

SAM HOUSTON STATE UNIVERSITY
COLLEGE OF SCIENCES AND ENGINEERING TECHNOLOGY

COURSE SYLLABUS

ETEC 4351 AUTOMATION & CONTROL SYSTEMS

SPRING 2018

Department: College of Sciences and Engineering Technology
Course Name/ Title: ETEC 4351 Automation and Control Systems
Semester: Spring 2018
Credit: 3 Credit Hours
Location/Time: Pirkle 220 Class, 142 Lab, Thursday 6:00 - 9:50 pm
Instructor: Gabriel Teodorescu
Email: sgt006@shsu.edu
Phone: 936- 217-5467
Office Hours: Virtual / Email

Course Catalog Description: This course explores the concepts of automation, electrical control systems, and programmable logic controllers. Topics include principles of control system operations, numbering systems as applied to electrical controls, types of programmable logic controllers, and operations of programmable logic controllers, such as ladder logic diagrams, timers and counters, equipment interfacing, and ladder logic programs. Application-oriented laboratory experiments and design problems are used to enhance students' knowledge and skills.

Required Textbook: Programmable Logic Controllers, 5th Edition by Frank D. Petruzella. McGraw Hill Publishers. ISBN: 978-0-07-3373843

Required Supplies: A notebook, A flash drive, A Texas Instruments scientific/engineering type calculator and **pencils** (at least three colors - red, black, green, and optional yellow).

Course Objectives: The student will be expected to perform the following tasks in written examination or laboratory demonstration:

- Define a Programmable Logic Controller.
- Explain how instructions get into a PLCs memory.
- Demonstrate ability to successfully test use BCD, Octal and Hexadecimal number systems.
- Convert from one numbering system to another and express binary numbers in 2s complement
- Correctly explain the different data formats used in common PLCs.
- Use ladder logic to solve algorithms.
- Draw a correct ladder logic diagrams.
- Program PLCs with correct ladder logic.
- Describe sinking and sourcing as related to input modules.
- Correctly explain TTL output modules.
- Program and explain relay output modules.
- Properly use surge suppression in output modules.
- Explain basic relay instructions
- Program a PLC for normally closed instruction.
- Set up a PLC for normally open PLC instruction.
- Use a PLC to perform timing and counting.
- Connect input and output devices to a PLC and develop a program to check, debug, and troubleshoot
- Develop and troubleshoot/debug PLC programs using written program requirements, wiring diagrams, and/or hard-wired ladder diagrams.

Class Structure and Attendance: This is an important core electronics and electrical engineering course and your attendance is required. *Lectures, in-class problems and discussions, laboratory experimental projects, homework assignments, quizzes* will constitute the structure of the course. The make-up labs and exams will be given only in the case of **documented physical illness (In this case, students must inform instructor at least 24 hours before the exam).**

Homework Assignments and Laboratory Experiments: Homework assignments will be available through SHSU Blackboard. The HW assignments will be automatically graded by the blackboard system and be available to students after completion of each HW assignment. The HW assignments will not be available to the students after the due dates. No credit will be given for late homework and lab assignments (except documented physical illness). **Students are encouraged to work and discuss with others on the lab reports and homework assignments, however, submissions must consist of the students own work, in accordance with departmental policies.** Please work neatly, *showing all calculations, manipulations, plots and program files* (if any) required reaching your solution. Students should use pencils in lab reports.

Blackboard Use: Presentations, course syllabus, Lab/HW assignments will be available in blackboard system. All the HW assignments will be completed through Blackboard systems. Please pay attention to the due dates.

Grading Scale: The final grade will be based on the following requirements. Mid-term Test	25%
Final Exam	25%
Laboratory Experiments	25%
Homework Assignments & Quizzes	15%
Attendance, Observed performance, Attitude	10%
Total	100%

Percentage range	Grade
90 – 100	A
80 – 89	B
70 – 79	C
60– 69	D
0-59	F

Classroom Rules of Conduct: Students will avoid doing behavior in the classroom that intentionally or unintentionally disrupts the learning process and, thus, obstructs the mission of the university. Cellular *telephones* and *paggers* must be turned off before class begins. Students are prohibited from *eating in class, using tobacco products, making offensive remarks, reading newspapers, sleeping, talking at inappropriate times, or engaging in any other form of distraction.* Inappropriate behavior in the classroom shall result in a directive to leave class. Students who are especially disruptive also may be reported to the Dean of Students for disciplinary action in accordance with university policy.

