ET 5100 Fundamentals of Mechatronics and Industrial Applications Cr. 3
Fundamentals of mechatronics and their applications in industry;
building blocks of mechatronic products including sensors, proximity,
displacement and rotational measurement sensors, force and torque
measurement sensors, pressure sensors, accelerometers, and actuators;
introduction of closed-loop control, electrohydraulic motion control, PLC
mechatronics design by embedding sensors, actuators and controllers
into mechanical components. Offered Winter.
Prerequisites: EET 3180 with a minimum grade of C- or MCT 3010 with a
minimum grade of C-.

ET 5110 Advanced Programmable Controllers and Industrial Applications
Cr. 3
Introduces basic concepts and architecture of industrial control systems,
sensors, measurement devices, PID controllers, and operating principles
of PLCs. Students will learn how to operate the PLC programming
software. Ladder logic programs are the main language, and functions
and function blocks will also be taught for students to grasp high-level
PLC-programming skills. Offered Fall, Winter.
Prerequisite: EET 3720 with a minimum grade of C-

ET 5500 Graduate Industrial Internship Cr. 1-4
Industrial practice under supervision in cooperative education. Oral
presentation and written report describing professional experience
required. Offered for graduate credit only. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 4 Credits

ET 5600 Python: Industrial Applications Cr. 3
Provides a combination of lectures and hands-on projects on how
computer programming is applied in various industrial applications
including robotics, automation and visualization applications. After an
introduction to the basics of Python programming, students will then be
provided with the opportunity to perform industrial projects using Python.
Offered Yearly.
Restriction(s): Enrollment is limited to Graduate or Undergraduate level
students; enrollment limited to students with a class of Senior.

ET 5800 Industrial Robots Programming Cr. 3
Provides an understanding of basic robotic theory (direct kinematics,
inverse kinematics, links, joints, coordinates systems, and robotic
vision theory) and applications. Students will program and maintain
an R-J or higher robot controller with a standard application software
package; identify the components of a vision system; install vision
hardware; develop an application; perform error recovery procedures;
and follow recommended safety practices. Labs, assignments and
projects will be done using industrial robots: FANUC S 430 iW, FANUC
LR Mate 200 iC, FANUC LR Mate 200 iD, and FANUC CR 4iA collaborative
robot. Simulation and off-line programming will be done using Visual
Components and ROBOGUIDE simulation software packages. Students
will have the opportunity to receive an industrial certificate if they
successfully complete the required test. Offered Fall.

ET 5870 Engineering Project Management Cr. 3
Provides a combination of lectures and hands-on projects on how
computer programming is applied in various industrial applications
including robotics, automation and visualization applications. After an
introduction to the basics of Python programming, students will then be
provided with the opportunity to perform industrial projects using Python.
Offered Yearly.
Restriction(s): Enrollment is limited to Graduate or Undergraduate level
students; enrollment limited to students with a class of Senior.

ET 5995 Special Topics in Engineering Technology I Cr. 1-4
Topics to be announced in Schedule of Classes. Offered Intermittently.
Repeatable for 8 Credits

ET 7300 Advanced Battery Systems for Electric-drive Vehicles Cr. 4
Aims to familiarize students with advanced battery technologies and
their applications in hybrid and electric vehicles. Contents include: a
descriptive overview of energy sources and conversions, HEV/PHEV/
EV technology, hybrid powertrain configuration and components, in-
vehicle energy storage systems, electrochemistry fundamentals, battery
power and capacity/energy, battery system design (cell, module and
pack), Battery Management System (BMS), cell monitoring and balancing,
thermal management, on-board diagnostics, battery charging schemes
and systems. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: EVE 7300
ET 7430 Methods of Engineering Analysis Cr. 4
This course aims to provide the theory and computer applications of differential equations, partial derivatives, Laplace transforms, Fourier series, matrices, and vectors. It also encourages students to use software programming environments to solve numerical problems. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.

