MECH 1010
Introduction to Mechatronics
3:3:0 Fall, Spring
Exposes students to Mechatronics through integrated system design that combines electrical, mechanical, and microprocessor programming theory. Discusses the fundamentals of materials science, manufacturing processes, and the application of automation systems in a production environment. Presents the fundamentals of the structure of metals, classification of steel and aluminum, and introduces the basics of the mechanical properties of metals. Covers common manufacturing processes such as casting, forming, metal removal, and heat treating. Introduces the application of automation in manufacturing and production systems and illustrates overall system control and data management methods. Course fee of $20 for materials applies. Lab access fee of $35 applies.

MECH 1200
Electronics in Automation Design
3:3:0 Fall, Spring
* Corequisite(s): MECH 1205
* Prerequisite(s) or Corequisite(s): MAT 1010
Teaches 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. Course Lab fee of $40 for materials, lab applies. Lab access fee of $35 applies.

MECH 1205
Electronics in Automation Design Laboratory
2:0:6 Fall, Spring
* 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.

MECH 1250
Logic Fundamentals for Mechatronic Design
2:2:0 Fall, Spring
* Corequisite(s): MECH 1255
Emphasizes the concepts of logic design using integrated circuits, computer architecture, and discrete electro-mechanical devices. Lab access fee of $35 applies. Course Lab fee of $11 for materials, lab applies.

MECH 1255
Logic Fundamentals for Mechatronic Design Laboratory
1:0:3 Fall, Spring
* Corequisite(s): MECH 1250
Emphasizes the concepts of logic design using integrated circuits, computer architecture, and discrete electro-mechanical devices. Utilizes standard laboratory equipment to experience logic circuits by building, analyzing, and troubleshooting.

MECH 2200
Semiconductors in Mechatronic Systems
3:3:0 Fall, 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 Fall, 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.

MECH 2300
Microcontroller Architecture and Programming
3:3:0 Fall, 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. Lab access fee of $35 applies.

MECH 2305
Microcontroller Architecture and Programming Lab
1:0:3 Fall, 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.

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 $35 applies.

MECH 2500
Introduction to PLCs in Mechatronic Design
4:2:6 Fall
* Prerequisite(s): MECH 2300
Studies 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. Course Lab fee of $15 for materials, lab applies. Software fee of $29 applies. Lab access fee of $35 for computers applies.

MECH 2510
Automation System Sensors
3:2:3 Fall
* Prerequisite(s) or Corequisite(s): MECH 2500
Teaches mechatronics students 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. Utilizes signal conditioning methods to interface sensors to microprocessors and PLC’s. Course Lab fee of $20 for lab notebook, lab applies. Lab access fee of $35 applies.
MECH 2550
Advanced PLC Programming and Applications
4:2:6 Spring
* Prerequisite(s): MECH 2500
Teaches the principles of program structure, subroutines, interrupts, debugging, and simplifying. Illustrates the measurement and scaling of analog signals and the use of tables and pointers to manipulate data. Features networking principles, such as Ethernet, serial, and blue-tooth communication. Includes the use of high speed counters and PWM output. Course Lab fee of $15 for materials, lab applies. Software fee of $29 applies. Lab access fee of $35 for computers applies.

MECH 2600
Introduction to Pneumatics
3:2:3 Spring
* Prerequisite(s): MECH 2400
Develops the concepts used to design, build, and control a pneumatic system that is used in an industrial automation process. Employs laboratory exercises to illustrate the selection and use of pneumatic actuators, valves, and controls to sequentially control a process. Course Lab fee of $15 for materials, lab applies. Lab access fee of $35 applies.

MECH 3000
Wiring Diagrams in Automation Systems
3:3:0 Fall
* Prerequisite(s): (EGDT 1071, EGDT 1000, or Department Approval) and University Advanced Standing.
Teaches how to create industrial wiring diagrams and how to integrate them into a 3D design using SolidWorks Electrical. Requires students to follow IEEE drawing standards to design a complete electromechanical automation system. Includes the development of a complete electrical wiring diagram package that conforms to standard industrial practice. Lab access fee of $35 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.

