

ENGINEERING AND SCIENCE TECHNOLOGY

The Department of Engineering and Science Technology offers programs in automated manufacturing and advanced manufacturing engineering technology, corrosion engineering technology, surveying and mapping, electrical and electronic engineering technology, mechanical engineering technology, and construction engineering technology.

Faculty in the Department pride themselves in applying leading-edge technology to classroom instruction while using the latest technology to complement hands-on instruction. Program courses are offered during the day and evenings in formats that include online, hybrid, and flipped.

In each area, students learn theoretical instruction and scientific theories that are applied in industry, plus plenty of hands-on training using equipment and technology. Students also have various learning opportunities outside of the classroom, including co-ops, service-learning and professional student organizations. Strategic partnerships within the region help ensure student success and job placement.

Why Choose Akron?

We offer market-driven, applied degrees (associate and bachelor) and certificates. Our faculty's expertise (discipline education and real-world work experience) is a key component to the program's success and enables the hands-on, experiential learning brought to our students. The Department also provides instruction in the General Technologies of Chemistry and Physics.

Accreditation: Our programs are accredited, ensuring program quality and continuous improvement.

Making you career ready: Our students have various learning opportunities outside of the classroom including co-ops, service-learning and professional student organizations. Program courses are offered during the day and evenings in formats that include online, hybrid and flipped (lectures are viewed at home, leaving class time for projects and discussions). Further, we have partnerships with industry within the region help ensure student success and job placement.

Vision: Our department vision is to become a regional leader in technology education recognized for our focus on student success and inclusive excellence. Through educational experiences that expose our students to the latest technology, we will empower them to become innovators and entrepreneurs.

Mission: The Department of Engineering and Science Technology will create a better common future for our students and for society through career-focused educational activities that address the needs of this region's industrial, technical, and business communities by leveraging the region's strengths; foster economic, social, and cultural vitality; and pursue innovative solutions to major challenges.

2850: Corrosion Engineering Technology

A degree in Corrosion Engineering Technology prepares students to evaluate corrosion of materials in the field and apply strategies for mitigating corrosion. Students learn engineering principles of corrosion and materials performance, and develop skills in math, science, communication, and economics. The program strives to balance classroom instruction with real-world, hands-on, experiential learning in the focus areas of material selection and design, cathodic protection,

coatings, water treatment/inhibitors, failure analysis, and project/risk management. The Department of Defense has provided funds that will directly support the degree.

2860: Electrical and Electronic Engineering Technology

The Bachelors of Science Degree is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>. The Associate of Applied Science Degree curriculum is the same as years one and two of the Bachelors Degree.

This program prepares individuals to develop, design, manufacture, test, and service electrical and electronic equipment and systems. It also prepares students to apply specific principles for analyzing, designing, developing, implementing, and overseeing advanced electrical, electronic, and computer systems and processes.

2870/2880: Automated and Advanced Manufacturing Engineering Technology

Through the study of basic technical subjects and through concentration on work measurement, manufacturing computer applications, quality control, robotics, manufacturing work cells, and MRPII, this program educates the student in the areas of analysis, and the design and management of the resources, facilities and people involved in modern manufacturing.

2920: Mechanical Engineering Technology

The Bachelors of Science Degree is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>. The Associate of Applied Science Degree curriculum is the same as years one and two of the Bachelors Degree.

This program prepares individuals to work as technicians in developing, designing, manufacturing, testing, and servicing mechanical equipment and systems. It also prepares individuals to work as technologists in applying specific principles for analyzing, designing, developing, implementing, and overseeing advanced mechanical systems or processes.

2980: Surveying and Mapping

The Bachelors of Science Degree and Associate of Applied Science Degree are accredited by the Applied and Natural Science Accreditation Commission of ABET, <https://www.abet.org>. The Associate of Applied Science Degree curriculum is the same as years one and two of the Bachelors Degree.

The professional surveyor solves modern land boundary, location, and mapping problems by applying knowledge and skills in mathematics, law, local land history, map design, and business, using advanced technology. The program provides the surveying skills necessary to become a Certified Surveying Technician (CST) under the National Society of Professional Surveyors (NSPS) testing program. As surveying and mapping functions become more complex and technology-based, including the use of drones, the demand for highly-trained technicians and professional surveyors continues to grow.

2990: Construction Engineering Technology

The Bachelors of Science Degree is accredited by the Engineering Technology Accreditation Commission of ABET, <https://www.abet.org>. The Associate of Applied Science Degree curriculum is the same as years one and two of the Bachelors Degree.

Students in this program are prepared to work in the field of construction engineering technology using knowledge of construction methods, business operations, and management skills to support construction projects. They work on residential and commercial buildings, bridges, roads, dams, wastewater treatment systems, or other similar projects. Common jobs assumed by graduates of this program include but are not limited to engineering technician, construction coordinator, cost estimator, scheduler, field engineer, and assistant project engineer. The program also offers a degree in Construction Field Operations, which prepares students for construction industry careers, such as field superintendents, foremen, project management assistants, inspectors, and other allied industrial positions.

