MTE - MECHATRONICS ENGINEERING (MTE)

MTE 2403 Thermofluid Systems (3-1-3)
Covers properties of pure substances and ideal gases through the application of the ideal gas equation of state, property diagrams and the use of tables. Studies energy transfer and its conversion, and principles of fluid mechanics and thermodynamics. Introduces the continuity principle and energy conservation law in an incompressible steady flow processes, and energy balance for closed systems and open systems. Includes selected laboratory experiments covering main concepts of the subject.
Prerequisites: PHY 1103

MTE 2602 Mechatronics Measurements and Troubleshooting (1-3-2)
Covers basic measurement techniques of the common industrial variables (plant parameters), naming pressure, flow, temperature, linear displacement, etc.., and evaluate different sensors / transducers for proper control action. It also covers troubleshooting of mechatronic systems in industrial settings. Includes use of software packages and laboratory experiments.
Prerequisites: ELE 2153

MTE 2903 Sophomore Design Project (2-2-3)
Learns how to propose, design, plan and implement a capstone engineering project. Integrate and apply technological, organizational, communication, simulation, and interpersonal skills for safe implementation, documentation, and presentation skills. Evaluate a team on its ability to coordinate efforts to propose the project design criteria, major components, resources, systematic design, implementation schedule, and estimated cost. Hazards identification and control. Discuss environment protection and safety training.
Prerequisites: MCE 2203, MCE 2303, MCE 2311, ELE 2153

MTE 3503 Electronics Product Design (2-2-3)
This course covers the design, analysis, and fabrication of printed circuit boards. The design of a printed circuit board (PCB) is an integral part of all electronic products. The topics covered are modeling and simulation of electronic circuits, rapid prototyping, PCB design, PCB layout, and PCB fabrication process. At the end of this course, students should be able to design and fabricate their PCB projects using computer-aided circuit design with CAD tools.
Prerequisites: MTE 3603, EGN 2712

MTE 3603 Electronics Systems and Circuits (3-1-3)
Introduces the application of digital and linear semiconductor devices in addition to basic combinational and sequential circuits including minimisation techniques. In the linear circuits, students will study operational amplifiers characteristics and their applications.
Prerequisites: ELE 2153

MTE 3623 Microcontroller Systems (2-2-3)
Introduces concepts and practices of Microcontrollers and their application to the control of electromechanical devices and systems. The hardware and software architecture of a typical Microcontroller is described and used as a basis for the implementation of programs and interfacing. Top-down design is applied to implement solutions using onboard peripherals, and various modules for a selected range of applications. Practical laboratories and mini-projects are utilized to reinforce concepts.
Prerequisites: MTE 3603, EGN 2712

MTE 3633 Sensors and Actuators (2-2-3)
Covers sensors and transducers in addition to electromechanical, electro-pneumatics and hydraulics actuators. Sensors and transducers covered include: analog and digital motion sensors; optical sensors; temperature sensors; magnetic and electromagnetic sensors, torque, force and tactile sensors. Actuators covered include: stepper motors, DC and AC motors, hydraulic and pneumatic actuators, magnet and electromagnetic actuators. Introduces programmable logic controllers. Includes use of CAD tools and laboratory experiments.
Prerequisites: MTE 2602, EGN 2712

MTE 4503 Design of Mechatronic Systems (3-1-3)
Covers synergetic integration of electronics, mechanics, PLC and computer control, pneumatics, hydraulics, sensors and Actuators, basics of Dynamic Systems Modelling, Data Acquisition and Virtual Instrumentation, and PC-Based and Embedded Controllers, Computer Simulation. Applications illustrated by numerically and experimentally generated results. Includes Laboratory experiments and mini-projects on smart product design
Prerequisites: MTE 3623, MTE 3633, MCE 4603

