Course Syllabus

ELMT 1301 – Basic Programmable Controllers

Catalog Description:
An introduction to programmable logic controllers as used in industrial environments including basic concepts, programming, applications, troubleshooting of ladder logic, and interfacing of equipment. Lecture Hrs. – 2, Lab Hrs. – 2

Prerequisites: ELPT 1311

Semester Credit Hours: 3
Lecture Hours per week: 2
Contact Hours per Semester: 64
State Approval Code: 1504030000
Course Subject/Catalog Number: ELMT 1301
Course Title: Basic Programmable Controllers

Course Rationale:
This course provides a student with an introduction to PLC’s including their construction, application in industry, and programming.

Instructional Goals and Purposes:
The purpose of this course is to provide students with basic skills useful in installing, programming, and troubleshooting real-life electrical/electronic systems.

Learning Objectives:

1. Define the four main units of a PLC.
2. List the factors to consider in the selection of a PLC.
3. Define and sketch the schematic symbol for the following: Temperature switch, pressure switch, liquid level switch, flow switch, float switch, foot switch, proximity switch.
4. List the rules for drawing relay logic diagrams.
5. Define NOT, AND, OR, NAND, NOR, XOR, XNOR.
6. List and define the two types of timer instructions.
7. List and define the three registers related to timer instructions.
8. List and define the two types of counters.
9. List and define the three registers related to timer instructions.
Specific Course Objectives (Include SCANS information):

1. Define the four main units of a PLC.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

2. List the factors to consider in the selection of a PLC.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

3. Define and sketch the schematic symbol for the following. Temperature switch, pressure switch, liquid level switch, flow switch, float switch, foot switch, proximity switch.
   SCANS (1 A-I, 1A-ii, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

4. List the rules for drawing relay logic diagrams.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

5. Define NOT, AND, OR, NAND, NOR, XOR, XNOR.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

6. List and define the two types of timer instructions.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

7. List and define the three registers related to timer instructions.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

8. List and define the two types of counters.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)

9. List and define the three registers related to timer instructions.
   SCANS (1 A-I, 1A-ii, 1Aiv, 1B-iii, 1B-iv, 1 C-I, 1C-iv, 2A-I, 2A-iii, 2B-I, 2C-i, 2C- ii, 2C-iii, 2D-ii, 2D-iii, 2E-ii)
1. BASIC SKILL COMPETENCIES

A. Basic Skills
i. Reading: Locate, understand and interpret written information in prose and in documents such as manuals, graphs and schedules.
ii. Writing: Communicate thoughts, ideas, information and messages in writing, and create documents such as letters, directions, manuals, reports, graphs, and flow charts.
iii. Arithmetic & Mathematical Operations: Perform basic computations and approach practical problems by choosing appropriately from a variety of mathematical techniques.
iv. Listening: Receive, attend to, interpret, and respond to verbal messages and other cues.
v. Speaking: Organize ideas and communicate orally.

B. Thinking Skills
i. Creative Thinking: Generate new ideas.
ii. Decision Making: Specify goals and constraints generate alternatives, consider risks and evaluate and choose the best alternative.
iii. Problem Solving: Recognize problems and devise and implement plan of action.
iv. Visualize ("Seeing Things in the Mind's Eye"): Organize and process symbols, pictures, graphs, objects, and other information.
v. Knowing how to learn: use efficient learning techniques to acquire and apply new knowledge and skills
vi. Reasoning: Discover a rule or principle underlying the relationship between two or more objects and apply it when solving a problem.

C. Personal Qualities
i. Responsibility: Exert a high level of effort and persevere toward goal attainment.
ii. Self-Esteem: Believe in one's own self-worth and maintain a positive view of oneself.
iii. Sociability: Demonstrate understanding, friendliness, adaptability, empathy, and politeness in group settings.
v. Integrity & Honesty: Choose ethical courses of action.

2. WORKPLACE COMPETENCIES

A. Resources:
i. Time: Select goal-relevant activities, rank them, allocate time, and prepare and follow schedules.
ii. Money: Use or prepare budgets, make forecasts, keep records, and make adjustments to meet objectives.
iii. Material & Facilities: Acquire, store, allocate, and use materials or space efficiently.
iv. Human Resources: Assess skills and distribute work accordingly, evaluate performance and provide feedback.

B. Interpersonal Skills:
i. Participate as Member of a Team: Contribute to group effort.
ii. Teach Others New Skills.

iii. Serve Clients/ Customers: Work to satisfy customers' expectations.

iv. Exercise Leadership: Communicate ideas to justify position, persuade & convince others, responsibly challenge existing procedures & policies.

v. Negotiate: Work toward agreements involving exchange of resources, resolve divergent interests.

vi. Work with Diversity: Work well with men and women from diverse backgrounds.

C. Information:
   i. Acquire and Evaluate Information.
   ii. Organize and Maintain Information.
   iii. Interpret and Communicate Information.
   iv. Use computers to process information.

D. Systems:
   i. Understand Systems: Know how social, organizational and technological systems work and operate effectively with them.
   ii. Monitor & Correct Performance: Distinguish trends, predict impacts on system operations, and diagnose deviations in systems' performance.
   iii. Improve or Design Systems: Suggest modifications to existing systems and develop new or alternative systems to improve performance.

E. Technology
   i. Select Technology: Choose procedures, tools or equipment including computers and related technologies.
   ii. Apply Technologies to Task: Understand overall intent and proper procedures for setup and operation of equipment.
   iii Maintain and Troubleshoot Equipment: Prevent, identify, or solve problems with equipment, including computers and other technologies.

Course Grading Policy:

Assessment Policy:

The following items will be assigned during the semester and used to calculate the student’s final grade.

- **Quizzes**
  Quizzes will be given at the end of each chapter covered, that will consist of multiple choice and fill in the blank questions. Quizzes will be administered either in paper form or Canvas online platform.

- **Lab**
  Throughout the semester there will be lab exercises both virtual and hands on. Students will be assessed on his or hers ability to complete the task with minimal assistance.
• **Attendance and participation**
  Students are expected to attend class and to be on time. Students are also required to participate with other students during class exercises.

• **Final Exam**
  There will be a cumulative final given in one or two parts that will span the students various skills and will including lab exercises.

**Method of instruction and delivery:** This course will be taught as a weekly lecture and/or lab. Assignments, quizzes, and grade books will be administered through Canvas online platform or paper assessments.

**Course Grade:**

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<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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</thead>
<tbody>
<tr>
<td>Final Exams</td>
<td>40%</td>
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<tr>
<td>Quizzes</td>
<td>20%</td>
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<tr>
<td>Lab assignments</td>
<td>20%</td>
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<tr>
<td>Student Learning Assessment</td>
<td>10%</td>
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<tr>
<td>Attendance and Participation</td>
<td>10%</td>
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</tbody>
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**Grading Notes:**

Every absence that does not have an acceptable excuse will result in a penalty. If any student misses four class periods this may result in failure. Any student thirty or more minutes late will be counted absent. Students will have one day out of the semester assigned by the instructor to take any quizzes and/or lab assignments that were missed due to the student being absent. **Instructor may implement different percentages or assignment categories under course grades.** Students may record notes in class for his or hers studying purposes, students **may not** reproduce and distribute any reviews or study guides without the instructor's approval.

Instructor: *Daniel Hall*  
Student: __________________________

**Texts, Materials, and Supplies:**

1. *Programmable Logic Controllers by Max Rabiee*

2. Note pad and pencil for sketching.

3. Flash drive