- Advanced Manufacturing Engineering Technology, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/advanced-manufacturing-engineering-technology-aas/>)
- Automated Manufacturing Engineering Technology, BS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/automated-manufacturing-engineering-technology-bs/>)
- Construction Engineering Technology, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-engineering-technology-aas/>)
- Construction Engineering Technology, BS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-engineering-technology-bs/>)
- Construction Estimation, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-estimation-certificate/>)
- Construction Field Operations, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-field-operations-aas/>)
- Construction Management, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-management-certificate/>)
- Construction Materials Testing, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-materials-testing-certificate/>)
- Corrosion Engineering Technology, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/corrosion-engineering-technology-aas/>)
- Corrosion Technology, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/corrosion-technology-certificate/>)
- Drafting and Computer Drafting, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/drafting-computer-certificate/>)
- Electrical and Electronic Engineering Technology, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/electronic-engineering-technology-aas/>)
- Electrical and Electronic Engineering Technology, BS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/electronic-engineering-technology-bs/>)
- Geographic and Land Information Systems, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/geographics-land-information-certificate/>)
- Heavy Construction, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/heavy-construction-certificate/>)
- Land Surveying, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/land-surveying-aas/>)
- Mechanical Engineering Technology, AAS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/mechanical-engineering-technology-aas/>)
- Mechanical Engineering Technology, BS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/mechanical-engineering-technology-bs/>)
- Residential Building Technology, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/construction-residential-building-certificate/>)
- Residential Inspection, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/residential-inspection-certificate/>)
- Surveying and Mapping, BS (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/surveying-mapping-bs/>)
- Surveying for Civil Engineers, Certificate (<https://bulletin.uakron.edu/undergraduate/colleges-programs/engineering-polymer-science/engineering-science-technology/surveying-civil-engineers-certificate/>)

General Technology (2820)

2820:100 Introduction to Engineering Technology (2 Credits)

This introductory course stresses skills needed for academic success. Discussion of fields in engineering technology, job searches, calculators, and data measurement and analysis are included.

2820:105 Basic Chemistry (3 Credits)

Prerequisite: 2010:052 with a grade of C or better or math placement test. Elementary treatment of facts and principles of chemistry emphasizing biological application. Elements and compounds important in everyday life, biological processes and medicine. Introduction to laboratory techniques. Primarily for medical assistant, criminal justice and allied health students. Laboratory.

Gen Ed: Tier 2 - Natural Science w/LAB

2820:110 Physical Science for Technicians (3 Credits)

Elementary presentation of theory and facts of general chemistry and physics (excluding electricity). Includes atomic structure, chemical reactions, energy, electromagnetic radiation, sound and mechanics.

2820:111 Introductory Chemistry (3 Credits)

Corequisite: 2030:152. Facts and theories of general chemistry. Elements and compounds and their uses. Elementary treatment of atomic structure, gaseous state, periodic table, water, solutions. Laboratory.

Gen Ed: Tier 2 - Natural Science w/LAB

2820:112 Introductory & Analytical Chemistry (3 Credits)

Prerequisite: 2820:111 or permission. Chemical equilibria, ionization, radioactivity. Properties of selected metals and nonmetals. Introduction to organic chemistry. Basic concepts of qualitative analysis. Identifications of cations and anions. Laboratory.

Gen Ed: Tier 2 - Natural Science w/LAB

2820:131 Software Applications for Technology (1 Credit)

Prerequisite: 2030:153. Word processing and spreadsheets used within technical applications. This course focuses on using software for technical reports and data analysis. Laboratory.

2820:290 Special Topics: General Technology (1-4 Credits)

Prerequisite: Permission. Selected topics of subject areas of interest in General Technology. (May be repeated for a total of eight credits.)

2820:310 Programming for Technologists (2 Credits)

Prerequisites: 2820:131 and 2030:255. A study of a technical programming language with applications in engineering technology. Limited to students in Engineering & Science Technology Department programs.

Corrosion Engineering Technology (2850)**2850:100 Introduction to Corrosion Technology (2 Credits)**

Prerequisite: 2030:151 or higher math. Analysis of material selection and environmental conditions on corrosion; review of corrosion types, environments and characteristics of structural materials; economic impact, control methods are explored.

2850:120 Corrosion Engineering Technology Fundamentals I (3 Credits)

Corequisite: 2820:111. Introduction to corrosion engineering topics including economic impacts of corrosion, types of corrosion, their recognition and prevention, parameters affecting corrosion, and methods of corrosion control.

2850:121 Corrosion Engineering Technology Fundamentals II (4 Credits)

Prerequisite: 2850:120. Basic understanding of steps and methods required for combating corrosion including proper design, material selection, protective coating application, inhibitors use, and cathodic and anodic protection.

2850:200 Advanced Corrosion Technology (3 Credits)

Prerequisite: 2850:100. Study of corrosion control methods through design, materials selection, protective coatings, cathodic and anodic protection; corrosion testing and monitoring; diagnosis of corrosion failures; selection of treatment options; corrosion data analysis.

2850:220 Strategies for Corrosion Prevention (4 Credits)

Prerequisite: 2850:121. Corequisite: 3650:163. This course focuses on the control of corrosion by applying coatings and cathodic protection.

2850:221 Corrosion Engineering Technology Projects (4 Credits)

Prerequisite: 2850:220. Course focuses on corrosion/failure analysis and corrosion mitigation, and discussion of regulatory compliance and resource acquisition and allocation.

Electrical and Electronic Engineering Technology (2860)**2860:120 Circuit Fundamentals (4 Credits)**

Prerequisite: 2030:152 or permission. SI units, current, voltage, resistance, Ohm's Law, circuit analysis, network theorems, computer simulation, inductor, capacitor, RLC dc analysis, transients, laboratory support of circuit concepts, ac introduction.

2860:121 Introduction to Electronics and Computers (2 Credits)

Prerequisite: 2030:151. Introduces students to computer simulation, Boolean algebra, circuit manufacturing, laboratory practices, and to the electronics industry.

2860:122 AC Circuits (3 Credits)

Prerequisite: 2860:120. Corequisite: 2030:154. Sinusoidal voltage and current, reactance and impedance, methods of AC circuit analysis, AC power, transformers, AC meters and oscilloscopes, dependent and independent sources.

2860:123 Electronic Devices (4 Credits)

Prerequisite: 2860:120. Physical theory, characteristics and operational parameters of solid-state devices. Analysis and design of electronic circuits incorporating these devices, utilizing characteristic curves and linear modeling.

