ENR 301 Mechatronics

Summer 2024

Course Credits: 4
Contact Hours: 56 hours
Instructor: TBA
Email:TBA

COURSE OBJECTIVES

This course is an advanced course focusing on the integration of mechanical, electrical, and computer engineering principles to design and develop automated systems. The course covers topics such as sensors and actuators analysis, selection, and implementation; programmable logic controllers (PLCs); ladder logic and sequential programming; microcontroller analysis, implementation, and programming; communication interfaces; and case studies of mechatronic systems, simulation, and testing.

Upon Completion of this Course, students will be able to:

1. Have a comprehensive understanding of mechatronic systems and their components;
2. Familiarize with the analysis, selection, and implementation of sensors and actuators in mechatronic systems;
3. Make out ladder logic and sequential programming for PLCs;
4. Explore communication interfaces used in mechatronic systems;
5. Present case studies of mechatronic systems, simulation techniques, and testing methodologies.

PREREQUISITES

CS 240 Object-oriented Programming; ENR 300 Control Theory

GRADING

Grades will be determined by accumulating points, with 100 points being the

maximum, as follows:

ITEM	POINTS
2 Labs	20 Points
Midterm 1	15 Points
Midterm 2	15 Points
2 Projects	20 Points
Final Exam	30 Points
Total	100 Points

Late submissions will be graded at the end of the course. Grades will be assigned according to the following rule:

A ≥ 90 > B ≥ 80 > C ≥ 70 > D ≥ 60 > F.

We reserve the right to make adjustments to the overall grading policy.

COURSE MATERIALS

Required Texts:

Clarence W. de Silva, ***Mechatronics: An Integrated Approach***, 1st Edition, CRC PRESS, 2005.

Recommended (Optional) Texts or Other Materials:

None

COURSE TOPICS

MODULE	TASKS
Module 1	**Topics:** Topic 1: Introduction to Mechatronics Topic 2: Sensors: Types, Characteristics, and Selection Topic 3: Actuators: Types, Characteristics, and Selection Topic 4: Sensor Interface Circuits **Assessments:** Project 1

Module 2	**Topics:** Topic 5: Actuator Drive Circuits Topic 6: Programmable Logic Controllers (PLCs): Overview and Applications Topic 7: Ladder Logic Programming Topic 8: Sequential Programming for PLCs **Assessments:** Lab 1
Module 3	**Topics:** Topic 9: Microcontrollers: Architecture and Operation Topic 10: Microcontroller Programming Languages Topic 11: Microcontroller Interfacing with Sensors and Actuators Topic 12: Communication Interfaces in Mechatronic Systems **Assessments:** Midterm#1 Project 2
Module 4	**Topics:** Topic 13: Case Studies: Industrial Mechatronic Systems Topic 14: Simulation Techniques for Mechatronic Systems Topic 15: Testing Methodologies for Mechatronic Systems Topic 16: Integration of Mechanical, Electrical, and Computer Engineering Principles **Assessments:** Midterm#2 Lab 2
Module 5	**Topics:** Topic 17: Design Considerations for Mechatronic Systems Topic 18: Control Systems in Mechatronics Topic 19: Mechatronics Applications in Robotics Topic 20: Mechatronics Applications in Automotive Systems **Assessments:** Final Exam

ATTENDANCE

1) Class attendance is required. Missing classes without permission will lead to decrease in overall grade.

Missing less than two classes: no penalty.

Missing more than two classes: 7% will be taken off from the overall grade.

If the instructor reports a student's frequent missing of class to the Soochow University Academic Administration Office, the student might get a written warning

and might be prohibited from attending final exam.

2) Participants in this course are expected to arrive in class promptly and adequately prepared. The primary objective of this course is to critically engage with the readings and the subject matter. Therefore, course participants are expected to have completed the reading prior to class and prepare thoughtful reflections/commentaries to share with fellow colleagues.

LEARNING REQUIREMENTS

1) Late assignments are not acceptable and are subjected to grade deductions.

2) Assignments submitted in the wrong format will be counted as not submitted.

3) Failure to submit or fulfill any required course component results in failure of the class.

4) Make-up for midterm and final exams only with valid excuses, as defined by the University.

5) In order to earn a Certificate of Completion, participants must thoughtfully complete all assignments by stated deadlines and earn an average quiz score of 50% or greater.

TECHNOLOGY POLICY

The use of electronic devices in class is distracting, both for the user and for the rest of the class. Only non-programmable calculators can be used in the tests and exam. Any attempts to use cell phones and other electronic communication devices will be seemed as cheating. Laptops are discouraged, unless you use them for activities DIRECTLY related to the course (eg., note taking, reading course documents).

ACEDEMIC INTEGRITY POLICY

Soochow University highly values the academic integrity and aims to promote the academic fairness, honesty and responsibility. Any academic dishonesty behaviors and any attempts to cheats and plagiarism will be reported to the university administration office. A written warning and the relevant penalties will be imposed. The record might be shown on the official university transcript.

DISABILITY ACCOMMODATION

Soochow University is committed to maintaining a barrier-free environment so that students with disabilities can fully access programs, courses, services, and activities at Soochow University. Students with disabilities who require accommodations for access to and/or participation in this course are welcome.

Note:

Please contact the University Administrative Office immediately if you have a learning disability, a medical issue, or any other type of problem that prevents professors from seeing you have learned the course material.