ETDE 2113 Introduction to Programmable Logic Controllers

Course Description:
This is an introductory course in programmable logic controllers (PLC’s) and their applications. Topics include ladder logic diagrams, input and output modules, power supplies, selection and installation of controllers, and interfacing controllers with equipment. Upon successful completion, the student should be able to install PLC’s and create basic programs.

Type of course: Theory/Lab.
Credit Hours: 3;
Total hours of theory per semester: 30; Total hours of lab for the semester: 45;
Class length - Full Semester
Class days and times: TR 7:30 - 9:55 AM
Prerequisites: ETDE 1343

Instructor Name: Geeth Bagusetty   Instructor Phone: (918) 293-5325
Office: ETDE Building -Room 15   Instructor email: geeth.bagusetty@okstate.edu

Contact: My preferred method of contact is e-mail. Please allow 24-48 hours to return your correspondence during the normal work week.

Instructor's Office Hours: By Appointment

Division Name:  Engineering Technologies  Division Phone: (918) 293-5150

REQUIRED TEXT, SOFTWARE, REFERENCES, AND MATERIALS

Software: Logixpro 500
Materials: Basic note taking materials, Thumb Drive

Estimated Cost for Text /Software/Materials: $160.00

UPON SUCCESSFUL COMPLETION STUDENTS WILL BE ABLE TO:
<table>
<thead>
<tr>
<th>Item</th>
<th>Course Outcomes</th>
<th>Assessment Methods</th>
<th>Program Outcome</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Students will be able to predict the operation of the PLC when shown a Ladder Logic Diagram</td>
<td>Learning Activities, Exam</td>
<td>D</td>
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<tr>
<td>2</td>
<td>Students will be able to apply Ladder Logic Programming Instructions to a Virtual PLC, and simulate its operation within a virtual environment</td>
<td>Lab Activities</td>
<td>H</td>
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<tr>
<td>3</td>
<td>Students will be able to distinguish (identify) hardware relay control logic, and convert hardware relay control logic into Ladder Logic Instructions</td>
<td>Learning Activities, Lab Activities, Exam</td>
<td>D</td>
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<tr>
<td>4</td>
<td>Students will be able to identify PLC Hardware, and define PLC modules to interface with field devices</td>
<td>Learning Activities, Exam</td>
<td>H</td>
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<tr>
<td>5</td>
<td>Students will be able to identify Ladder Logic Instructions within a Ladder Logic Diagram (schematic), and predict the operation of the logic</td>
<td>Learning Activities, Exam</td>
<td>D</td>
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<tr>
<td>6</td>
<td>Students will be able to solve narrative process and control problems with Ladder Logic Instructions, and apply their solutions through programming sequence with the LogixPro-500 simulator</td>
<td>Lab Activities, Exam</td>
<td>D</td>
</tr>
<tr>
<td>7</td>
<td>Students will be able to define program control structures, and apply their knowledge through the design of equipment machine control logic and feedback loops</td>
<td>Lab Activities</td>
<td>D</td>
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<tr>
<td>8</td>
<td>Students will be able to distinguish memory types and addressing schemes within the structure of a PLC</td>
<td>Learning Activities, Exam</td>
<td>H</td>
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<td>9</td>
<td>Students will be able to identify Discrete Field Device Symbols, and their Operation with a Control System Feedback Loop</td>
<td>Learning Activities, Exam</td>
<td>H</td>
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<tr>
<td>10</td>
<td>Students will be able to define Digital Logic Concepts, and its application within Ladder Logic Circuits that involve Counters and Timers, Sequencers and Shift Registers</td>
<td>Learning Activities, Exam</td>
<td>H</td>
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</tbody>
</table>
Students will Solve Digital Math Problems using digital numbered (numeral) systems of Base 2, Base 8, Base 10, Base 16, BCD, and convert their solutions using Digital Conversion techniques and PLC Ladder Logic Instructions within a Ladder Diagram

| 11 | Learning Activities, Exam | D |

**COURSE ACTIVITIES**
In this course students will:
*(Please list the specific activities in the course)*

- Participate in class discussions and activities.
- View videos that depict the various concepts.
- Compile a portfolio of work produced.
- Take examinations.
- Complete reading assignments.
- Complete Lab assignments

**COURSE GRADING CRITERIA**

The final course grade will be calculated with the following weights:

- Tests - 30%
- Homework/Learning Activities 30%
- Labs 40%

**Instructors Policy to Submit Work**
To provide students with improved feedback, technical documents shall be submitted electronically via D2L unless approval is received for other methods. To ensure students learn to submit documents electronically, students are required to submit work in PDF format and follow a pre-defined template and format. Students will be asked to meet a goal in data recording and analysis by submitted data plots in PDF format (after creating in Microsoft Excel or other professional software format) with the aid of team members and instructor advisement. All submissions must be delivered as one PDF document unless instructed otherwise. Documents that are not legible will be given a grade of zero. NO EXCEPTIONS!
Instructors Late Work Policy
Quizzes, Research/Homework, Labs/Project, Unit Exams and Final Exam: Submitting your complete and properly-executed work early is always acceptable. No late work will be accepted.

Quizzes and class performance are in-class lecture assessments that cannot be made-up under any circumstances. Attendance is mandatory.

RESEARCH/HOMEWORK submitted on the due date is considered to be on time. Late submissions are NOT ACCEPTED. This work is 10% of your grade.

LAB/PROJECT reports submitted after the due dates WILL NOT BE ACCEPTED! Presentations CANNOT be made up. Labs and course project is 40% of your grade.

UNIT EXAMS AND FINAL EXAM If you miss an exam, it cannot be made up unless your absence meets the requirements for an approved absence. Make-up exams may be different from the exam given in class and may be more difficult. Unit Exams CANNOT be made up without strict approval and penalty! If you know in advance that you will miss an exam, special arrangements to re-schedule the exam may be possible for hardship circumstances. This section constitutes 40% of your final grade.

Student Conduct and Other Lab and Classroom Policies
Students are expected to cooperate in maintaining a classroom environment conducive to learning. Courteous and respectful behavior will be expected from all students each day. All pagers, cellular phones, CD and MP3 players should be turned off. The use of tobacco in any form in University buildings is prohibited.

Students are expected to maintain a clean and organized lab work place. After completion of a lab or at the end of the class period, components must be returned to the appropriate storage location they were obtained from. Instruments, test probes, and any items used to perform an experiment must also be returned to the appropriate storage location. All other instruments must be turned-off.

Lab computers are to be used for teaching/learning only. Do not use for entertainment or casual internet surfing or chatting. This is especially true during class.

Students are expected to maintain a respectful manner during class-sleeping or otherwise assuming a laid down position will not be tolerated.

Safety Glasses are required while in the lab setting. NO EXCEPTIONS!

NO FOOD OR DRINK IN LAB/COMPUTER AREA!

Students are expected to check D2L for announcements and assignments on a regular basis.

All research assignments, written formal Lab Reports, project work, etc. will be placed either in the appropriate folder in the D2L dropbox or instructor office room.
Dress Code
1. Shoes must cover entire foot.
2. Clothing with obscene logos are not to be worn.
3. Hats may not be worn in the classroom setting.
4. Clothing that is saggy/baggy should not be worn for safety reasons.
5. Sunglasses are not permitted

E-Mail Communication Standards
Students are encouraged to use e-mail when communicating personal issues with their instructor. E-mail corruption is a significant problem and unidentified e-mails are simply purged. Therefore a strict standard is necessary to identify a legitimate student communication. The “message line” of student e-mails must contain in order – Subject, Name, Course, and Trimester. Example:
Missing Assignment, John Smith, ETDE 2113, Spring 2015.

Institutional Attendance Policy for Face to Face courses:
A primary component of OSUIT's Mission is “to prepare and sustain a diverse student body as competitive members of a world-class workforce.” Regular and consistent attendance not only aids in academic success, dependable attendance is a requirement in today's real-world employment; therefore, regular and consistent attendance is a requirement in all OSUIT courses.

Definitions:
Absent: Failing to attend all or a significant portion of a class or lab session.
A. Students may not be marked as absent if missing class for situations such as, but not limited to
   1. participating in a required university activity such as a field trip;
   2. fulfilling a military obligation;
   3. a mandatory court appearance;
   4. death in the immediate family;
   5. extreme illness or accident to oneself or immediate family. Instructors, at their discretion, may require proof of such events.
B. It is the responsibility of the student to contact and inform the instructor and/or department in advance of such excused absences whenever possible.

Tardy: Arriving late to class as defined by the individual class instructor. Faculty, at their discretion, may equate three tardies to equal one absence.

