Mech 1010 Fundamentals of Mechatronics

For additional course information, including prerequisites, corequisites, and course fees, please refer to the Catalog: https://catalog.uvu.edu/

Semester: Spring
Year: 2025
Course Prefix: MECH
Course and Section #: 1010 X01
Course Title: Fundamentals of Mechatronics
Credits: 3

Course Description

Covers the fundamental skills and theory of the Mechatronics discipline. Covers integrated system design which includes electrical, mechanical, and microprocessor programming theory. Discusses the fundamentals of materials science, manufacturing processes, and the application of automation systems in a production environment.

This course is required for both the Associates degree and Bachelors degree in Mechatronics Engineering. This course provides the framework and fundamentals for being successful throughout the Mechatronics program.

Course Attributes

This course has the following attributes:
☐ General Education Requirements
☐ Global/Intercultural Graduation Requirements
☐ Writing Enriched Graduation Requirements
☒ Discipline Core Requirements in Program
☐ Elective Core Requirements in Program
☐ Open Elective
Other: *Click here to enter text.*

Instructor Information

Instructor Name: Justin Zsiros

Student Learning Outcomes

Upon successful completion of this course, students will be able to:

- Describe career paths in automation
- Describe factory automation systems
- Describe a production environment
- Identify safety standards in a production environment
- Identify electrical, mechanical, and control components of a system

Course Materials and Texts

Required materials and technology

- Textbook: Industrial Maintenance and Mechatronics, 2nd edition, by Shawn A Ballee, Gary R. Shearer, Goodharrt-Wilcox publishing 978-1-63776-711-5
    - textbook is available from the publisher or affiliate or online via Wolverine Access
    - Do Not Purchase the EduHub item from GW, only purchase the eBook. The EduHub is specific to Canvas Content provided by the publisher. We use our own content here instead.
- Access to a computer and reliable internet connection

Course Requirements

Course Assignments, Assessments, and Grading Policy
Grading Scale:
The following grading standards will be used in this class: (percent of total):

A	A-	B+	B	B-	C+	C	C-	D+	D	D-
94	90	87	84	80	77	74	70	67	64	60

Assignment Categories

Activity	**Percentage**
Admin Assignments	5
Discussions	5
Quiz Homework	30
Projects/Presentations	30
Exams	30
Total	100

Late Work Statement:
The best way to be successful in this course is to submit all assignments by their due date. Late work is not accepted and a zero will be given.
In the event that you will not be able to meet a due date, contact your instructor as soon as possible. Contacting the instructor after the due date asking for an extension is not acceptable.

Administration Assignments (easy 5%):

- Syllabus Quiz: One of your first assignments is to complete the syllabus quiz. It is important that you familiarize yourself with the syllabus (this document) and all of the information in the Course Orientation module. This quiz is multiple/choice, true/false and must be taken as many times as necessary to receive a perfect score which releases the full course materials. This will ensure that course expectations are clear.
- Introduce yourself to the class
- Update Canvas Profile

Discussions (easy 5%):

- Students Helping Students discussions are opportunities to reach out to other students for each module. These are optional and can prove to be very helpful if you take them seriously.
- Project progress discussions will provide opportunities to post a short summary of your progress during a particular week to share ideas you are applying to your project for the benefit of other students. Responses are not required.
    - Due dates will conclude by **Friday**. After this, posts will be marked late and given a zero.

Projects (30%):

- Projects will be iterative assignments where you create and add to a particular system infographic. Infographics are a visual image such as an image, chart, or diagram used to represent information or data. If you are unfamiliar with infographics, google "mechatronic infographics" (include the quotes) and filter to images to see some examples. These assignments will help you better understand the systems we will cover and create the foundation you need to continue in this major.

Quiz Homework & Exams (combined 60%):

- Quiz Homework are due weekly, are not timed, and allow two (2) attempts.
- Exams are limited to 60 minutes and consist of 40 multiple choice, true/false, and matching type questions.
    - Exams are completed online anytime during the typical 3-day testing period. They are open resource AND must be completed individually.
- Final Project Exam is a systems level infographic you develop based on a Senior Mechatronics System Capstone Project created by our own UVU seniors.

Required or Recommended Reading Assignments

All required readings use chapters from the course text that align with the lectures below.

