

# DEPARTMENT OF ENGINEERING TECHNOLOGY

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**Contact Information:** (936) 294-1216 and (936) 294-1191

**Website:** Department of Engineering Technology (<http://www.shsu.edu/academics/engineering-technology/>)

## Mission

The mission of the Engineering Technology Department is to provide an educational program designed to provide academic and practical experiences in the areas of engineering design and development, electronics and computer engineering technology, construction management, mechanical engineering technology, leadership, management, and safety to meet industry challenges and needs.

## Highlights

The Department of Engineering Technology offers courses in multiple specialized facilities.

- The Fred L. Pirkle Engineering Technology Center (PIRK) provides space for several specialized classrooms and laboratories.
  - The computer-aided design and drafting (CADD) laboratories provide students with experiences in construction, architectural, and engineering design software tools, design and drafting tools, and rapid prototyping equipment.
  - Electricity, electronics, automation and control, instrumentation, and robotic courses are offered in the Electronics and Robotics laboratories
  - Energy systems courses and workshops are offered in the Energy Systems and Sustainability laboratories as well as the Energy Terrace
  - The Collaboration/Innovation laboratory provides the infrastructure and cutting edge equipment/tools necessary for capstone research projects
  - Rapid Prototyping lab
- The Westmoreland Engineering Technology Laboratory (WETL)
  - Drafting and design, surveying, electrical and renewable energy technologies
  - Metal, wood, and concrete construction for residential and commercial structures
  - Manual and computer numerical control (CNC) machining and material testing
  - Plastics injection molding lab
- The Farrington Building (FARR)
  - Engineering mechanics (statics and strength of materials).
- Engineering Technology Annex C
  - Mechanical engineering technology lab
  - Manufacturing engineering technology lab
  - Fluid Powers Lab
  - Heating, ventilation, and air conditioning (HVAC)
- Engineering Technology Annex A
  - Construction materials lab
  - Safety research & technology lab
  - Virtual reality engineering lab

## Career Opportunities

- Architectural Design
- Automation and Control
- Computer Hardware and Software
- Construction Management
- Electrical and Mechanical Systems
- Engineering Design
- Industrial Design and Development

- Industrial Education and Training
- Industrial Robotics
- Instrumentation and Data Acquisition Systems
- Manufacturing
- Mechanical Engineering Technology
- Occupational Safety and Health
- Power and Energy Systems
- Product Design
- Sales and Marketing of Industrial Products

Engineering Technology students learn to draw upon the principles of management, leadership, physical and applied sciences, technology of industry, and basic engineering for the solution of problems involving industrial products, services, materials and processes, and the supervision and management of facilities and personnel.

## Suggested Minors

Engineering Technology students may choose minors from program areas within the department (see Minor area), while others will select from the College of Business Administration, such as General Business Administration, Management, Marketing, etc. Students are highly encouraged to choose a minor that best suits their needs and interests.

## Program Specific Requirements

For additional information regarding admission requirements, degree programs, description of courses, and available financial assistance, please refer to the appropriate sections of this catalog. Brochures and information concerning the department and scholarships may be obtained by calling (936) 294-1216 and (936) 294-1191 or writing:

### Sam Houston State University

Department of Engineering Technology, PO Box: 2088  
Huntsville, Texas 77341-2088

- Bachelor of Science, Major in Construction Management (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-construction-management/>)
- Bachelor of Science, Major in Electronics and Computer Engineering Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-electronics-computer-engineering-technology/>)
- Bachelor of Science, Major in Engineering Design Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-design-technology/>)
- Bachelor of Science, Major in Engineering Technology-Civil Engineering 2+2 (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-technology-civil-engineering/>)
- Bachelor of Science, Major in Engineering Technology-Electrical Engineering 2+2 (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-technology-electrical-engineering/>)
- Bachelor of Science, Major in Engineering Technology-Mechanical Engineering 2+2 (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-technology-mechanical-engineering/>)
- Bachelor of Science, Major in Engineering Technology - Concentration in Electronics (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-technology-concentration-electronics/>)
- Bachelor of Science, Major in Engineering Technology - Concentration in Safety Management (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-technology-concentration-safety-management/>)
- Bachelor of Science, Major in Engineering Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-engineering-technology/>)
- Bachelor of Science, Major in Mechanical Engineering Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/bs-mechanical-engineering-technology/>)
- Minor in Architectural Design Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/architectural-design-technology-minor/>) (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/agricultural-science/architectural-design-technology-minor/>)
- Minor in Construction Management (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/construction-management-minor-/>)
- Minor in Electronics (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/electronics-minor/>)

- Minor in Engineering Design Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/engineering-design-technology-minor-/>)
- Minor in Industrial Safety Management (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/industrial-safety-management/>)
- Minor in Manufacturing Engineering Technology (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/manufacturing-engineering-technology-minor-/>)
- Minor in Trades and Industry Certification (<http://catalog.shsu.edu/archives/2021-2022/undergraduate/colleges-academic-departments/science-and-engineering-technology/engineering-technology/trades-and-industry-certification-minor/>)

## Student Organizations

- Katatronics Robotics (KatatroniX)
- Sam Houston Construction Association (SHCA)
- Renewable and Clean Energy Association (RCEA)
- Society for Women in Excellence in Engineering and Technology (SWEET)
- Engineering Technology Ambassadors
- Virtual Reality (VR)

## Internships

The internship program is intended to provide experience-based learning opportunities for students in their respective discipline of study. Students generally seek internship experience at the end of their junior or senior year. Internships may be arranged through student contact with providers or through departmental faculty and staff announcements and postings. All internships must receive departmental approval through application prior to the initiation of the internship. Maximum credit for an internship is six (6) credit hours, and it may be used towards graduation.

