Mechatronics Technology (MECH)

MECH 1010
Fundamentals of Mechatronics
3:3:0 Fall, Spring
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. Course fee of $20 for materials applies. Lab access fee of $45 applies.

MECH 1200
Electronics in Automation Design
3:3:0 Fall
* Corequisite(s): MECH 1205
* Prerequisite(s) or Corequisite(s): MAT 1010
Teaches basic DC and AC electronics theory including voltage, current, resistance, reactance, and complex impedance as well as basic electronic components such as resistors, capacitors, and inductors. Includes the analysis of series, parallel, and complex circuits as well as troubleshooting and measurement techniques. Teaches principles of algebra and trigonometry which will be utilized for circuit analysis. Emphasizes the application of electronic theory and analysis in the design of automation systems. Course Lab fee of $40 for materials, lab applies.

MECH 1205
Electronics in Automation Design Laboratory
2:0:6 Fall
* Corequisite(s): MECH 1200
Applies basic DC and AC electronics theory including voltage, current, resistance, reactance, and impedance as well as basic electronic components such as resistors, capacitors, and inductors. Includes the analysis of series, parallel, and complex circuits as well as troubleshooting and measurement techniques. Presents the fundamentals of digital logic using combinational and sequential logic. Teaches number systems, binary arithmetic, logic gates, Boolean algebra, truth tables and logic simplification. Introduces computer architecture. Emphasizes the application of electronic theory and analysis in the design of automation systems. Lab access fee of $45 for computers applies.

MECH 1300
Industrial Wiring for Mechatronic Systems
2:1:3 Spring
Covers National Electrical Code and International Electrical Code using electrical prints, installation methods, and system requirements in mechatronic systems. Covers the creation and use of electrical diagrams for design and troubleshooting. Lab access fee of $45 for computers applies.

MECH 2200
Semiconductors in Mechatronic Systems
3:3:0 Spring
* Prerequisite(s): MECH 1200
* Corequisite(s): MECH 2205
Teaches the theory of semiconductor PN junctions and discrete semiconductors such as diodes, bipolar junction transistors, and MOSFET's applied to automation control. Also introduces the utilization of opto-isolators, triacs, and SCR's in controlling automation power devices. Course Lab fee of $25 for materials, lab applies.

MECH 2205
Semiconductors in Mechatronic Systems Lab
1:0:3 Spring
* Prerequisite(s): MECH 1200
* Corequisite(s): MECH 2200
Applies the theory of semiconductor PN junctions and discrete semiconductors such as diodes, bipolar junction transistors, and MOSFET's applied to automation control. Introduces the utilization of opto-isolators, triacs, and SCR's in controlling automation power devices. Lab access fee of $45 for computers applies.

MECH 2300
Microcontroller Architecture and Programming
4:4:0 Spring
* Corequisite(s): MECH 2305
* Prerequisite(s) or Corequisite(s): MECH 2200
Teaches computer architecture and the fundamentals of computer programming in C language. Uses an IDE to develop, compile and debug C code. Introduces structured top down design and program documentation. Teaches the organization of I/O ports including alternate functions. Utilizes microcontroller communications, functions and I/O methods to interface to sensors and actuators. Course Lab fee of $50 for materials, lab applies. Software fee of $29 applies.

MECH 2305
Microcontroller Architecture and Programming Lab
1:0:3 Spring
* Corequisite(s): MECH 2300
Applies computer architecture and the fundamentals of computer programming in C language. Uses an IDE to develop, compile and debug C code. Introduces structured top down design and program documentation. Teaches the organization of I/O ports including alternate functions. Utilizes microcontroller communications, functions and I/O methods to interface to sensors and actuators. Lab access fee of $45 for computers applies.

MECH 2400
Mechanical Components
4:4:0 Fall
* Prerequisite(s): MECH 1010
Teaches students how to select, design, and analyze mechanical components that are used in manufacturing automation systems. Reviews and reinforces the concepts of the structure of metals, metals selection, and mechanical properties. Focuses on the selection of belt and chain drives, gear and gearbox selection, design of shafts, specification of rolling element bearings, and the use of threaded fasteners. Integrates the selection and design of mechanical components into a design project. Lab access fee of $45 applies.