Course Content and Lab Schedule: The tentative course content schedule will include the following topics. Depending upon extra handouts//homework assignment explanations, ***the tentative course content may be shifted slightly later in the semester.***

Week	Date	Subject
1	1/18	Introduction to the Course and Safety
2	1/25	Laboratory Safety Instructions (Hazards to avoid, Proper use of equipment)
3	2/1	Chapter 1 Programmable Logic Controllers (PLCs) An Overview HW#1 (Due 2/8)
4	2/8	Chapter 2 PLC Hardware Components HW#2 (Due 2/15)
5	2/15	Chapter 3 Number Systems and Codes HW#3 (Due 2/22)
6	2/22	Chapter 4 Fundamentals of Logic HW#4 (Due 3/1)
7	3/1	Chapter 5 Basics of PLC Programming HW#5 (Due 3/8)
8	3/8	Chapter 6 Developing Fundamental PLC Wiring Diagrams and Ladder Logic Programs HW#6 (Due 3/16) <i>Midterm Test Review</i>
9	3/15	<i>Spring Break</i>
10	3/22	Mid-Term Exam
11	3/29	Chapter 7 Programming Timers HW#7 (Due 4/5) Lab Experiments
12	4/5	Chapter 8 Programming Counters HW#8 (Due 4/12) Lab Experiments
13	4/12	Chapter 9 Program Control Instructions HW#9 (Due 4/19) Lab Experiments
14	4/19	Chapter 10 Data Manipulation Instructions HW#10 (Due 4/26) Lab Experiments
15	4/26	Chapter 11 Math Instructions HW#11 (Due 5/3) Lab Experiments
16	5/3	Chapter 12 Sequencer and Shift Register Instructions HW#12 (Due 5/9) Lab Experiments
17	<i>May 10</i>	FINAL EXAMINATIONS (Chapters 8-12)

Laboratory Instructions

Laboratory Assignments: There are regular labs will be announced by the instructor during the lectures for this course. All laboratory project assignments must be completed for your lab grading. You must obey departmental laboratory safety rules & policies. ***You must attend and successfully complete the each lab.*** Lab reports due dates are provided in the tentative schedule. Make sure you write clearly and neatly! ***Two students work at the same workbench should submit one lab report together.*** Student misses the lab section of the class should submit lab report individually if a specific reason for the absence is provided to instructor. ***Tear off the related pages of lab project from the laboratory workbook and staple them together before submitting to the instructor.***

Rules and Recommendations for Effective and Safe Use of the Laboratory and Work Benches in Thomason 201 (Electronics Lab)

1. ***DO NOT turn on the power before the instructor checks your circuit!***
2. Use the coat racks for neat laboratory appearance as well as safety. Do not place coats or book bags on workbenches.
3. Refrain from drinking beverages in the laboratory. The hall may be used for intervals of relaxation.
4. ***The lab bench must be cleaned and all wires must be returned to the hooks provided in the lab room before leaving the room.***
5. Report all component and equipment failures to your Instructor lab TA. Neglecting to report faulty equipment causes problems for the next group that uses the bench and may result in injuries.
6. When using the instruments ***DO NOT STACK THEM***, as the combined heat may cause component failure.
7. Place all of the trainer units, transformers, motors, DMMs, resistors, inductors, capacitors, etc., back to their original places and/or *original rated* boxes after you are done with the laboratory.
8. ***All power switches should be turned off before leaving the lab bench.***
9. Rings and other jewelry, which may cause a potential hazard, must be removed before working in the laboratory.
10. No individual should operate equipment in the laboratory until the appropriate examinations are passed and/or demonstrations by instructor are safely observed.