2860:210 Industrial Control Panel Fabrication (2 Credits)

Prerequisite: 2030:152. This course will introduce students to shop fabricating skills involved in the creation of electrical control panels using mechanical and electrical fabricating tools.

2860:225 Applications of Electronic Devices (4 Credits)

Prerequisites: 2860:122 and 2860:123. Frequency response, filter concepts, electronic amplifiers, power amplifiers, multistage amplifiers, differential amplifiers, operational amplifiers, voltage regulators, feedback and oscillators, special devices, computer simulation analysis.

2860:237 Digital Circuits (4 Credits)

Prerequisite: 2860:121. Devices used in logic circuits, interfacing, combinational logic, arithmetic circuits, encoders, multiplexers, programmable logic devices, flip-flops, counters, shift registers, computer modeling of digital circuits.

2860:238 Microprocessor Applications (4 Credits)

Prerequisite: 2860:237. Programmable logic devices, computer modeling of digital circuits, memory circuits. Computer architecture, programming the microprocessor, microprocessor hardware, microprocessor applications, parallel I/O and programmable timers.

2860:242 Machinery & Controls (3 Credits)

Prerequisites: [2860:120 and 2860:121] or 2860:370. Study of DC and AC motors and generators and their control. Fundamentals of power transformers. Three-phase distribution and motor control. Principles of industrial electronic devices.

2860:251 Electronic Communications (4 Credits)

Prerequisite: 2860:225. Resonance, coupling, filters, oscillators, mixers, power amplifiers, AM, FM, receivers.

2860:260 Electronic Project (2 Credits)

Prerequisites: Final semester or permission and 2940:210. Design, construction, and testing of an electronic circuit of choice. Progress reports, oral, and a formal written report required. Discussion of electronic design, fabrication, and troubleshooting techniques.

2860:290 Special Topics: Electronic Engineering Technology (1-4 Credits)

Prerequisite: Permission of instructor. Directed study in a special field of interest chosen by the student in consultation with the instructor (may be repeated for a total of six credits).

2860:310 National Electrical Code and Electrical System Design (3 Credits)

Prerequisite: 2860:122 or 2860:370. This course provides students with the skills necessary to apply the National Electrical Code (NFPA 70) to the design and installation of electrical systems and circuits.

2860:350 Advanced Circuit Theory (3 Credits)

Prerequisite: 2860:251. Corequisite: 2030:356. Nodal, mesh, Thevenin, and dependent sources in resistive circuits. Inductor and capacitor as time domain elements. First- and second-order circuit analysis. Phasor analysis. Operational amplifier analysis.

2860:352 Microcontrollers (4 Credits)

Prerequisite: 2860:238. Corequisite: 2860:350. Using a typical microcontroller, study its architecture, program it, use subroutines and interrupts, use it in various applications, utilize various on-board modules including analog-to-digital, and timers.

2860:354 Advanced Circuits Applications (3 Credits)

Prerequisites: 2030:356 and 2860:350. Introduction to calculus based circuit analysis. Emphasizing Laplace transforms in operational circuit analysis, transfer functions, impulse function, Bode diagrams, Fourier Series.

2860:360 Virtual Instrumentation and Data Acquisition (3 Credits)

Prerequisites: 2860:122 and 2860:370. An introduction to instrumentation, data acquisition (DAQ) and graphical programming used in manufacturing and laboratory environments.

2860:370 Survey of Electronics I (3 Credits)

Prerequisite: 3650:163. Fundamentals of DC and AC electrical circuits and rotating machinery. For non-Electronic Engineering Technology majors.

2860:371 Survey of Electronics II (3 Credits)

Prerequisite: 2860:370. Survey of the most commonly used solid state circuit components including typical applications. Introduction into digital circuits and microprocessor applications. For non-Electronic Technology majors.

2860:400 Computer Simulations in Technology (3 Credits)

Prerequisites: 2030:345 and 2860:354. Introduce the use of software widely used in industry to simulate and study electrical circuits and signals. Methods of data sampling, management and presentation will be studied.

2860:406 Communication Systems (3 Credits)

Prerequisites: 2860:251 and 2860:354. Digital communications, transmission lines, waveguides, microwave devices and antennas.

2860:420 Biomedical Electronic Instrumentation (3 Credits)

Prerequisite: 2860:354. Introduction to electrical signals from the body, transducers, recording devices, telemetry, microprocessor applications, and electrical safety of medical equipment.

2860:451 Industrial Electrical Systems (3 Credits)

Prerequisite: 2860:354. Electric power, industrial nameplates, power factor correction, mutual inductance, linear transformers, power transformers, polyphase systems, per-phase analysis, system grounding, protective device coordination computer-aided analysis.

2860:453 Control Systems (4 Credits)

Prerequisites: 2860:354 and 2870:301. Modeling and responses of closed-loop systems. Laplace transforms, root-locus analysis. Stability, compensation, digital control, optimal control. Digital computer in system simulation and design.

2860:455 Senior Project (2 Credits)

Capstone experience consisting of Electrical or Electronic Project emphasizing creative technical analysis or design and presentation.

2860:490 Special Topics: Electronic Engineering Technology (1-4 Credits)

Prerequisite: Permission of instructor. Directed study in a special field of interest chosen by the student in consultation with the instructor (may be repeated for a total of six credits).

2860:497 Senior Honors Project: Electronic Technology (1-3 Credits)

Prerequisites: Senior standing in Honors Program, permission of department preceptor, and major in electronic technology. Independent research leading to completion of Senior Honors Thesis or other original work. (May be repeated for a total of six credits)

Automated Manufacturing Engineering Technology (2870)

2870:301 Computer Control of Automated Systems (3 Credits)

The development of computer based systems and computer programs using robotics and machine controllers as the solutions for automated manufacturing problems.