MECH 2500
Introduction to PLCs in Mechatronic Design
2:2:0 Fall
* Prerequisite(s): MECH 1200, MECH 2300
* Corequisite(s): MECH 2505
Covers the theory and programming of industrial control systems and programmable logic controllers (PLC). Introduces PLC programming stressing Ladder Logic and PLC programming, troubleshooting, and maintenance. Covers connection of PLCs to external components. Presents the fundamentals of digital logic using ladder logic. Covers number systems and Boolean algebra. Course Lab fee of $15 for materials, lab applies. Software fee of $29 applies.

MECH 2505
Introduction to PLCs in Mechatronic Design Laboratory
2:0:6 Fall
* Prerequisite(s): MECH 1200, MECH 2300
* Corequisite(s): MECH 2505
Applies the theory and programming of industrial control systems and programmable logic controllers (PLC). Applies PLC programming stressing Ladder Logic and PLC programming, troubleshooting, and maintenance. Applies connection of PLCs to external components. Lab access fee of $45 for computers applies.

MECH 2510
Fundamentals of Automation Controls
2:2:0 Fall
* Corequisite(s): MECH 2515
* Prerequisite(s) or Corequisite(s): MECH 2500
Covers how to select, install, and troubleshoot sensors in a manufacturing environment. Emphasizes the application of proximity sensors in automation equipment as well as the use of encoders to measure speed and position, pressure transducers, and the use of thermocouples and thermistors to measure temperature. Covers signal conditioning methods to interface sensors to microprocessors and PLC's. Course Lab fee of $20 for lab notebook, lab applies.
### Course Descriptions

**MECH 2515**  
Fundamentals of Automation Controls  
1:0:3  
Fall  
* Corequisite(s): MECH 2510  
* Prerequisite(s) or Corequisite(s): MECH 2500  
Applies methods for proper selection, installment, and troubleshooting of sensors in a manufacturing environment. Emphasizes the application of proximity sensors in automation equipment as well as the use of encoders to measure speed and position, pressure transducers, and the use of thermocouples and thermistors to measure temperature. Utilizes signal conditioning methods to interface sensors to microprocessors and PLC’s. Lab access fee of $45 for computers applies.

**MECH 2550**  
Advanced PLC Programming and Applications  
2:2:0  
Spring  
* Prerequisite(s): MECH 2500  
* Corequisite(s): MECH 2555  
Covers the principles of program structure, subroutines, interrupts, debugging, and simplifying. Illustrates the measurement and scaling of analog signals. Covers networking principles such as Ethernet and serial. Course Lab fee of $15 for materials, lab applies. Software fee of $29 applies.

**MECH 2555**  
Advanced PLC Programming and Applications Laboratory  
2:0:6  
Spring  
* Prerequisite(s): MECH 2500  
* Corequisite(s): MECH 2555  
Applies the principles of program structure, subroutines, interrupts, debugging, and simplifying using a PLC. Applies the use of PLCs in the measurement and scaling of analog signals. Applies networking principles such as Ethernet and serial to communicate with a PLC. Lab access fee of $45 for computers applies.

**MECH 2600**  
Introduction to Fluid Power Systems  
3:2:3  
Spring  
* Prerequisite(s): MECH 2400  
Develops the concepts used to design, build, and control a fluid power system that is used in an industrial automation process. Employs laboratory exercises to illustrate the selection and use of actuators, valves, and controls to sequentially control a process. Course Lab fee of $15 for materials, lab applies. Lab access fee of $45 for computers applies. Software fee of $50 applies.

**MECH 3060**  
Mechatronics Management  
3:3:0  
On Sufficient Demand  
* Prerequisite(s): MECH 2550 and University Advanced Standing  
Provides management principles, processes, and standards commonly used in manufacturing and other industries. Covers basic concepts in project management, operations management, quality management, and safety management. Familiarizes students with applicable software tools. Lab access fee of $45 for computers applies.