Procedures:
Early Intervention
A. Any student who misses 10% of an individual course (or earlier at faculty discretion) during a regular fifteen-week semester, or the equivalent portion of time in a shorter session, will have their name submitted by that course instructor to the OSUIT Early Alert System for retention intervention.
B. At the point the Early Alert is issued, the student must meet with their assigned faculty advisor or designated faculty/staff member within seven (7) academic calendar days for counseling on how to improve their attendance and academic success.

Excessive Absences
A. The University reserves the right to administratively withdraw any student from an individual course who misses 20% of that course, whether excused or unexcused, and, in the opinion of the instructor, the student does not have a reasonable opportunity to be successful in the course.
B. Students should be aware any of the following may impact their financial aid:
   1. being administratively withdrawn from a course
   2. dropping a course
   3. their last date of attendance in a course

Please see OSUIT Policy 2-021 for full details and procedures

ACADEMIC DISHONESTY
Academic dishonesty or misconduct is neither condoned nor tolerated at OSUIT. Any student found guilty of academic dishonesty or misconduct shall be subject to disciplinary action. Academic dishonesty and/or misconduct includes, but is not limited to, the following actions:
(1) Plagiarism: the representation of previously written, published, or creative work as one’s own; (2) Unauthorized collaboration on projects; (3) Cheating on examinations; (4) Unauthorized advance access to exams; (5) Fraudulent alteration of academic materials; (6) Knowing cooperation with another person in an academically dishonest undertaking. Students are required to actively protect their work against misuse by others. For details, refer to The OSUIT Student Handbook (Student Rights and Responsibilities Governing Student Behavior) available online at http://www.osuit.edu/academics/forms/student_rights_responsibility.pdf.

Americans with Disabilities ACT (ADA)
According to the Americans with Disabilities Act, each student with a disability is responsible for notifying the University of his/her disability and requesting accommodations. If you think you have a qualified disability and need special accommodations, you should notify the instructor and request verification of eligibility for accommodations from the Office of Academic Accommodations/LASSO Center. Please advise the instructor of your disability as soon as possible, and contact The LASSO Center, to ensure timely implementation of appropriate accommodations. Faculty have an obligation to respond when they receive official notice of a disability but are under no obligation to provide retroactive accommodations. To receive services, you must submit appropriate documentation and complete an intake process during which the existence of a qualified disability is verified and reasonable accommodations are identified. The LASSO Center is located on the 3rd floor of the Noble Center. You may call 918.293.4855 for more information or fax documentation to 918.293.4853.
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<tr>
<th>Course Outline Schedule</th>
<th>Topic</th>
<th>Assignment</th>
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<td>Week 1</td>
<td>Overview</td>
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<td>Week 2</td>
<td>PLC Hardware components</td>
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<td>Week 3</td>
<td>Number Systems &amp; Codes</td>
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<td>Week 4</td>
<td>Fundamentals of Logic</td>
<td>Exam 1</td>
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<td>Week 5</td>
<td>Basics of PLC Programming</td>
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<td>Week 6</td>
<td>Developing Fund. PLC wiring diagrams and ladder logic programs</td>
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<td>Week 7</td>
<td>Programming Timers</td>
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<td>Week 8</td>
<td>Programming Counters</td>
<td>Exam 2</td>
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<td>Week 9</td>
<td>Program Control Instructions</td>
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<td>Week 10</td>
<td>Data Manipulation Instructions</td>
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<td>Week 11</td>
<td>Math Instructions</td>
<td>Exam 3</td>
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<tr>
<td>Week 12</td>
<td>Sequencer and Shift Register Instructions</td>
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<tr>
<td>Week 13</td>
<td>PLC Installation</td>
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<td>Week 14</td>
<td>PLC Editing and troubleshooting</td>
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<tr>
<td>Week 15</td>
<td>Control Logix Controllers</td>
<td>Final Exam</td>
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Schedule is subject to change at instructor discretion.
I have read and understand this syllabus, and agree to abide by the policies, procedures and guidelines specified therein.

Printed Name

Student CWID Number  (this is not your SSN)

Signature

Date

I agree that Oklahoma State University Institute of Technology may excerpt some of my work to be utilized for institutional assessment purposes. The purpose of institutional assessment is for verification of student learning and program improvement. I recognize that every effort will be made to keep this information confidential and that my name will not be associated with my work.

Printed Name

Student ID Number  (this is not your SSN)

Signature

Date