MTE 4603 Robotics Technology (2-2-3)
Covers mechanical components, transducers, and actuators of industrial and mobile robots. Specifically, a hands-on approach is used to explore robotic embedded systems, associated modelling, programming, and control. The fundamental concepts describing robotics operation including coordinate transformations, kinematics and trajectory planning, motion analysis and control, sensor and actuator selection are introduced.
Prerequisites: MTE 3623, MTE 3633
Corequisites: MCE 4603

MTE 4613 Industrial Control Systems (2-2-3)
This course provides an overview of the fundamental systems and concepts of Programmable Logic Controllers (PLCs) with application to modern industry and manufacturing. Using simulation software, students will learn the role PLCs play within a mechatronic system or subsystem. They will also learn basic elements of PLC functions by writing programs and testing these programs on an actual system. Students will learn to identify malfunctioning PLCs, as well as to apply troubleshooting strategies to identify and localize problems caused by PLC hardware or software.
Prerequisites: MTE 4603 or MCE 4603

MTE 4623 Industrial Automation (2-2-3)
Introduces basic control systems such as hydraulics and pneumatics motion controllers, PLCs programmable controllers, sensors and vision systems, robotics to design a computer integrated manufacturing (CIM) cell. Hands-on, team based, activities covering the case studies on the design of manufacturing automation systems using both hard automation and robots used in a CIM cell high-end automation system.
Prerequisites: MTE 4603, MCE 2213

MTE 4633 Process Control (2-2-3)
Introduces Process Control technologies associated with a complex mechatronics system. Topics include Closed Loop Control; interaction between controllers, sensors and actuators; controller operating parameters and PID controllers; Key concepts in automatic control and instrumentation of process plants including control diagrams, symbols, concepts, and operation of industrial based control system and simulation programs. Optimization Techniques and Supervisory Control. Case studies including supervisory control and data acquisition systems, distributed control systems and PLCs.
Prerequisites: MCE 4603, MTE 2403

MTE 4643 Digital Control Systems (2-2-3)
Covers components of computer control systems, design and analysis of digital controllers. Introduces A/D and D/A, Signal sampling and reconstruction, signal conditioning, anti-alias filters, Discrete time systems, Z-transforms and their properties, digital control design, digital PID control. CAD tools such as MATLAB, and/or LabVIEW are introduced to analyse the response of a specified, closed-loop, computer-controlled control system. The course includes realisation of digital control systems practical implementation.
Prerequisites: MTE 3623, MCE 4603

MTE 4653 Real Time Embedded Systems (2-2-3)
Covers programming embedded systems and build basic projects using a microcontroller based kit. Topics will cover hardware level programming in high level language, interfacing on-board peripherals, digital and analog I/O, and bus communication. Real time operating system concepts pertaining to embedded systems are discussed. Hands-on experience completing small hardware projects using microcontroller based kit is emphasized.
Prerequisites: MTE 3623, MTE 3633, MTE 4603

MTE 4863 Special Topics in Mechatronics Engineering (3-1-3)
Presents a theoretical or practical topic proposed by the faculty beyond what is offered in existing courses. Can be repeated for credit.

MTE 4902 Capstone Design Project I (1-3-2)
Capstone final year design project requires the formation of a team to propose, plan and design an engineering product. The student team is totally responsible for the completion of the project milestones and course objectives while working under the mentorship of a faculty or industry engineer. The team is evaluated on its ability to coordinate efforts to propose the project design criteria, components, resources, implementation schedule, and estimated cost.
Prerequisites: MTE 3623, EGN 3803

MTE 4912 Capstone Design Project II (1-3-2)
Covers implementation, evaluation, and analysis of the capstone engineering project. Integrate and apply technological, organizational, communication, and interpersonal skills for safe implementation, documentation, and presentation skills. Includes health, safety and environment report documentation discussing environment protection, accident prevention, effective committee operations, accident investigation and safe working practice for artifact fabrication to form the basis for assessment.
Prerequisites: MTE 4902