

# ENGINEERING TECHNOLOGY

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Chairperson: Ece Yaprak  
<http://engineering.wayne.edu/et/>

The Division of Engineering Technology, founded in 1973, stresses the application of current technology to typical industrial problems. The curricula maintain a close relationship between theoretical principles taught in the classroom and their applications.

Engineering technology is a profession closely related to engineering. It deals with the application of knowledge and skills to industrial processes, production and management. Technologists are organizers of people, materials, and equipment for the effective planning, construction and maintenance of technical facilities and operations. Their responsibilities require technical and practical knowledge. Graduates of Wayne State's engineering technology programs are employed in such areas as manufacturing engineering, engineering production, marketing, maintenance, quality control, product testing, field engineering, consulting engineering, design, and technical supervision.

AYOOBI, MOHSEN: Ph.D., Louisiana State; M.Sc. and B.Sc., Isfahan University; Assistant Professor

CHEN, JIMMY CHING-MING: Ph.D., Texas A&M University; M.S., B.S., National Taiwan University; Assistant Professor

CHEN, WEN: Ph.D., Simon Fraser University; M.S., Nanyang Technological University; Diploma, Northeastern University; Associate Professor

DJURIC, ANA: Ph.D., M.S., University of Windsor; M.E., B.S., Belgrade University; Assistant Professor

LIAO, GENE Y.: D.Eng., University of Michigan; Mechanical Engineer, Columbia University; M.S., University of Texas at Arlington; B.S., National Central University; Professor

SSEMAKULA, MUKASA E.: Ph.D., M.S., B.S., University of Manchester Institute of Science and Technology; Professor

YAPRAK, ECE: Ph.D., M.S., Wayne State University; B.S., University of Michigan, Dearborn; Professor and Chair

YEH, CHIH-PING: Ph.D., M.S., Texas A & M University; B.S.E.E., Tamking University; Associate Professor

- Engineering Technology (M.S.) (<http://bulletins.wayne.edu/graduate/college-engineering/engineering-technology/engineering-technology-ms>)

## Engineering Technology

### 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 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 the student with insights into human and organizational behavior affecting projects, in addition to the quantitative tools for the successful management of engineering projects. The course addresses a variety of project types and deals with how to select, initiate, operate and control as well as terminate a project. The role of project managers and their interaction with the rest of the organization is highlighted. Offered Fall, Winter.

**Prerequisites:** MAT 1800 with a minimum grade of C-

### 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; enrollment limited to students with a class of Candidate Masters.

**Repeatable for 6 Credits**

## **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.

### **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.

## **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.

## **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 PHY 2140 with a minimum grade of C-

### **MCT 6150 Hybrid Vehicle Technology Cr. 4**

Technical concepts and design, energy analysis, unified modeling approach, optimization, control; power generation, engine overview, concepts of hybridization, on-board energy storage; overview of motors, transmissions, fuel cells, future applications. Offered Yearly.

**Prerequisites:** ET 3450 with a minimum grade of C- and PHY 2140 with a minimum grade of C-