as On-Off, PID, feed-forward, ratio, cascade, and adaptive. (A, B, C)
9. Enhance student understanding of how to perform calibration procedures on instruments. (A, B, C)
10. Work in a team environment during laboratory sessions and develop written reports to communicate the principles learned through the experiment. (D, F)

### **Expected Student Learning Outcomes**

NOTE: Numbers after Expected Student Learning Outcomes reference the course goals listed above.

The student will

- a. Define the terms: Open-loop, closed-loop, feedback, feed-forward, on-off control, proportional control, proportional-Integral control, Time-Proportioning control, batch processes, continuous process, Dynamic, Static, dead time, response time, and pure lag. (1,3,8)
- b. Explain the purpose of the following circuits used in instrumentation; op-amp, Schmitt trigger, comparators, optoelectronic devices, photodiodes, phototransistors, SCRs, Triac, A/D, D/A, timing devices. (1, 2, 3)
- c. Use a simplified block diagram of industrial control systems. (1, 6, 7)
- d. Describe the different controller operations. (1, 4, 8)
- e. Describe fundamentals of the following; Pressure Control, Temperature Control, Flow Control and Level Control. (4, 5, 6)

- f. Able to recognize and draw Instrumentation Symbols. (7)
- g. Explain the different industrial process techniques. (1, 4, 5, 6, 8)
- h. Explain the different process control Methods. (3)
- i. Perform Instrument calibrations. (2, 3, 9, 10)
- j. Identify the different instrument signal types, such as 4-20mA. (3, 4, 5, 9)
- k. Identify different field contact voltages used with various instruments. (3, 4, 5, 9)
- l. Identify the difference between a transducer and transmitter. (2, 3, 4, 5, 6)
- m. Identify the difference between digital and analog signals. (2, 3, 4, 5, 6)
- n. Interpret the specifications of various instrumentation devices. (2, 3)
- o. Perform basic instrumentation calculations based on physical principles. (2, 3, 4, 5, 10)
- p. Communicate instrumentation principles in written or graphical form. (10)

## **Evaluation**

### **Testing Procedures: 80% of grade**

Chapter Tests	40%
Quizzes	20%
Final Exam	20%

### **Laboratory Expectations: 20% of grade**

The laboratory portion of the grade will be determined by a combination of performance within the lab and the quality of demonstrated comprehension of the lab report. A lab test and lab project may also be included. There will be at least ten labs during the semester to go along with the classroom material.

The laboratory serves as a medium for verifying classroom theory. The laboratory report serves as a means to practice both organizing a laboratory notebook and presenting technical observations in written form. Clean, concise, well-organized report writing in an engineering environment is of paramount importance to the EET student. Correct usage of English in the report is necessary and will be evaluated. The report grade may be reduced up to two grade levels as a result of incorrect usage of English.

**Field Work**

None

**Other Evaluation Methods**

None

**Grading Scale**

93 – 100	A
88 - 92	B+
83 - 87	B
78 - 82	C+
70 – 77	C
60 - 69	D
0 - 59	F

**Policies****Attendance Policy**

Pellissippi State expects students to attend all scheduled instructional activities. As a minimum, students in all courses (excluding distance learning courses) must be present for at least 75 percent of their scheduled class and laboratory meetings in order to receive credit for the course. Individual departments/programs/disciplines, with the approval of the vice president of Academic Affairs, may have requirements that are more stringent. In very specific circumstances, an appeal of the policy may be addressed to the head of the department in which the course was taken. If further action is warranted, the appeal may be addressed to the vice president of Academic Affairs.

**Academic Dishonesty**

Academic misconduct committed either directly or indirectly by an individual or group is subject to disciplinary action. Prohibited activities include but are not limited to the following practices:

- Cheating, including but not limited to unauthorized assistance from material, people, or devices when taking a test, quiz, or examination; writing papers or reports; solving problems; or completing academic assignments.
- Plagiarism, including but not limited to paraphrasing, summarizing, or directly quoting published or unpublished work of another person, including online or computerized services, without proper documentation of the original source.
- Purchasing or otherwise obtaining prewritten essays, research papers, or materials prepared by another person or agency that sells term papers or other academic materials to be presented as one's own work.
- Taking an exam for another student.
- Providing others with information and/or answers regarding exams, quizzes, homework or other classroom assignments unless explicitly authorized by the instructor.
- Any of the above occurring within the Web or distance learning environment.

Please see the Pellissippi State Policies and Procedures Manual, Policy 04:02:00 Academic/Classroom Conduct and Disciplinary Sanctions for the complete policy.

### **Accommodations for Disabilities**

Students that need accommodations because of a disability, have emergency medical information to share, or need special arrangements in case the building must be evacuated should inform the instructor immediately, privately after class or in her or his office. Students must present a current accommodation plan from a staff member in Disability Services (DS) in order to receive accommodations in this course. [Disability Services](#) (<http://www.pstcc.edu/sswd/>) may be contacted via [Disability Services email](#) or by visiting Alexander 130.