MECH 1010
Introduction to Mechatronics
3:3:0 Spring
* Prerequisite(s): MECH 1200
Exposes students to 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.

MECH 1200
Electronics in Automation Design
5:3:6 Fall
* Prerequisite(s) or Corequisite(s): MATH 1010
Teaches basic AC and DC electronics theory including voltage, current, and resistance 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. Emphasizes the application of electronic theory and analysis in the design of automation systems. Course Lab fee of $40 for materials, lab applies.

MECH 1250
Logic Fundamentals for Mechatronic Design
3:2:3 Fall
* Prerequisite(s) or Corequisite(s): MECH 1200
Emphasizes the concepts of basic logic design using combinational and sequential logic including fundamental computer architecture. Teaches number systems, binary arithmetic, logic gates, switches, relays, ladder logic, boolean algebra, truth tables, logic simplification, combinational and sequential circuits, flip/flops counters, shift registers, and computer architecture. Utilizes standard laboratory equipment to experience logic circuits by building, analyzing, and troubleshooting. Course Lab fee of $11 for materials, lab applies.

MECH 2200
Semiconductors Used in Mechatronic Systems
4:3:3 * Prerequisite(s): MECH 1200
Teaches the theory of semiconductor PN junctions and the application of discrete semiconductors such as diodes, bipolar junction transistors, and MOSFET's applied to automation controllers, interfaces, amplifiers, and sensors. Also emphasizes the utilization of opto-isolators, triacs, and SCR's in controlling automation power devices. Course Lab fee of $25 for materials, lab applies.

MECH 2300
Microcontroller Architecture and Programming
4:3:3 Spring
* 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.

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. Software fee of $25 applies.

MECH 2500
Introduction to PLCs in Mechatronic Systems
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 $25 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. Software fee of $25 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 $25 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.

MECH 3000
Wiring Diagrams in Automation Systems
3:3:0 * Prerequisite(s): EGDT 1071 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.
MECH 3060
Mechatronics Management
3:3:0 Not Offered
* 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 3220
Automation Motors and Controllers
3:2:3
* Prerequisite(s): MECH 2400 and MECH 2550, University Advanced Standing.
Introduces the selection and application of AC and DC servo motors and how to control the speed and position of the motor application. Teaches variable frequency drives and servo amplifiers in an automation system design. Course Lab fee of $15 for materials, lab applies.

MECH 3300
Industrial Networks
3:2:3
* Prerequisite(s): MECH 3220, University Advanced Standing.
Teaches the students how to design, configure, integrate, and maintain an industrial floor network. Uses Allen Bradley software to integrate PLC's, sensors, HMI's, and remote computers, smart phones, and iPads into a manufacturing data management network. Course Lab fee of $25 for materials, lab applies.

MECH 3400
Statics and Strength of Materials
5:5:0
* Prerequisite(s): MECH 2400 and MATH 1050 or higher, University Advanced Standing.
Teaches the concept of forces as vectors, the equations of equilibrium, how to calculate internal forces on a structure, and the calculation of centroids and area moments of inertia. Using the principles of statics, teaches how to calculate tensile and shear stress in machine components and compare the resultant forces to standard theories of failure.

MECH 3500
Industrial Robots
3:2:3
* 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.

MECH 3570
Design Analysis and Rapid Prototyping
3:3:0
* 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.

MECH 3700
CNC Machines
3:2:3
* 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.

MECH 4100
Technical Math Applied to Automation
2:2:0
* Prerequisite(s): MATH 1050, MECH 2550
Covers the fundamentals of algebra, trigonometry and geometry as used in mechatronics systems. Introduces basic differential and integral calculus. Emphasizes mathematical techniques applied to technically oriented applications in automation.

MECH 4300
Advanced Pneumatic Design
3:2:3
* 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.

MECH 4400
Polymers/Composites and Processes
3:3:0
* 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.

MECH 4500
Advanced Automation Controls
3:2:3
* 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.

MECH 4800
Capstone Project
3:1:6
* 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.