**MECH 3220**  
Automation Motors and Controllers  
3:3:0  
Fall  
* Prerequisite(s): (MECH 2550, or EART 2270, or Department Approval) and University Advanced Standing  
* Corequisite(s): MECH 3225  
Presents the selection and application of AC and DC servo motors and how to control the speed and position in automation systems. Teaches variable frequency drives and servo drives in automation system design. Applies algebra, trigonometry, integrals, and derivatives. Course Lab fee of $15 for materials, lab applies. Software fee of $29 applies.

**MECH 3225**  
Automation Motors and Controllers Laboratory  
1:0:3  
Fall  
* Prerequisite(s): (MECH 2550, or EART 2270, or Department Approval) and University Advanced Standing  
* Corequisite(s): MECH 3220  
Presents the selection and application of AC and DC servo motors and how to control the speed and position in automation systems. Teaches variable frequency drives and servo drives in automation system design. Lab access fee of $45 for computers applies.

**MECH 3250**  
Industrial Networks  
2:2:0  
Spring  
* Prerequisite(s): MECH 3220, University Advanced Standing  
* Corequisite(s): MECH 3305  
Covers the principles of designing, configuring, and maintaining an industrial network. Covers the use of software to integrate PLC’s, sensors, HMI’s, computers, and smart devices into a manufacturing data management network. Lab access fee of $25 for materials, lab applies. Software fee of $29 applies.

**MECH 3305**  
Industrial Networks Laboratory  
1:0:3  
Spring  
* Prerequisite(s): MECH 3220 and University Advanced Standing  
* Corequisite(s): MECH 3300  
Applies the principles of designing, configuring, and integrating in maintaining an industrial network. Applies the use of software to integrate PLC’s, sensors, HMI’s, computers, and smart devices into a manufacturing data management network. Lab access fee of $45 for computers applies.

**MECH 3400**  
Statics and Material Properties for Mechatronics  
4:4:0  
Spring  
* Prerequisite(s): MECH 3225  
* Corequisite(s): MECH 3405  
Teaches the concept of forces as vectors, the equations of equilibrium, calculation of internal forces, and the calculation of centroids and area moments of inertia. Teaches how to calculate tensile and shear stress in machine components and compare the resultant forces to standard theories of failure using the principles of statics. Teaches algebra, trigonometry, and elementary calculus in terms of the application of statics.

**MECH 3405**  
Statics and Material Properties for Mechatronics Laboratory  
1:0:3  
Spring  
* Prerequisite(s): University Advanced Standing  
* Corequisite(s): MECH 3400  
Applies the concept of forces as vectors, the equations of equilibrium, calculation of internal forces, and the calculation of centroids and area moments of inertia. Covers how to calculate tensile and shear stress in machine components and compare the resultant forces to standard theories of failure by using the principles of statics. Lab access fee of $45 for computers applies.

**MECH 3500**  
Industrial Robots  
2:2:0  
Spring  
* Prerequisite(s): MECH 2550, University Advanced Standing  
* Corequisite(s): MECH 3505  
Covers the principles of industrial robotics, programming, and the application of vision systems using industry created curriculum. May be delivered hybrid and/or online. Course Lab fee of $11 for flat ribbon cable, lab applies. Lab access fee of $45 for computers applies. Software fee of $50 applies.
MECH 3505
Industrial Robots Laboratory 1:0:3 Spring
* Prerequisite(s): MECH 2550, University Advanced Standing
* Corequisite(s): MECH 3500
Applies the principles of industrial robotics, programming, and the application of vision systems using industrial robots. Lab access fee of $45 for computers applies.

MECH 3570
Design Analysis and Rapid Prototyping 3:3:0 Fall
* Prerequisite(s): University Advanced Standing
Covers the fundamentals of geometric dimensioning and tolerancing based on the ASME Y14.5 standard. Explores how a design is affected by manufacturing tolerances and how to specify the fit of parts on a detail print. Emphasizes assembly analysis using SolidWorks Motion and rapid prototyping to verify the form, fit, and function of a design. Lab access fee of $45 for computers applies.