2870:311 Facilities Planning (3 Credits)

Prerequisite: 2940:180 or 2940:210 or permission. An application based study of facilities analysis, design and layout utilizing software based solutions.

2870:332 Management of Technology Based Operations (3 Credits)

A study of the techniques and knowledge necessary to effectively manage technical personnel.

2870:348 CNC Programming I (3 Credits)

Prerequisites: [2030:154 and 2920:121] or 2880:248, or permission. Introduction to CAM (Computer Aided Manufacturing) based CNC (Computer Numerical Control) programming; development of milling, drilling, and turning programs.

2870:441 Advanced Quality Practices (3 Credits)

Prerequisite: 2880:241 or permission. Specific quality assurance procedures will be developed conceptually, proven mathematically, and then tested in lab exercises. Industry accepted SQC software will be used.

2870:448 CNC Programming II (3 Credits)

Prerequisite: 2870:348. The study of advanced CNC programming techniques utilizing an industry standard CAM programming software package and CNC program verification software.

2870:470 Simulation of Manufacturing Systems (3 Credits)

Prerequisite: 2880:211. Computer simulation solutions applied to the traditional manufacturing problems of equipment justification, production line balancing, and capacity planning.

2870:480 Automated Production (3 Credits)

Prerequisites: 2870:301, 2870:448, and 2880:201. A study of the automated production system. The various systems studied thus far, CNC, robotics, automated machines via PLCs, and facilities design, are integrated and analyzed from a production standpoint.

2870:485 SME Manufacturing Technologist Certification Preparation (2 Credits)

Prerequisites: 2870:441 and 2920:347. Pre/Corequisite: 2870:480.

Provides a review for the SME Manufacturing Technologist Certification Exam. Topics include a review of materials and manufacturing processes, automated systems and control, quality and process control methods, manufacturing management, and other topics appearing on the exam.

2870:490 Manufacturing Project (2 Credits)

Prerequisite: Senior status. Advanced CAD/CAM topics are presented. A comprehensive project is undertaken.

2870:495 Individual Investigation in Manufacturing Engineering Technology (2 Credits)

Selected topic(s) that provide for specific individual study in the area of manufacturing engineering technology under the direct supervision of a faculty member.

2870:496 Special Topics in Manufacturing Engineering Technology (1-3 Credits)

Prerequisite: Permission. Selected topic(s) that provide for specific course work in the area of manufacturing engineering technology offered once or only occasionally in areas where no formal course exists.

2870:499 Workshop in Manufacturing Engineering Technology (1-3 Credits)

Prerequisite: Permission. Group studies of special topics in manufacturing engineering technology.

Manufacturing Engineering Technology (2880)

2880:100 Basic Principles of Manufacturing Management (4 Credits)

A survey of basic concepts of management and their interrelationships to a manufacturing environment. Includes production control, quality control, work measurement, and employee motivation.

2880:101 Introduction to Advanced Manufacturing (2 Credits)

This course defines advanced manufacturing and provides students with an overview of the knowledge, skills, and abilities necessary to succeed in an advanced manufacturing career.

2880:110 Manufacturing Processes (3 Credits)

Study of the machines, methods, and processes used in manufacturing.

2880:130 Work Measurement & Cost Estimating (3 Credits)

Prerequisite: 2030:152. Time and motion study. Development of accurate work methods and production standards, and their relationship to manufacturing cost estimates.

2880:140 Computer Aided Drawing (3 Credits)

Drafting procedures and techniques used for creating drawings using AutoCAD software. Topics include basic components, drawing, editing, dimensioning, layers, text, blocks, plotting, and hatch.

2880:151 Industrial Safety & Environmental Protection (2 Credits)

A contemporary overview of the science and management of occupational health and safety programs, policies, and procedures in an industrial and business type environment.

2880:201 Robotics & Automated Manufacturing (3 Credits)

Prerequisite: 2880:100 or permission of instructor. Study of manufacturing automation and the computer-based products and processes available for this task. Robots, machine controllers, and machine/process interfaces are investigated.

2880:211 Manufacturing Operations (3 Credits)

A study of all functions involved in a manufacturing production system. Areas covered include product design, forecasting, capacity planning, scheduling, materials management, and project management.

2880:225 Computer Aided Tool Design (3 Credits)

Prerequisite: 2880:140 or 2920:121. The study of standard tool design practices and procedures utilizing industry-standard computer-aided design software.

2880:230 3-D Modeling & Design (3 Credits)

Prerequisite: 2940:210. This course covers advanced topics in the use of AutoCAD. These topics include 3-D modeling. Laboratory.

2880:232 Labor Management Relations (3 Credits)

Prerequisite: 2880:100. Study of historical background of labor movement, management viewpoints, legal framework for modern labor organizations and collective bargaining process.

2880:241 Introduction to Quality Assurance (3 Credits)

Prerequisite: 2030:152. Theory and practice of inspection and sampling techniques for measurement of quality, QC charts, sampling plans, mill specs, checking machine capabilities, and setting tolerances.

2880:248 Introduction to CNC and Additive Manufacturing (3 Credits)

Prerequisites: 2030:153 and [2880:140 or 2920:121] or permission. This course provides an overview of CNC manual programming utilizing the G-code programming language along with an introduction to additive manufacturing processes.

2880:290 Special Topics: Industrial Technology (1-2 Credits)

Prerequisite: Permission. Selected topics or subject areas of interest in industrial technology. (May be repeated for a total of four credits)

Mechanical Engineering Technology (2920)

2920:100 Survey of Mechanical Engineering Technology (2 Credits)

Corequisite: 2030:154. Overview of the Mechanical Engineering Technology degree programs; pre-testing; career opportunities; professional societies & certification; standards; and useful tools of the MET field.