## Scholarships

The department is pleased to have several scholarships in value up to \$5,000 per academic year available for students majoring in engineering technology-related degrees. These scholarships are a one-time award and are awarded on an annual basis. A student may reapply in subsequent years if eligibility requirements are met.

The Scholarships 4 Kats (<http://www.shsu.edu/dept/financial-aid/scholarships/>) program must be used to apply for departmental scholarships. The program enables you to apply for all scholarships for which you are eligible, including those outside the Department of Engineering Technology. The deadline for departmental scholarships and university-wide scholarships are announced through Scholarships 4 Kats; (<http://www.shsu.edu/dept/financial-aid/scholarships/>) non-departmental scholarship deadlines vary.

### CONTACT:

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 (936) 294-1216 OR (936) 294-1191

## Construction Management

### ETCM 1363. Wood Frame Construction. 3 Hours. [TCCN: ARCH 2312]

This course is a study of materials and methods of wood frame construction found in residential and commercial construction focusing on aspects of load-bearing structural design elements. Instruction is given in the correct use of hand tools and machine tools, job safety, job-site controls, material handling, equipment, and application. Laboratory experiences include design and construction of a wood frame structure with elements typically found in residential construction. (2-2).

### ETCM 2350. Surveying. 3 Hours. [TCCN: ENGR 1307]

Students learn fundamentals of surveying methodologies and apply them to construction and civil engineering projects. Course topics may include theory of errors in observations, distance measurements, leveling methods, angles, azimuths and bearings, total station methods, and traverse computations.

**Prerequisite:** ETCM 1363.

### ETCM 2363. Architectural Design. 3 Hours. [TCCN: ARCH 2603]

This course consists of the development of a set of plans and specifications for a small residence.

**Prerequisite:** ETDD 1390 or ETDD 1361 or ETCM 1363 or FACS 1360 or FACS 2364.

### ETCM 2396. Special Topic. 3 Hours.

This course of faculty-led study is designed to provide exposure of undergraduate students to new construction management and technology topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010 and ETCM 1363.

**ETCM 3320. Mechanical, Electrical & Plumbing (MEP) Systems in Buildings. 3 Hours.**

Students design and implement typical Mechanical, Electrical and Plumbing (MEP) systems that are part of residential and commercial construction. Topics include design criteria, installation, and operation methods used to conserve both energy and water in buildings.

**Prerequisite:** PHYS 1301 or 1302 and Sophomore Standing.

**ETCM 3353. Construction Project Management. 3 Hours.**

Students practice the management principles and techniques associated with managing construction projects. Students apply the most proven methods in construction project management as well as new techniques emerging from the current construction industry and recent research. Lecture and Lab.

**Prerequisite:** MATH 1316 and ETCM 1363.

**ETCM 3367. Metal Building Systems. 3 Hours.**

This course is a study of materials and methods of construction found in metal building systems. Instruction is given in the correct use of hand and power tools, job safety, job-site controls, material handling, equipment and application. Aspects of load design calculations, fastener use, metal coatings, and erection equipment are studied. Laboratory instruction includes basic metal working processes (welding, sheet-metal, foundry) used in metal frame construction.

**Prerequisite:** ETCM 1363.

**ETCM 3368. Concrete/Masonry Construction. 3 Hours.**

This course is a study of materials and methods of construction found in concrete and masonry structures. Concrete chemistry, mixing and placement equipment, testing, finishing techniques, reinforcing, formwork, specification, and job-site safety implementing these materials are studied. Laboratory experiences include batch sampling and testing and small group projects implementing concrete and masonry methods and materials. Sophomore standing.

**Prerequisite:** ETCM 1363.

**ETCM 3370. Construction Technology II. 3 Hours.**

This course focuses on non-structural construction typically found in cabinetry, trim, and furniture construction. Included is the study of woods, synthetic materials, hardware, and wood joinery. Instruction is given in the correct use of hand and machine tools, job safety, job-site controls, and material specification. Lab experiences include designing, planning, construction, and finishing of a piece of cabinetwork or furniture. Sophomore standing.

**Prerequisite:** ETCM 1363.

**ETCM 3371. Civil Design Technology. 3 Hours.**

This course will consist of drafting techniques and requirements necessary for civil engineering offices. Topics include survey drafting, map drafting, topos, site plans, subdivision plats, profile drawings and other related topics. Sophomore standing.

