SYLLABUS

EE5377
PROGRAMMABLE LOGIC CONTROLERS IN INDUSTRIAL AUTOMATION
SPRING 2002
4:00 – 5:20 P.M. MONDAY & WEDNESDAY
NEDDERMAN HALL, ROOM 108

Instructor:
Wei-Jen Lee, Ph.D., PE
Professor of the Electrical Engineering

Office:
ENGINEERING ANNEX, RM 204

Office Hours:
8:30 AM – 11:00 AM, TUESDAY & THURSDAY
(OTHER TIME BY APPOINTMENT)

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Instructor WWW site:
http://www-ee.uta.edu

Course WWW site:
http://www-ee.uta.edu

Required Textbook(s):

Final Examination:
Wednesday, May 8, 2:00 PM – 4:30 PM

Course Description:
In late 1960’s, Programmable Logic Controllers (PLC) were first introduced as a means of automating manufacturing process. Since then, PLCs have evolved into sophisticated and sometimes complex pieces of equipment. Nevertheless, their use and flexibility has reached a point where they are no longer discretionary pieces of equipment, but necessities. Very few industries exist today that do not employ PLCs. The relatively rapid integration of the PLC into the manufacturing sector has been called the second industrial revolution, and the revolution is far from over.
A successful engineer who is involved in nearly any manufacturing business needs a basic knowledge of the way in which PLCs are used. This course is established under the response of this demand for knowledge about PLCs. In addition to the PLC’s programming languages and hardware configurations, its typical applications in the manufacturing industry are also introduced. A hand-on design project is designed for the students to understand the typical PLC implementation process in industry.
**Course Learning Goals/Objectives:**
The application of programmable Logic Controllers (PLC) to the system automation is the trend of industry. As such this course is a joint enterprise between you and your instructor; an adventure in which you start your formal study of the theory, programming languages and possible applications of PLCs to the field of industrial automation. It is the faculty's intention that this course imbues you with a never ceasing quest for knowledge and experience that you may apply to the pursuit of your professional career. Since there is no so-called "standards" among PLC industry, the material of this course is not so much to be "covered" as to be "uncovered" and it is the faculty's hope that the study of this material will start your professional journey in the automatic control.

This course will provide engineer students comprehensive information on the operation and application of PLCs. Some hands-on projects will be designed to enhance the application and programming skills of the students. The knowledge of analog circuit analysis, digital circuit design, and computer programming is the prerequisite of this course.

**Attendance and Drop Policy:**
The general format of the class will be a formal lecture used to develop the ideas and knowledge required for the understanding of Programmable Logic Controller and its applications. Since this is your education, you will be required to participate by:

- being aware of class procedures as set forth in this syllabus,
- attending all the lectures and labs,
- reading all assigned materials prior to the lecture,
- working the assigned homework problems,
- being aware of the course calendar, particularly examination times and dates

The grade of W will be assigned only if the conditions imposed by the University are met. The grade of X will be assigned only if the student has encountered circumstances beyond his or her control and the student’s previous actions have not created these circumstances. The assignment of this incomplete grade will be made at the decision of the instructor after consideration of the facts as presented in a written request from the student.

See the Registrar's Bulletin or the University Calendar in the front part of the UTA catalog for drop dates.

**Tentative Lecture/Top Schedule (Course Content):**
1. **Introduction to PLCs**
   * Principle of Operation
   * PLCs versus Other Type of Controls
   * Typical Areas of PLC Applications
   * The Benefits of Using PLCs
2. **Number System and Logic Concepts**
   * Number System and Number Conversion
   * Principles of Boolean Algebra and Logic
   * PLC Circuits and Logic Contact Symbology
3. **Programming Languages**
   * Types of PLC Instructions
   * Ladder Diagram Format
   * Basic Relay Instructions
   * Timer and Counter Instructions
   * Program/Flow Control Instructions
   * Arithmetic and Data Manipulation Instructions
   * Data Transfer and Network Communication Instructions
   * Other Non-Ladder Programming Languages
4. **Implementing and Programming the PLC System**
   * Implementing Guidelines
   * Programming Organization and Implementation
   * Discrete I/O Programming
   * Analog I/O Programming
5. Hardware Components of PLC
   * Processors, The Power Supply, and Programming Devices
   * Memory Systems and I/O Interaction
   * Discrete I/O Systems
   * Analog I/O Systems
   * Special Function I/O, Networking, and Serial Communication Interfacing