2920:101 Introduction to Mechanical Design (3 Credits)

Prerequisite: 2880:140 or 2920:121. Corequisite: [2880:230 or 2920:100] and 2030:154. Topics in engineering drawing: conventions, sections, dimensioning and tolerancing. Detail drawings, subassembly and assembly drawings. Introduction to various mechanical components and mechanical design tools.

2920:121 Fundamentals of Engineering Drawing (3 Credits)

Fundamentals of engineering drawing using freehand sketching and CAD; orthographic and isometric projections, sectioning, assemblies, and introduction to geometric dimensioning and tolerancing. Laboratory.

2920:130 Introduction to Hydraulics and Pneumatics (3 Credits)

Principles of hydrostatic forces, pressure, density, viscosity, incompressible and compressible fluids. Principles of hydraulic and pneumatic devices and systems.

2920:142 Introduction to Material Technology (3 Credits)

Fundamental properties of materials. Material testing. Applications of methods to control material properties.

2920:243 Kinematics (3 Credits)

Prerequisite: 2990:125. Corequisite: 2920:101. Study of rigid-body motions of simple linkages, cams, gears, and gear trains. Vector solutions emphasized. Industrial applications presented and computers used to analyze mechanisms.

2920:245 Mechanical Design II (5 Credits)

Prerequisites: 2920:101, 2920:243, and 2990:225. Corequisite: 2920:142. Advanced stress and fatigue analysis, theories of failure. Design of machine elements: gears, keys and keyways. Experimental stress analysis and design projects.

2920:249 Applied Thermal Energy I (2 Credits)

Prerequisites: 2030:255 and 3650:164. Thermodynamic principles. Study of power cycles. Applications in I.C. engines, compressors, steam power cycles, refrigeration.

2920:251 Fluid Power (2 Credits)

Prerequisites: 3650:160 and 3650:164. Statics and dynamics of fluids. Viscosity, energy and momentum relationships. Fluid machinery and measurements.

2920:252 Thermo-Fluids Laboratory (1 Credit)

Prerequisite: 2920:251. Corequisite: 2920:249. Laboratory experiments in applied thermal energy and fluid power.

2920:290 Special Topics: Mechanical Engineering Technology (1-3 Credits)

Prerequisite: Permission. Selected topics or subject areas of interest in Mechanical Engineering Technology. (May be repeated for a total of four credits)

2920:310 Economics of Technology (3 Credits)

Prerequisite: 64 credits or permission. Economic principles as they pertain to technology. Equivalence, alternatives, costs, depreciation, valuation. Project studies.

2920:344 Dynamics (3 Credits)

Prerequisites: 2920:243, 2030:255, and 2990:125. Introduces particle dynamics, displacement, velocity, and acceleration of constrained rigid bodies in plane motion. Kinetics of particles and rigid bodies, work and energy, mechanical vibration.

2920:346 Mechanical Design III (4 Credits)

Prerequisites: 2920:245 and 2920:344. Continuation of design of mechanical components: gears, bearings, shafts, springs, and fasteners. Special topics presented will be coordinated with assigned design projects.

2920:347 Production Machinery & Processes (3 Credits)

Prerequisites: 2030:255 and [2880:110 or 2920:142]. Study of manufacturing processes (casting, forging, welding, forming sheet metal), integrating material technology, mechanical design, and mechanics of materials.

2920:365 Applied Thermal Energy II (3 Credits)

Prerequisites: 2030:255, 2920:249, and 2920:251. Review and application of basic thermodynamic principles used in designing automotive engines and refrigeration equipment. Introduction to heat transfer, heating, ventilation, and air conditioning.

2920:370 Plastics Design & Process (3 Credits)

Prerequisites: 2820:111 or higher. Introduction to structure and properties of polymers, selection based on properties and cost, design of products and tools, basic principles of the major processes.

2920:402 Mechanical Projects (2 Credits)

Prerequisites: 2920:310, 2920:365, 2920:370, 2920:490, and [2870:301 or 2920:405]. Individual projects emphasizing creative technical design.

2920:405 Introduction to Industrial Machine Control (3 Credits)

Prerequisite: 2860:370. Principles and design of industrial machine control systems. Application oriented study of typical control devices. Utilization of programmable controllers as the system logic controllers.

2920:470 Plastics Processing & Testing (2 Credits)

Prerequisite: 2920:370 or permission. Use of basic polymer testing methods. Setup and operation of modern molding and extrusion equipment. Basic troubleshooting procedures. Study of processing effects on final properties.

2920:490 Mechanical Engineering Technology Senior Seminar (1 Credit)

Prerequisites: 2920:346 and 2920:347. An opportunity for post-testing of all MET students and the presentation of social and professional responsibilities, diversity, professional certification, life-long learning, and career opportunities.

2920:497 Senior Honors Project in Mechanical Engineering Technology (1-3 Credits)

Prerequisites: Senior standing in Honors Program, permission of area honors preceptor, and major in mechanical technology. Independent research leading to completion of senior honors thesis or other original work. (May be repeated for a total of six credits)

2920:498 Independent Study in Mechanical Engineering Technology (1-4 Credits)

Prerequisite: Permission. Directed study in a special field of interest chosen by the student in consultation with the instructor. (May be repeated for a total of six credits).

Surveying and Mapping (2980)

2980:100 Introduction to Geomatics (2 Credits)

An introductory course into the field of surveying and mapping technology. Integrated topics include: types of surveys, cartography, and geographic information systems.

2980:101 Basic Surveying (3 Credits)

Corequisite: 2030:153. Care and use of basic surveying field instruments and the basic computations and adjustments necessary to post process the field survey measurements. Field Practice.