General Description of the Subject Matter of Each Lecture or Discussion

Module	Assignments
Orientation	• Update Profile/Notifications • Introduce Yourself
1 What is Mechatronics	Week 1: Overview of mechatronics • M01: Project (System Infographic)

Module	Assignments
	• M01: Discuss Project
2 Electrical System	Week 1: Electrical power, distribution, horsepower, and energy • M02.1: Project (System Identification and Evaluation) • M02.1: Discuss Project Progress • M02.1: Homework Week 2: Electrical values, circuits, components, and magnetism • M02.2: Project (System Identification and Evaluation) • M02.2: Discuss Project Progress • M02.2: Homework Week 3: DC, AC, and 3 Phase • M02.3: Project (System Identification and Evaluation) • M02.3: Discuss Project Progress • M02.3: Homework Week 4: 3 Phase motors, 1 Phase motors, DC motors, and special motors • M02.4: Project (System Identification and Evaluation) • M02.4: Discuss Project Progress • M02.4: Homework • M02: Project (System Infographic - Electrical) • M02: Electrical Systems Midterm Exam
3 Mechanical System	Week 1: Mechanical forces, torque, energy, and levers • M03.1: Project (System Identification and Evaluation) • M03.1: Discuss Project Progress • M03.1: Homework Week 2: Gears, chains, pulleys, and belts

Module	Assignments
	• M03.2: Project (System Identification and Evaluation) • M03.2: Discuss Project Progress • M03.2: Homework Week 3: Hydraulics, pneumatics, and fluid power calculations • M03.3: Project (System Identification and Evaluation) • M03.3: Discuss Project Progress • M03.3: Homework Week 4: Bearings, maintenance, and troubleshooting • M03.4: Project (System Identification and Evaluation) • M03.4: Discuss Project Progress • M03.4: Homework • M03: Project (System Infographic - Mechanical) • M03: Mechanical Systems Midterm Exam
4 Control System	Week 1: Control devices and control logic • M04.1: Project (System Identification and Evaluation) • M04.1: Discuss Project Progress • M04.1: Homework Week 2: Inputs, outputs, control loops, and variables • M04.2: Project (System Identification and Evaluation) • M04.2: Discuss Project Progress • M04.2: Homework Week 3: PLC's and microcontrollers • M04.3: Project (System Identification and Evaluation) • M04.3: Discuss Project Progress • M04.3: Homework

Module	Assignments
	Week 4: Troubleshooting control systems • M04.4: Project (System Identification and Evaluation) • M04.4: Discuss Project Progress • M04.4: Homework • M04: Project (System Infographic - Control) • M04: Control Systems Midterm Exam
5 Whole System	Week 1: Wholistic System Integration • M05: Project (Full System Infographic) Week 2: Whole System dissection • M05 Final Mechatronics System Analysis (Full System Infographic) • SRI

Required Course Syllabus Statements

Generative AI
Artificial Intelligence (AI) Expectations and Requirements
Why Learn AI
Potential employers will eventually expect Mechatronics Professionals to know how to use tools like ChatGPT to generate content, code, and data. You should learn how to use artificial intelligence (AI) and in what instances AI can be helpful to you. Remember, AI programs are not a replacement for your human creativity, originality, and critical thinking. Writing, thinking, and researching are crafts you must develop over time to develop your own voice.
Permitted AI Use
The use of generative AI tools (e.g., ChatGPT, Google Gemini, etc.) is permitted in technology management courses for the following activities:

- Brainstorming and refining your ideas.
- Fine-tuning your research questions; don't accept anything AI generates at face value without checking it critically.
- Finding *accurate* information on your topic.
- Drafting an outline to organize your thoughts.
- Checking grammar and style.

Prohibited AI Use
The use of generative AI tools is **prohibited** in this course for the following activities:

- Impersonating you in classroom contexts, such as by using the tool to compose discussion board prompts/responses assigned to you or content that you put into a Teams/Canvas chat.

- Completing group work that your group has assigned to you unless it is mutually agreed upon that you may utilize the tool.
- Writing entire sentences, paragraphs, or papers to complete class assignments.

Who is Responsible

You are responsible for the information you submit based on an AI query (for instance, that it does not violate intellectual property laws or contains misinformation or unethical content). **Your use of AI tools must be appropriately documented and cited to stay within university policies on academic honesty.**

Be Transparent with AI Use

Any student work submitted using AI tools should clearly indicate what work is the student's work and what part is generated by the AI. In such cases, no more than 25% of the student work should be generated by AI. If any part of this is confusing or uncertain, please get in touch with the course instructor for a conversation before submitting your work. Additional university resources regarding the use of AI are available through the UVU Office of Teaching and Learning.

