

PELLISSIPPI STATE TECHNICAL COMMUNITY COLLEGE
MASTER SYLLABUS

ADVANCED PLCs
EET 2925

Class Hours: 1.0
Laboratory Hours: 3.0

Credit Hours: 2.0
Revised: Fall 2016

Catalog Course Description

An advanced course in programmable logic controllers (PLCs) and applications in which they are used. Topics include a treatment of advanced programming instructions and techniques. Interfacing with sensors, HMI, and other control hardware will be addressed. Special control system projects will be assigned and implemented. PLC networking concepts will be applied.

Prerequisite

EET 2920 or Consent of Instructor

Co-requisites

None

Textbook(s) and Other Course Materials

Programmable Logic Controllers, Latest Edition. McGraw Hill. Frank D. Petruzella.
Instructor Developed Material and Handouts

Week/Unit/Topic Basis

Week	Topic
1	Review of Programmable Controllers
2	Program Control
3	Math & Data Manipulation Instructions
4	Sequencer and Shift Registers
5	Process Control & Networking Systems
6	Sensors and Final Control Elements
7-8	Human Machine Interface
9-14	Project Assignments
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 and ability to apply advanced PLC instruction set. A, B, C, D
- 2. Enhance student understanding of configuring the human machine interface. B, C, D, G
- 3. Improve student knowledge of developing PLC programs using advanced methods. A, B, C, D, E
- 4. Improve student knowledge and understanding on utilizing basic sensor and control element technology. A, B, C, D, E
- 5. Expand student experience interfacing the PLC with external control hardware using networking principles and hardwired principles. A, B, C, D
- 6. Expand student experience in applying, as an individual and as a team member, information skills, problem-solving skills, project execution skills, and communication skills. (D, E, F)

Expected Student Learning Outcomes

NOTE: Letters after performance expectations reference the course objectives listed above.

The student will

- a. Create a PID control loop using PLC software. 1, 3
- b. Interpret basic P&ID diagrams. 1, 2, 3, 4
- c. Explain the purpose of negative feedback. 1, 2
- d. Identify the purpose of feed-forward and cascade control techniques. 1, 2
- e. Identify the basic elements in a feedback loop. 1, 2
- f. Tune a simple PID controller. 1, 2, 3
- g. Control the speed of a servo motor using a PLC and drive. 1, 2, 5

- h. Recognize different PLC network communication configurations. 6
- i. Acquire technical information from various media, such as the internet. G
- j. Function as an effective team member in the lab or in classroom team assignments. G
- k. Prepare a technical report. G

Evaluation

Testing Procedures: 80%

Evaluation in the course will consist of a combination of periodic exams, a series of projects and lab assignments, and a final exam. The percentage that each of these factors count toward the grade for the course is left to the discretion of the instructor. Correct usage of English is necessary (on tests, laboratory reports, or any other documents submitted to the instructor), and will be evaluated.

Exams	40%
Quizzes	20 %
Final exam	20 %

Laboratory Expectations: 20%

Laboratory topics may vary at the discretion of the instructor, but will be related in a timely manner to the course work. Lab reports will include a computer printout of programs completed and tested on a PLC simulator panel. The lab reports will include an analysis of the lab assignment and must be prepared with the use of a computer. English usage will be evaluated. Students must attend the laboratory sessions to successfully complete the course.

Field Work

N/A

Other Evaluation Methods

N/A

Grading Scale

A	93-100
B+	88-92
B	83-87
C+	78-82
C	73-77
D	60-69
F	Below 60

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.