2980:102 Topographic Surveying (2 Credits)

Prerequisites: 2980:101 and 2030:153. Computations and adjustments of field survey measurements using both conventional and computer methods. Development of maps and plans stressed. Field Practice.

2980:122 Elementary Surveying (3 Credits)

Elementary surveying for non-surveying and construction majors. Basic tools and computations. Field practice.

2980:123 Surveying Field Practice (2 Credits)

Prerequisite: 2980:102 or equivalent. Practical experience in use of surveying equipment and methods of surveying. Provides students with responsibility for making decisions and planning and directing complete project.

2980:155 Computer Applications in Surveying (3 Credits)

Use of current surveying software to solve typical problems/projects in surveying technology.

2980:170 Surveying Drafting (3 Credits)

Corequisite: 2030:152 or permission. Drafting procedures, techniques, and tools required for the various phases of survey office work. Projects include topographic maps, plan and profile drawings, and cross-section drawings. Laboratory.

2980:222 Construction Surveying (3 Credits)

Prerequisite: 2980:101. Methods and procedures for establishing line and grade for construction. Circular and parabolic curves. Cross-sectioning methods and earthwork. Communication and plan reading.

2980:223 Geospatial Technologies (3 Credits)

Introduction to current and emerging geospatial technologies, such as Geographic Information Systems, remote sensing and global positioning systems, and exploring mapping data sources. Laboratory required.

2980:225 Advanced Surveying (3 Credits)

Prerequisite: 2980:228. Introduction to topographic mapping, flood maps, and ALTA surveys. Advanced topics in control surveys, State Plane Coordinates, and bearings from celestial observations. Field practice.

2980:228 Boundary Surveying (3 Credits)

Prerequisite: 2980:101 or equivalent. Analysis of evidence and procedures for boundary location; establishing and/or locating points for boundary and mortgage location surveys; plat preparation. Ohio survey minimum standards.

2980:251 CST Seminar (1 Credit)

Prerequisite: 2980:222. Prepares students for the National Society of Professional Surveyors Certified Surveying Technician (CST) Level I Examination. Examination is given at the end of the review sessions.

2980:310 Survey Computations & Adjustments (2 Credits)

Prerequisite: 2980:225. Concepts relating to measurement error, probability, and reliability. Computation and adjustment of horizontal and vertical networks.

2980:315 Boundary Control & Legal Principles (3 Credits)

Prerequisite: 2980:228. Historical development of boundaries, rectangular system of public land surveys, systems to describe property, surveyor's responsibility to understand and properly apply legal principles to boundary.

2980:325 OSHA Safety Requirements for Surveyors (1 Credit)

To provide OSHA safety training and certification required for surveying companies.

2980:330 Applied Photogrammetry (3 Credits)

Prerequisite: 2980:155. An introduction to metrical and quantitative photogrammetry using both hard- and soft-copy systems. Laboratory.

2980:335 The Business of Surveying (2 Credits)

A course focused on the business aspects of surveying, including development of business plan components for a company offering professional surveying and mapping services.

2980:340 Cadastral Surveying (2 Credits)

Prerequisites: 2980:101. A study of the official surveys of the United States. Cadastral surveys establish or recreate boundaries and /or tracts of land.

2980:410 LiDAR and Laser Scanning (2 Credits)

Prerequisite: 2985:101. Introduction to LiDAR (aerial and terrestrial) scanning as it applies to surveying and mapping. The course will discuss the collection and dissemination methods of the data.

2980:415 Legal Aspects of Surveying (3 Credits)

Prerequisite: 2980:315. A study of statute and common law related to land surveying. Evidence and the surveyor's role in the judicial process. Interpreting and writing land descriptions.

2980:420 Route Surveying (3 Credits)

Prerequisite: 2980:225. Surveying for long but narrow strips of land such as highways, railroads, and pipe lines. Course includes all requisite calculations and drawings.

2980:421 Subdivision Design (3 Credits)

Prerequisites: 2980:155, 2980:222, and 2980:315. Site analysis, land use controls, and plotting procedures. Laboratory includes preparation of various types of projects leading to a complete subdivision.

2980:422 Global Positioning System Surveying (3 Credits)

Prerequisites: 2980:225 and 2985:101 or permission. Introduction to the Global Positioning System (GPS). Course includes the planning, data collection, and processing of GPS data.

2980:425 Land Navigation (3 Credits)

Interpretation and use of topographic maps. Study of basic map elements with emphasis on identification of features and coordinate systems. Map use for land navigation.

2980:426 History of Surveying To 1785 (2 Credits)

A history of land surveying. Emphasis on the development of survey procedures through history. Part I (to 1785) covers the ancient world to the colonial period.

2980:427 Ohio Lands (2 Credits)

Study of the history of the original Ohio Land Subdivisions.

2980:428 History of Surveying Since 1785 (2 Credits)

A history of land surveying. Emphasis on the development of survey procedures through history. Part II (Since 1785) covers the history of the United States to date.

2980:430 Surveying Project (3 Credits)

Prerequisite: Senior or greater standing and permission. Provides opportunity to research and develop a specific surveying project within chosen area of surveying. Oral, written and graphical presentation of completed project(s).

2980:431 Senior Seminar (2 Credits)

Prerequisite: Senior or greater standing. Students demonstrate knowledge and skills acquired as surveying majors through assessment testing and review of professional licensure laws. Preparation for national exams.

2980:445 Applications in GIS using GPS (3 Credits)

Prerequisite: 2985:101. Advanced instruction in GIS applications using GPS as well as other surveying and mapping methods. Laboratory.

2980:450 Topics in Professional Practice (2 Credits)

Prerequisite: Junior or greater standing. Topics in applicational areas of surveying from the point of view of the practitioner and the consumer of land-related data.

