Course Information

Catalog Description: This course introduces the foundations of mechatronics. Students will learn about the various mechanical and electro-mechanical components that are fundamental building blocks of robotic systems. They will also receive a theoretical and hands-on overview of various mechatronics systems like servos, linear actuators, stepper motors, drivers, relays, processors, brushless motors, gear drives, and pneumatics.

Prerequisite(s):

Corequisite(s):

Credits: 3

Hours: 3

Required Text(s): Mechatronics: Electronic Control Systems in Mechanical and Electrical Engineering by William Bolton | ISBN-10: 9353065887

Supplemental Materials:

Instructor Information

Instructor's Name:

Contact Information:

Office Hours:

Program Goals

1. Equip students with a strong theoretical and applied understanding of robotics, mechatronics, automation, and AI, ensuring they are well-prepared for industry and further education.
2. Develop expertise in the structure, design, components, and subassemblies that make up robotic and automated systems, including motion control, sensors, actuators, and AI integration.

3. Provide hands-on experience to ensure proficiency in troubleshooting, diagnosing, and optimizing complex robotic and automation systems.
4. Ensure students acquire an applied understanding of manufacturing automation, including the tools, practices and processes involved in robotic and automated manufacturing.
5. Develop a hands-on understanding of the interrelation between mechatronic, robotic and automation hardware and software; foster technical proficiency in programming and interfacing robotic systems with AI-driven automation tools, ensuring adaptability in a rapidly advancing field.

Class Core Competencies

The following core competencies are embedded in this curriculum:

- Communicate effectively in both speech and writing.
- Apply appropriate mathematical and statistical concepts and operations to interpret data to solve problems.
- Use computer systems or other appropriate forms of technology to achieve educational and personal goals.
- Address an information need by locating, evaluating, and effectively using information.

Class Learning Assessment

Student Learning Outcomes	Suggested Means of Assessment
Correctly identify various electromechanical components based on their electrical and mechanical characteristics.	Lab exercises
Understand the functional characteristics, physical limitations and applications of commonly used mechatronic systems and components.	Quizzes and lab exercises
Understand and correctly interpret data sheets and specification sheets for commonly-used mechatronic components and sub-systems	Lab exercises

Student Learning Outcomes	Suggested Means of Assessment
Correctly connect and configure multiple mechatronic components to create a working system to meet specific project objectives	Lab exercises and final project
Understand the usability and reliability of various mechatronic components from the standpoint of Design for Manufacturability (DFM)	Lab exercises

Grading System

Letter Grade	Percentage Range
A	90 to 100 percent
B Plus (B+)	87 to 89.9 percent
B	80 to 86.9 percent
C Plus (C+)	77 to 79.9 percent
C	70 to 76.9 percent
D	60 to 69.9 percent
F	Below 60 percent

College Information

Disability Services
Disability Services Webpage

Statement and Policy on Cheating, Plagiarism, and Academic Conduct
Academic Conduct Policy (Policy 304) [PDF]

Students are required to perform all the work specified by the instructor and are responsible for the content and integrity of all academic work submitted. A violation of academic integrity will occur if a student: (1) knowingly represents work of others as one's own, (2) uses or obtains unauthorized assistance in any academic work, (3) gives fraudulent assistance to another student, or (4) furnishes false information or other misuse of college documents.

Unauthorized use of Artificial Intelligence (AI) is prohibited unless the instructor explicitly permits it in the syllabus or assignments. If tools such as ChatGPT are permitted by an instructor to be used for an assignment, they should be used with caution and with

proper citation. In all such cases, you may only use the specific tools identified as acceptable and you must adhere to the College's standards for attribution, validation, and transparency.

In cases of suspected violation of academic integrity, the incident is to be reported to the Office of Academics. A student found guilty of violating the rule of academic integrity by the Vice President of Academics will be considered to have failed in personal obligation to the College; such failure will be subject to disciplinary action by the College. Unless otherwise notified, the instructor will allow students who are pending disciplinary action to attend class.

Tutoring and Testing at the Instructional Support Center (ISC)

- Instructional Support Center (ISC) Webpage

WCCC Library Services

- WCCC Library Website

Citation Styles and Formatting

Work submitted for any Warren County Community College course must conform to the required formatting and citation style that are specified by the instructor. The Library and Instructional Support Center can assist students with formatting and citations for assignments and papers.

WCCC Attendance Expectations

The College expects students to attend and participate in all classes. This involves sharing discussions and lectures in class, as well as interacting with other students. Grades are based on the quality of work students complete in meeting the requirements for a particular course, as stated in the course syllabus and catalog description. Attendance, among other factors, may be an additional criterion for assigning grades. Students should realize that they are responsible for all class meetings and that work missed because of absences may affect their grades. Attendance in online classes is determined by the completion of assignments/ tests. Students who have not completed any assignments or tests will be considered non-attending and receive an NF grade in online classes.

Class Attendance Expectations

Topical Outline

1. Introduction to mechatronics
2. Processing and control Systems
3. Brushed and brushless dc motors
4. Stepper motors and stepper drivers
5. Open and closed-loop servos
6. Electromechanical actuators
7. Relays and switches
8. Electric linear actuators
9. Limit switches and electromechanical sensing systems
10. Non-contact sensing systems: optical, IR, Ultrasonic, Hall-effect
11. Pneumatic control: valves, compression and actuation
12. Load sensing and measurement: load cells and encoders
13. Gear reduction and power transfer

Grading Methods

Assignment	Points/Percentage

Class Itinerary

Week / Unit	Topic	Readings/Assignments

Week / Unit	Topic	Readings/Assignments