General Safety Procedures – Introduced by the instructor	
I. Introduction: How Electricity Works a. Conductors b. Insulators c. Grounding	II. Hazards of Electricity a. Electrical shock b. Electrical burns c. Electrical fires d. Case Studies of Electrical Accidents
III. Types of Electrical Hazards a. Working on energized (hot) circuits b. Loose connections c. Frayed or missing insulation d. Missing ground prongs on plugs e. Water and electricity don't mix f. Damaged power tools g. Ungrounded equipment h. Improper use of extension cords	IV. How to Protect Yourself from Electricity a. General electrical safety rules b. Properly grounded electrical circuits c. Ground fault protection near water sources d. Insulated power tools e. Proper housekeeping f. Don't overload circuits
V. Soldering Hazards a. General soldering safety rules b. Proper handling of soldering equipment	

Academic Dishonesty: All students are expected to engage in all academic pursuits in a manner that is above reproach. Students are expected to maintain honesty and integrity in the academic experiences both in and out of the classroom. Any student found guilty of dishonesty in any phase of academic work will be subject to disciplinary action. The University and its official representatives may initiate disciplinary proceedings against a student accused of any form of academic dishonesty including but not limited to, cheating on an examination or other academic work which is to be submitted, plagiarism, collusion and the abuse of resource materials.

Student Absences On Religious Holy Days Policy: Section 51.911(b) of the Texas Education Code requires that an institution of higher education excuse a student from attending classes or other required activities, including examinations, for the observance of a religious holy day, including travel for that purpose. A student who is excused under this subsection may not be penalized for that absence and shall be allowed to take an examination or complete an assignment from which the student is excused within a reasonable time after the absence. University policy 861001 provides the procedures to be followed by the student and instructor. A student desiring to absent himself/herself from a scheduled class in order to observe (a) religious holy day(s) shall present to each instructor involved a written statement concerning the religious holy day(s). This request must be made in the first fifteen days of the semester or the first seven days of a summer session in which the absence(s) will occur. The instructor will complete a form notifying the student of a reasonable timeframe in which the missed assignments and/or examinations are to be completed.

Disabled Student Policy: It is the policy of Sam Houston State University that individuals otherwise qualified shall not be excluded, solely by reason of their disability, from participation in any academic program of the university. Further, they shall not be denied the benefits of these programs nor shall they be subjected to discrimination. Students with disabilities that might affect their academic performance should register with the Office of Services for Students with Disabilities located in the Lee Drain Annex (telephone 936-294-3512, TDD 936-294-3786, and e-mail disability@shsu.edu). They should then make arrangements with their individual instructors so that appropriate strategies can be considered and helpful procedures can be developed to ensure that participation and achievement opportunities are not impaired. SHSU adheres to all applicable federal, state, and local laws, regulations, and guidelines with respect to providing reasonable accommodations for students with disabilities. If you have a disability that may affect adversely your work in this class, then I encourage you to register with the SHSU Services for Students with Disabilities and to talk with me about how I can best help you. All disclosures of disabilities will be kept strictly confidential. NOTE: No accommodation can be made until you register with the Services for Students with Disabilities. For a complete listing of the university policy, see: <http://www.shsu.edu/dept/academic-affairs/documents/aps/students/811006.pdf>

Tobacco Policy: In order to promote a healthy, safe, and aesthetically pleasing work, educational, and living environment, Sam Houston State University (SHSU) will endorse a smoke free and tobacco free environment. The primary purpose of this policy is to establish guidelines prohibiting smoking and the use of all tobacco products. Tobacco products include cigarettes, cigars, pipes, smokeless tobacco, and all other tobacco products. This policy applies to all faculty, staff, students, employees of contractors, and visitors of Sam Houston State University on the premises of the university.

Visitors in the Classroom: Only registered students may attend class. Exceptions can be made on a case-by-case basis by the professor. In all cases, visitors must not present a disruption to the class by their attendance. Students wishing to audit a class must apply to do so through the Registrar's Office.

"The above schedule, policies, and assignments in this course are subject to change in the event of extenuating circumstances or by mutual agreement between the instructor and the students."