MECH 3700
CNC Machines in Mechatronic Design 2:2:0 Fall
* Prerequisite(s): MECH 3220, University Advanced Standing
* Corequisite(s): MECH 3705
Covers the application, programming, and maintenance of CNC machines. Emphasizes the integration of CNC machines into automation systems. Covers specifications, performance, interfacing with industrial robots, tooling, programming, and integrating the CNC machine into factory system. Course lab fee of $35 for materials applies. Software fee of $25 applies.

MECH 3705
CNC Machines in Mechatronic Design Laboratory 1:0:3 Fall
* Prerequisite(s): MECH 3220, University Advanced Standing
* Corequisite(s): MECH 3700
Applies the application, programming, and maintenance of CNC machines. Emphasizes the integration of CNC machines into automation systems. Applies specifications, performance, interfacing with industrial robots, tooling, programming, and integrating the CNC machine into a factory system. Lab access fee of $45 for computers applies.

MECH 4300
Advanced Fluid Power Design 2:2:0 Fall
* Prerequisite(s): MECH 2600, University Advanced Standing
* Corequisite(s): MECH 4305
Expands on the basics taught in MECH 2600 covering motion control of a fluid power system using a PLC, proportional flow control valves, and analog sensors. Course lab fee of $15 for equipment applies.

MECH 4305
Advanced Fluid Power Design Laboratory 1:0:3 Fall
* Prerequisite(s): MECH 2600, University Advanced Standing
* Corequisite(s): MECH 4300
Expands on the basics taught in MECH 2600 by applying motion control of a fluid power system using a PLC, proportional flow control valves, and analog sensors. Lab access fee of $45 for computers applies.

MECH 4400
Polymers/Composites and Processes 3:3:0 Spring
* Prerequisite(s): MECH 3400, University Advanced Standing.
Covers the application, programming, and manufacturing processes associated with polymer based products. Also teaches types of composites and design of composite products. Course lab fee of $35 for materials applies. Lab access fee of $45 for computers applies.

MECH 4500
Advanced Automation Controls 3:3:0 Spring
* Prerequisite(s): MECH 4300, University Advanced Standing
* Corequisite(s): MECH 4505
Introduces methods of advanced control of high speed components, analog controls, temperature, pressure, and time delay processes using digital and analog methods of control. Covers algebra, trigonometry, and basic applied calculus in the context of complex control systems. Course lab fee of $45 for equipment applies. Lab access fee of $45 for computers applies.

MECH 4505
Advanced Automation Controls Laboratory 1:0:3 Spring
* Prerequisite(s): MECH 4300, University Advanced Standing
* Corequisite(s): MECH 4500
Integrates methods of advanced control of high speed components, analog controls, temperature, pressure, and time delay processes using digital and analog methods of control. Implements practical applications of the concepts discussed in the lecture portion of the class. Lab access fee of $45 for computers applies.

MECH 4800
Capstone Project 3:1:6 Spring
* Prerequisite(s): MECH 3570, University Advanced Standing
Integrates the concepts of the Mechatronics Engineering Technology curriculum into a semester-long design project. Requires students to conceive, define, design, document, and prototype a mechatronic project. Lab access fee of $45 for computers applies. Software fee of $29 applies.

MECH 481R
Mechatronics Internship 1 to 3:1 to 3:0 Fall, Spring
* Prerequisite(s): Matriculation into Mechatronics Engineering Technology, Instructor Approval, and University Advanced Standing
Provides opportunity to use work experience to add to educational background and academic experience. A maximum of 6 credit hours may be counted towards graduation. May be graded credit/no credit. May be delivered hybrid and/or online.

MECH 490R
Topics in Mechatronics 3:3:0 Spring
* Prerequisite(s): University Advanced Standing
Covers a chosen topic in the mechatronics discipline. May be taken more than once for different topics and for a maximum of 6 credit hours toward graduation. Lab access fee of $45 for computers applies.