ET 7800 Industrial Robots Dynamics and Control Cr. 3
Covers the direct and inverse dynamic problem for industrial robots; Newton-Euler and Lagrange-Euler equations of robot arm motion; a new automatic separation method (ASM) for automatic generation of dynamic equations; robot trajectory generation; control of Robot Manipulators (PID control, design of control systems in State-Space and computed torque technique); sensing (range sensing, proximity sensing, touch sensing, force and torque sensing) using available Robots and Collaborative robots; current trends and research in Industrial Robotics and Cobotics. Offered Winter.
Prerequisite: MIT 5700 with a minimum grade of C or ET 5800 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

ET 7990 Directed Study Cr. 1-8
Supervised study and instruction in an advanced topic. Outline of proposed study and petition must be submitted to graduate committee in advance of registration for approval. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 8 Credits

ET 7995 Special Topics in Engineering Technology II Cr. 1-4
Topics to be announced in Schedule of Classes. Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 8 Credits

ET 7999 Master's Project Cr. 1-6
Design, fabrication, system optimization, and applications of graduate level material. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students;
repeatable for 6 Credits

MCT 6150 Hybrid Vehicle Technology Cr. 4
Covers the direct and inverse dynamic problem for industrial robots; Newton-Euler and Lagrange-Euler equations of robot arm motion; a new automatic separation method (ASM) for automatic generation of dynamic equations; robot trajectory generation; control of Robot Manipulators (PID control, design of control systems in State-Space and computed torque technique); sensing (range sensing, proximity sensing, touch sensing, force and torque sensing) using available Robots and Collaborative robots; current trends and research in Industrial Robotics and Cobotics. Offered Winter.
Prerequisite: MIT 5700 with a minimum grade of C or ET 5800 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

MCT 5210 Energy Sources and Conversion Cr. 3
Various energy sources and how they are utilized. Wind, solar, geothermal, fuel cells, storage devices, energy economics and transportation techniques, related to harnessing energy to a usable form such as electricity and heat. Offered Fall.
Prerequisites: ET 3430 with a minimum grade of C- and ET 3450 with a minimum grade of C

MCT 5150 Hybrid Vehicle Technology Cr. 4
Covers the direct and inverse dynamic problem for industrial robots; Newton-Euler and Lagrange-Euler equations of robot arm motion; a new automatic separation method (ASM) for automatic generation of dynamic equations; robot trajectory generation; control of Robot Manipulators (PID control, design of control systems in State-Space and computed torque technique); sensing (range sensing, proximity sensing, touch sensing, force and torque sensing) using available Robots and Collaborative robots; current trends and research in Industrial Robotics and Cobotics. Offered Winter.
Prerequisite: MIT 5700 with a minimum grade of C or ET 5800 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

ET 7430 Methods of Engineering Analysis Cr. 4
This course aims to provide the theory and computer applications of differential equations, partial derivatives, Laplace transforms, Fourier series, matrices, and vectors. It also encourages students to use software programming environments to solve numerical problems. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.

ET 7800 Industrial Robots Dynamics and Control Cr. 3
Covers the direct and inverse dynamic problem for industrial robots; Newton-Euler and Lagrange-Euler equations of robot arm motion; a new automatic separation method (ASM) for automatic generation of dynamic equations; robot trajectory generation; control of Robot Manipulators (PID control, design of control systems in State-Space and computed torque technique); sensing (range sensing, proximity sensing, touch sensing, force and torque sensing) using available Robots and Collaborative robots; current trends and research in Industrial Robotics and Cobotics. Offered Winter.
Prerequisite: MIT 5700 with a minimum grade of C or ET 5800 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

ET 7990 Directed Study Cr. 1-8
Supervised study and instruction in an advanced topic. Outline of proposed study and petition must be submitted to graduate committee in advance of registration for approval. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 8 Credits

ET 7995 Special Topics in Engineering Technology II Cr. 1-4
Topics to be announced in Schedule of Classes. Offered Intermittently.
Restriction(s): Enrollment is limited to Graduate level students.
Repeatable for 8 Credits

ET 7999 Master's Project Cr. 1-6
Design, fabrication, system optimization, and applications of graduate level material. Offered Every Term.
Restriction(s): Enrollment is limited to Graduate level students;
repeatable for 6 Credits