6. Data Measurements and Transducers
   * Basic Measurement Concepts
   * Interpreting Errors in Measurements
   * Implementation of Transducer Measurements
   * Thermal Transducers
   * Displacement Transducers
   * Pressure Transducers
   * Flow Transducers
   * Voltage and Current Transducers
   * Power Transducers

7. Applications of PLC in Industrial Automation
   * Remote Monitoring, Data Acquisition, and Control of a Substation
   * Power Plant Monitoring and Control
   * Applications on the Process Control
   * Other Applications

Specific Course Requirements w/ Descriptions:

HOMEWORKS: are due at the end of the class on the day the assignment is due. All work presented must meet professional standards regarding materials and format. Homework will be checked as to effort and number of problems presented. The homework grade is based on ten (10) points per problem per assignment. Since it is faculty’s strongly belief that a student’s success is directly proportional to success with homework, it is imperative that the homework be done.

It is the expressed policy of the faculty of the department to take decisive action involving any incidence relating to academic dishonesty. The instructor of this course will strictly enforce this policy!

LATE HOMEWORK ASSIGNMENTS: Homework must be turned in at the end of the class period on the day the assignment is due. No late homework will be accepted after the solution is posted in the copy center or web site. There will be a 25% grade reduction for each class period late.

MAKE UP OF MISSED EXAMINATION: There will be no make up of a missed examination.

CONSIDERATION OF RE-GRADING REQUEST: It is the student’s responsibility to keep up with various grades assigned to their work by the instructor. If there is any question concerning the assigned grade, the instructor will accept a formal request to examine the grading in question if such a request is presented to the instructor within one-week following the returning of the material in question from the instructor. The entire original work in question must be submitted to the instructor. The instructor reserves the rights to re-grade the entire materials.

********** ANY CHEATING WILL RESULT IN SEVERE PENALTIES **********

If you require an accommodation based on disability, I would like to meet with you in the privacy of my office, during the first week of the semester, to make sure you are properly accommodated.
Course Evaluation & Final Grade:

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<tr>
<th>#</th>
<th>ITEM</th>
<th>POINTS</th>
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<tbody>
<tr>
<td>1</td>
<td>HOMEWORK</td>
<td>15.00</td>
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<tr>
<td>2</td>
<td>FIRST EXAMINATION</td>
<td>20.00</td>
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<tr>
<td>3</td>
<td>FIRST PROJECT</td>
<td>15.00</td>
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<td>4</td>
<td>SECOND PROJECT</td>
<td>30.00</td>
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<tr>
<td>5</td>
<td>FINAL EXAMINATION</td>
<td>20.00</td>
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TOTAL COURSE POINTS 100.00

STUDENT COURSE AVERAGE      FINAL LETTER GRADE
90.0 - 100.0                 A
80.0 - 89.9                  B
70.0 - 79.9                  C
60.0 - 69.9                  D
0.0 - 59.9                   F

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Student Evaluation of Teaching
Students will be asked to complete instructor/course evaluation forms at the end of the semester.

Americans with Disabilities Act:
The University of Texas at Arlington is on record as being committed to both the spirit and letter of federal equal opportunity legislation; reference Public Law 93112—The Rehabilitation Act of 1973 as amended. With the passage of new federal legislation entitled Americans with Disabilities Act – (ADA), pursuant to section 504 of The Rehabilitation Act, there is renewed focus on providing this population with the same opportunities enjoyed by all citizens.

As a faculty member, I am required by law to provide “reasonable accommodation” to students with disabilities, so as not to discriminate on the basis of that disability. Student responsibility primarily rests with informing faculty at the beginning of the semester and in providing authorized documentation through designated administrative channels.

If you require an accommodation based on disability, I would like to meet with you in the privacy of my office, during the first week of the semester, to make sure you are properly accommodated.

Academic Dishonesty
It is the philosophy of The University of Texas at Arlington that academic dishonesty is a completely unacceptable mode of conduct and will not be tolerated in any form. All persons involved in academic dishonesty will be disciplined in accordance with University regulations and procedures. Discipline may include suspension or expulsion from the University.

“Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit of any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student or the attempt to commit such acts.” (Regents’ Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22).