2980:489 Special Topics in Surveying (1-3 Credits)

Prerequisite: Permission. Special lecture/laboratory courses offered once or only occasionally in areas where no formal course exists. (May be repeated for a maximum of six credits.)

2980:490 Workshop in Surveying (1-3 Credits)

Prerequisite: Permission. Group study of special topics in surveying. May not be used to meet undergraduate major requirements in surveying. May be used for elective credit only. (May be repeated for a maximum of six credits.)

2980:495 Internship: Surveying and Mapping (3 Credits)

Prerequisites: 64 hours in program and permission. Supervised work experience in surveying and mapping to increase student understanding of surveying and mapping technology.

2980:497 Surveying Honors Project (3 Credits)

Prerequisites: Senior Studies as an honor student. Provides opportunities to research and develop a specific surveying project within chosen area of surveying. Oral, written, and geographical presentation of completed projects.

2980:498 Independent Study (1-3 Credits)

Prerequisite: Permission or instructor. Directed study in a special field of interest chosen by student in consultation with instructor. (May be repeated for a total of six credits).

Geographic and Land Information Systems (2985)

2985:101 Introduction to Geographic & Land Information Systems (3 Credits)

Introduction to the principles and concepts of Geographic and Land Information Systems used in surveying and mapping applications. Laboratory.

2985:151 GIS Essential Skills (3 Credits)

Prerequisite: 2985:101. Continued instruction and hands-on emphasis on common skills used in the GIS industry. Skills: Creating reference maps, geocoding, digitizing, reports and mapbooks. Laboratory.

2985:201 Intermediate Geographic and Land Information Systems (3 Credits)

Prerequisite: 2985:101. Continued instruction in the hands-on technical applications of Geographic and Land Information Systems. Laboratory.

2985:205 Building Geodatabases (3 Credits)

Prerequisite: 2985:101. Introduction and application of spatial geodatabases. The student will create, use, and manage geodatabases. Geodatabases are used for storing spatial and attribute data. Laboratory.

2985:210 Geographic and Land Information Systems Project (3 Credits)

Prerequisites: 2985:101. Practical application and presentation techniques using the principles and concepts of cartography and geographic information systems. Laboratory.

2985:280 Topics in Professional Practice (2 Credits)

Topics in applicational areas of Geographic and Land Information Systems (GIS/LIS) from the point of view of the practitioner and the consumer.

2985:290 Special Topics in Geographic and Land Information Systems (1-3 Credits)

Special lecture/laboratory courses offered once or only occasionally in areas where no formal course exists.

2985:291 Geographic and Land Information Systems Internship (3 Credits)

Prerequisite: Permission. Supervised professional experience in GIS/LIS agencies or related setting.

2985:295 Workshop in Geographic and Land Information Systems (1-3 Credits)

Group studies of special topics in GIS/LIS. May be used for elective credit only to a maximum of three credits.

2985:299 Independent Study (1-3 Credits)

Directed study in a special field of interest chosen by the student in consultation with the instructor.

2985:301 Exploring ArcGIS Extensions (3 Credits)

Prerequisite: 2985:101. Specialized instruction and laboratory exercises in working with the ArcGIS extensions, Spatial Analyst, 3-D Analyst and Network Analysis. Laboratory.

Construction Engineering Technology (2990)

2990:125 Statics (3 Credits)

Prerequisites: 2030:154 and 3650:160. This course covers forces, resultants, and couples. Equilibrium of force systems. Trusses, frames, centroid, moment of inertia, and friction.

2990:129 Computer Applications in Construction (3 Credits)

This course introduces students to important computing skills for construction managers including software for estimating, scheduling, presentations, general business administration and graphics.

2990:131 Building Construction (2 Credits)

Materials and methods used in construction. Encompasses buildings constructed with wood, steel, concrete or a combination of these materials.

2990:150 Plan Reading (2 Credits)

Prerequisite: 2990:131. The language of construction. Symbols, scales, plan views, elevation views, sections and details. Quantity take-off estimation.

2990:225 Strength of Materials (3 Credits)

Prerequisite: 2990:125. Stress, strain and stress-strain relationships. Tension, compression, torsion, beams. Shear and moment diagrams. Combines stresses.

2990:226 Construction Supervision (3 Credits)

Introduction to topics on construction supervision including planning, directing and coordinating onsite activities to build quality defined by drawings and specifications.

2990:234 Elements of Structures (3 Credits)

Prerequisites: 2990:125 and 2990:225. Principles of stress and structural analysis, concepts of steel, timber design, and reinforced concrete.

2990:235 Construction Inspection (3 Credits)

Prerequisite: 2990:131. Fundamentals of total quality management and construction inspection.

2990:237 Materials Testing I (2 Credits)

Prerequisite: 2030:154. Laboratory testing of soils with emphasis on physical properties of soil. Laboratory and field procedures used for quality control.

2990:238 Materials Testing II (2 Credits)

Prerequisite: 2030:154. Mix design of concrete. Laboratory testing of concrete containing ordinary Portland cement and pozzolanic admixtures. Experiments demonstrate physical properties as related to design and quality control.

2990:239 Construction Geomechanics (3 Credits)

Prerequisite: Admission to the Associate of Science program or permission of the program director. This course provides an understanding of the impact of the mechanical behavior and engineering properties of soils and rock related to construction processes and methods. Topics include erosion control, laboratory test methods for engineering design, flood and mass wasting behavior, soil subsidence, and sustainability of engineered coastal structures.

2990:245 Construction Estimating (3 Credits)

Prerequisite: 2030:154 and 2990:150. Quantity takeoffs in construction to include mass excavations, foundation systems, structural steel, residential construction, and various commercial construction methods.