AI Options

- UVU's AI instance of Microsoft CopilotLinks to an external site.
  - Microsoft Copilot ResourcesLinks to an external site.
  - MS Copilot keeps your inquiries within the UVU AI system
- ChatGPTLinks to an external site.
- GeminiLinks to an external site.
- Other

Using Remote Testing Software

☐ This course does not use remote testing software.

☐ This course uses remote testing software. Remote test-takers may choose their remote testing locations. Please note, however, that the testing software used for this may conduct a brief scan of remote test-takers' immediate surroundings, may require use of a webcam while taking an exam, may require the microphone be on while taking an exam, or may require other practices to confirm academic honesty. Test-takers therefore shall have no expectation of privacy in their test-taking location during, or immediately preceding, remote testing. If a student strongly objects to using test-taking software, the student should contact the instructor at the beginning of the semester to determine whether alternative testing arrangements are feasible. Alternatives are not guaranteed.

Required University Syllabus Statements

Accommodations/Students with Disabilities

Students needing accommodations due to a permanent or temporary disability, pregnancy or pregnancy-related conditions may contact UVU Accessibility Services at accessibilityservices@uvu.edu or 801-863-8747.

Accessibility Services is located on the Orem Campus in BA 110.

Deaf/Hard of Hearing students requesting ASL interpreters or transcribers can contact Accessibility Services to set up accommodations. Deaf/Hard of Hearing services can be contacted at DHHservices@uvu.edu

DHH is located on the Orem Campus in BA 112.

Academic Integrity

At Utah Valley University, faculty and students operate in an atmosphere of mutual trust. Maintaining an atmosphere of academic integrity allows for free exchange of ideas and enables all members of the community to achieve their highest potential. Our goal is to foster an intellectual atmosphere that produces scholars of integrity and imaginative thought. In all academic work, the ideas and contributions of others must be appropriately acknowledged and UVU students are expected to produce their own original academic work.

Faculty and students share the responsibility of ensuring the honesty and fairness of the intellectual environment at UVU. Students have a responsibility to promote academic integrity at the university by not participating in or facilitating others' participation in any act of academic dishonesty. As members of the academic community, students must become familiar with their rights and responsibilities. In each course, they are responsible for knowing the requirements and restrictions regarding research and writing, assessments, collaborative work, the use of study aids, the appropriateness of assistance, and other issues. Likewise, instructors are responsible to clearly state expectations and model best practices.

Further information on what constitutes academic dishonesty is detailed in UVU Policy 541: *Student Code of Conduct*.

Equity and Title IX

Utah Valley University does not discriminate on the basis of race, color, religion, national origin, sex, sexual orientation, gender identity, gender expression, age (40 and over), disability, veteran status, pregnancy, childbirth, or pregnancy-related conditions, citizenship, genetic information, or other basis protected by applicable law, including Title IX and 34 C.F.R. Part 106, in employment, treatment, admission, access to educational programs and activities, or other University benefits or services. Inquiries about nondiscrimination at UVU may be directed to the U.S. Department of Education's Office for Civil Rights or UVU's Title IX Coordinator at 801-863-7999 – TitleIX@uvu.edu – 800 W University Pkwy, Orem, 84058, Suite BA 203.

Religious Accommodation

UVU values and acknowledges the array of worldviews, faiths, and religions represented in our student body, and as such provides supportive accommodations for students. Religious belief or conscience broadly includes religious, non-religious, theistic, or non-theistic moral or ethical beliefs as well as participation in religious holidays, observances, or activities. Accommodations may include scheduling or due-date modifications or make-up assignments for missed class work.
To seek a religious accommodation, a student must provide written notice to the instructor and the Director of Accessibility Services at accessibilityservices@uvu.edu. If the accommodation relates to a scheduling conflict, the notice should include the date, time, and brief description of the difficulty posed by the conflict. Such requests should be made as soon as the student is aware of the prospective scheduling conflict.

While religious expression is welcome throughout campus, UVU also has a specially dedicated space for meditation, prayer, reflection, or other forms of religious expression.