MECH 3100
Advanced Technical Math Applied to Automation
2:2:0 Fall
* Prerequisite(s): University Advanced Standing and MECH 2550, or EART 2270, or Department Approval
Covers the fundamentals of algebra, trigonometry and geometry as used in mechatronics systems. Introduces differential and integral calculus in the context of system modelling and design. Emphasizes mathematical techniques applied to technically oriented applications in automation.

MECH 3220
Automation Motors and Controllers
2:2:0 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. Course Lab fee of $15 for materials, lab applies. Software fee of $29 applies. Lab access fee of $35 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.

MECH 3300
Industrial Networks
3:2:3 Spring
* Prerequisite(s): MECH 2550 or Department Approval
Introduces the principles of industrial robotics, programming, and the application of vision systems. Teaches power supply systems, degrees of freedom, sensors, end effectors, and maintenance methods. Course Lab fee of $11 for flat ribbon cable, lab applies. Lab access fee of $35 applies.

MECH 3400
Statics and Material Properties for Mechatronics
4:4:0 Spring
* Prerequisite(s): (MECH 3100 or Department Approval) and University Advanced Standing.
* 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. Lab access fee of $35 applies.

MECH 3405
Statics and Material Properties for Mechatronics Laboratory
1:0:3 Spring
* Prerequisite(s): (MECH 3100 or Department Approval) and 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. 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.

MECH 3500
Industrial Robots
3:2:3 Spring
* Prerequisite(s): MECH 3220, University Advanced Standing
Introduces the principles of industrial robotics, programming, and the application of vision systems. Teaches power supply systems, degrees of freedom, sensors, end effectors, and maintenance methods. Course Lab fee of $11 for flat ribbon cable, lab applies. Lab access fee of $35 applies.

MECH 3570
Design Analysis and Rapid Prototyping
3:3:0 Fall
* Prerequisite(s): MECH 3000, University Advanced Standing
Teaches the fundamentals of geometric dimensioning and tolerancing based on the ASME Y14.5 standard. Teaches 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 $35 applies.
MECH 3700
CNC Machines
3:2:3 Fall
* Prerequisite(s): MECH 3220, University Advanced Standing.
Teaches the design, application, programming, and maintenance of CNC machines used in automation systems. Emphasizes the integration of CNC machines into automation systems. Covers specifications and performance, interfacing to PLC's, interfacing to industrial robots, tooling, programming, and integrating the CNC machine into factory floor network systems. Course lab fee of $35 for materials applies. Software fee of $29 applies. Lab access fee of $35 applies.

MECH 4300
Advanced Pneumatic Design
3:2:3 Fall
* Prerequisite(s): MECH 2600, University Advanced Standing.
Expands on the basics taught in MECH 2600 and teaches motion control of a pneumatic system using a PLC, proportional flow control valves, and analog sensors. Covers analytical performance calculations as well as software simulation of the complete pneumatic system. Course lab fee of $15 for equipment applies. Lab access fee of $35 applies.

MECH 4400
Polymers/Composites and Processes
3:3:0 Spring
* Prerequisite(s): MECH 3400, University Advanced Standing.
Teaches students the selection of polymers, design of polymer products and manufacturing processes associated with polymer based products. Also teaches types of composites and design of composite products. Course lab fee of $18 for supplies applies. Lab access fee of $35 applies.

MECH 4500
Advanced Automation Controls
3:2:3 Spring
* Prerequisite(s): MECH 4300, University Advanced Standing.
Teaches methods of advanced control of high speed components, analog controls, temperature, pressure, and time delay processes. Teaches digital and analog methods of control. Course lab fee of $45 for equipment applies. Lab access fee of $35 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 $35 applies. Software fee of $29 applies.

MECH 490R
Topics in Mechatronics
3:3:0 Spring
* Prerequisite(s): MECH 3100 and MECH 3220 and University Advanced Standing.
Studies a chosen topic in the mechatronics discipline. Course may be taken more than once for different topics and for a maximum of 6 credit hours toward graduation.