2990:246 Site Engineering (3 Credits)

Prerequisite: 2990:131. The content includes study of the development of a site including surveying, excavation, soil treatment, heavy equipment requirements, storm water management, pavement design, and construction of roadways.

2990:248 Construction Graphics (3 Credits)

Introduction to terminology and drawing basics with a focus on civil/site plans, architectural and structural drawing.

2990:254 Building Codes (3 Credits)

Prerequisite: 2990:131. Students learn fundamental concepts for construction related to the residential building code.

2990:310 Residential Building Construction (3 Credits)

Introduction to building design, wood framing, and mechanical systems as commonly found in residential housing.

2990:312 Neighborhood Revitalization Project (3 Credits)

Residential construction and inspection knowledge used to perform field work, service projects, and written inspection reports.

2990:320 Advanced Materials Testing (3 Credits)

Prerequisite: 2990:241. This course investigates the usage of precision strain gage applications used by technicians in determining stresses in structural elements and mechanical parts.

2990:351 Construction Quality Control (3 Credits)

Prerequisites: Admission into the BCET program or permission of instructor. Overview of quality control concepts and techniques as related to the construction industry including the necessary statistical tools; exposes students to civil, mechanical and electrical inspection requirements.

2990:352 Field Management & Scheduling (2 Credits)

Prerequisites: 2990:245 or permission. Planning, scheduling, and controlling of field work within time and cost constraints. Manual methods and computer software packages studied.

2990:354 Foundation Construction Methods (3 Credits)

Prerequisites: 2990:234 and 2990:237. Soil mechanics and soils exploration as related to construction. Foundation construction methods and practice in the interest of safety and suitable economy.

2990:356 Safety in Construction (3 Credits)

The purpose of this course is to explain what creates hazards and why, and to suggest where to anticipate trouble in each phase of the work as it progresses.

2990:358 Advanced Estimating (3 Credits)

Prerequisite: 2990:245. This course focuses on estimating and bidding for public and private construction. Includes heavy/highway, residential and building construction with use of computer software to facilitate bid price.

2990:359 Construction Cost Control (3 Credits)

Prerequisites: 2420:211 or 6200:201. Course develops a practical understanding of the latest managerial accounting principles and practices as they apply to the construction business.

2990:361 Construction Formwork (3 Credits)

Prerequisite: 2990:234 or permission. Introduction to design and construction of formwork and temporary wood structures.

2990:362 Advanced Elements of Structures (3 Credits)

Prerequisite: 2990:234. This course examines advanced topics in structural engineering and is an extension of Elements of Structures.

2990:371 Green & Sustainable Building Practices (3 Credits)

This course is designed to provide an understanding of sustainable construction practices and their importance on environmental issues.

2990:453 Legal Aspects of Construction (2 Credits)

Prerequisite: Admission into the BCET program or permission. Study of business of contracting and subcontracting and legal problems therein such as breach, partial performance, payment, insolvency, subsurface. Review of standard contracts and construction industry rules of arbitration.

2990:455 Computerized Precision Estimating (3 Credits)

Prerequisite: 2990:245. Students will explore sophisticated software programs utilized by the construction industry to prepare estimates and bid packages.

2990:462 Mechanical Service Systems (3 Credits)

Introduction to materials and equipment used in mechanical heating, ventilating, air conditioning, water and waste systems.

2990:463 Electrical Service Systems (3 Credits)

Introduction to materials and equipment in electrical systems of buildings. Includes illumination, electrical sources, materials and distribution. Emphasis of fire safety.

2990:465 Heavy Construction Estimating (3 Credits)

Prerequisite: 2990:245. Quantity takeoffs and cost analysis to include methods, systems, and equipment relevant to heavy highway and civil infrastructure projects.

2990:466 Hydraulics (3 Credits)

Prerequisite: 2030:356. Introduction to hydrology. Flow in closed conduits and open channels, distribution, systems, storage requirements and basic concepts of hydraulic structures. Basic concepts of seepage and working knowledge of pumps.

2990:468 Construction Management (3 Credits)

Prerequisites: 2990:352 and 2990:358. Construction Management takes established construction practices, current technological advances, and latest management methods and makes them into an efficient, smooth working system.

2990:469 Contracts and Specifications (2 Credits)

Prerequisite: Admission to BSCET program or permission. This course studies the principles and applications of construction specifications, contracts, processes for managing professional risk and increasing economic performance of the construction process.

2990:471 Understanding LEED Guidelines (3 Credits)

Prerequisite: 2990:371. Provides an understanding of LEED guidelines and requirements and help prepare the student for the LEED associate exam.

2990:479 CPC Seminar (3 Credits)

Prerequisite: Must be of senior level status towards a B.S. Degree in Construction Engineering Technology or permission. This course prepares students for the content and format of the Certified Professional Constructor's Examination.

2990:489 Special Topics in Construction (1-3 Credits)

Prerequisite: Permission of instructor. (May be repeated for up to six credits.) Special lecture/laboratory courses offered once or only occasionally in areas where no formal courses exist.

2990:490 Workshop in Construction (1-3 Credits)

Prerequisites: Permission. Group studies of special topics in construction. May not be used to meet undergraduate major requirements in construction. May be used for elective credit only. (May be repeated for up to six credits)

2990:497 Honors Project (1-3 Credits)

Prerequisite: Senior standing in Honors College and permission of supervising faculty in student's degree field and pursuit of major in CET. Individual Senior Honor's Project relevant to student's major field of study. Specific projects are approved and supervised by a designated member of the faculty in the student's degree field.

2990:498 Independent Study in Construction (1-3 Credits)

Prerequisite: Permission. Directed study in a special field of interest chosen by student in consultation with instructor. (May be repeated for up to six credits)