MCT 6150 Hybrid Vehicle Technology Cr. 4
Covers the direct and inverse dynamic problem for industrial robots; Newton-Euler and Lagrange-Euler equations of robot arm motion; a new automatic separation method (ASM) for automatic generation of dynamic equations; robot trajectory generation; control of Robot Manipulators (PID control, design of control systems in State-Space and computed torque technique); sensing (range sensing, proximity sensing, touch sensing, force and torque sensing) using available Robots and Collaborative robots; current trends and research in Industrial Robotics and Cobotics. Offered Winter.
Prerequisite: MIT 5700 with a minimum grade of C or ET 5800 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

Mechanical Engineering Technology

MCT 5210 Energy Sources and Conversion Cr. 3
Various energy sources and how they are utilized. Wind, solar, geothermal, fuel cells, storage devices, energy economics and transportation techniques, related to harnessing energy to a usable form such as electricity and heat. Offered Fall.
Prerequisites: ET 3430 with a minimum grade of C- and ET 3450 with a minimum grade of C

MCT 6150 Hybrid Vehicle Technology Cr. 4
Covers the direct and inverse dynamic problem for industrial robots; Newton-Euler and Lagrange-Euler equations of robot arm motion; a new automatic separation method (ASM) for automatic generation of dynamic equations; robot trajectory generation; control of Robot Manipulators (PID control, design of control systems in State-Space and computed torque technique); sensing (range sensing, proximity sensing, touch sensing, force and torque sensing) using available Robots and Collaborative robots; current trends and research in Industrial Robotics and Cobotics. Offered Winter.
Prerequisite: MIT 5700 with a minimum grade of C or ET 5800 with a minimum grade of C

Restriction(s): Enrollment is limited to Graduate level students.

Manufacturing/Industrial Engineering Technology

MIT 5500 Machine Tool Laboratory Cr. 1
Laboratory experiences in manufacturing processes, machine tools, and mechanization. Calibration and part-setup. Offered Fall, Winter.
Prerequisites: ET 2140 with a minimum grade of C-

MIT 5700 Industrial Robots Modeling and Simulation Cr. 4
Topics include: the direct kinematic problem (homogeneous transformation matrices, composite homogeneous transformation matrix, links, joints and their parameters, the Denavit-Hartenberg representation, kinematic equations for manipulators); the inverse kinematic problem (geometric approach applied for 2DOF, 3DOF, 4DOF, 5DOF, and 6DOF manipulators; modeling, simulation and off-line programming of industrial robots and cobots (collaborative robots); and current trends and research in industrial robotics and cobotics. Offered Winter.
Restriction(s): Enrollment is limited to Graduate or Undergraduate level students; enrollment limited to students with a class of Unranked Grad or Senior.

MIT 7700 Robotics and Flexible Manufacturing Cr. 4
Kinematics, dynamics and controls of the manipulators, their design and applications in flexible manufacturing cells. Computer-integrated manufacturing. Offered Intermittently.
Prerequisite: ET 7430 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students.

Electrical/Electronic Engineering Technology

EET 5720 Computer Networking Applications Cr. 4
Networking protocols, components, architecture, and standards. Data communication, data packet structure, data transmission methods and techniques, network topologies, and media access control methods. Offered Yearly.
Prerequisites: EET 3100 with a minimum grade of C- and EET 3720 with a minimum grade of C
Course Material Fees: $25

EET 5730 Embedded Systems Networking Cr. 3
Principles of data communications and real-time wired and wireless embedded systems networking. State of the art embedded networks including Controller Area Networks (CAN), internet connectivity and other embedded standards will be utilized in this project based class. Offered Fall.
Prerequisites: EET 3100 with a minimum grade of C- and EET 3720 with a minimum grade of C-

EET 7720 Advanced Computer Networking Cr. 4
Latest advances in networking; internetworking with bridges, routers, and switches. LAN and WAN protocols, high speed networks. Offered Yearly.
Prerequisite: EET 5720 with a minimum grade of C
Corequisite: EET 7430
Restriction(s): Enrollment is limited to Graduate level students.