**Prerequisite:** ETDD 1361 or ETDD 1390.

**ETCM 3372. Construction Drafting. 3 Hours.**

This course is a study of drafting techniques and requirements for the commercial and heavy construction industries and will add to the skill set of construction management students. Topics will include foundation design, commercial building design, structural detail, and premanufactured metal constructed building design. Demonstrations, student inquiry, in-class problem solving, and three dimensional (3D) modeling will be utilized.

**Prerequisite:** ETDD 1361 or ETCM 1363.

**ETCM 4096. Directed Study. 1-6 Hours.**

Arranged professional and developmental learning experiences incorporating a practical application of construction management skills and practices. To include internships, individual research and industry studies. Variable Credit (1-6).

**Prerequisite:** Sophomore standing.

**ETCM 4310. Construction Cost Estimating. 3 Hours.**

Students learn the procedures for estimating construction costs of residential and light commercial projects. Topics may include the preparation of quantity surveys (take-offs), organizing cost information for contract documents, and the development of material, labor, and equipment costs. Lectures cover the skills and background to perform construction estimating, and students gain practical experience in estimating costs for material, labor, and equipment in labs.

**Prerequisite:** MATH 1316 and ETCM 2363.

**ETCM 4315. Construction Scheduling. 3 Hours.**

Students learn the concepts used in planning and scheduling of construction projects, including development of a project plan, progress reports, and deliverables. Students acquire the skills and background to perform construction scheduling, and they gain practical and software experience in using schedule networks, critical path methods, resource allocation, and project control techniques in labs.

**Prerequisite:** MATH 1316 and ETCM 2363.

**ETCM 4330. Construction Mgt & Procedures. 3 Hours.**

This course is designed to provide a general knowledge of construction applications and procedures. Emphasis is on site preparation, foundations, and concrete. Emphasis will be placed on the responsibility of general or prime contractors and specialty contractors. Students will be taught cost estimation and procedures for bidding.

**Prerequisite:** ETCM 1363 or ETDD 1361.

**ETCM 4368. Building Materials. 3 Hours.**

This course is devoted to the study of qualities, types, and sizes of materials such as lumber and other wood products, masonry, paint, hardware, ceramic and metal products. In addition cost estimates for materials and labor is studied by figuring the cost estimate of a small residence. Extensive use is made of actual samples and other visual aids.

**Prerequisite:** ETCM 1363, ETCM 2363, and Junior standing.

**ETCM 4369. Special Topic. 3 Hours.**

Individual study in specialized areas of Construction Management. To be directed and approved by the Industrial Technology advisor. This course is designed to be a multitopic course. The student can take the course under various special topics being offered.

**ETCM 4370. Construction Plans & Documents. 3 Hours.**

This course is designed to give a clear insight into the particular problems of construction and proper construction procedures. The site selection, availability of services, grading, subsurface explorations to determine foundation needs, construction organization, and other activities of construction are presented in logical units.

**Prerequisite:** ETCM 2363 or ETCM 3372 and ETCM 3368 and Junior standing.

**ETCM 4371. Building Information Modeling. 3 Hours.**

This course focuses on current issues in the construction industry from a Building Information Modeling standpoint. This approach incorporates the integrated project delivery method, productivity measurement, digital modeling, and construction process modeling for construction scheduling.

**Prerequisite:** ETCM 2363 or ETCM 3372.

## Engineering Design Technology

**ETDD 1361. Engineering Graphics. 3 Hours. [TCCN: ENGR 1304]**

This is an introductory engineering drawing course. Topics covered may include orthographic projection, isometric drawing, geometric construction, sectioning, and dimensioning using drafting equipment, freehand sketching, and two dimensional renderings with CAD software.

**ETDD 1366. Machining Technology I. 3 Hours.**

This course serves as an introduction to the problems, techniques, and processes of modern machining technology. Instruction is given in the use of hand and machine tools, introduction to computer numerical control, product planning and development, metric measurement, safety, and opportunities for employment in the machining industry.

**ETDD 1390. Intro -Computer Aided Drafting. 3 Hours. [TCCN: ENGR 1304]**

This course is intended to provide the student with an understanding of Computer-Aided Drafting Principles. Students will utilize the software command structure of a CAD program to complete a number of typical and practical application exercises.

**ETDD 2366. Machining Technology II. 3 Hours.**

Students learn Computer Numerical Control (CNC) programming as it applies to fundamental milling and turning operations. Topics may include machine tool axis motions, cutting tool setup, methods of work piece setup, cutting tool path design, cutting tool compensation, and canned cycles. Students use computer-aided manufacturing (CAM) software to create toolpaths and programs for multi-axis CNC milling and turning machines.

**Prerequisite:** ETDD 1366.

**ETDD 2396. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new engineering design development topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010 and ETDD 1361.

**ETDD 3310. Product Design & Development. 3 Hours.**

This course explores the processes by which products are brought to the market place. Processes are examined with special emphasis placed on manufacturing, prototyping, patent and trademark procedures, industrial design, problem solving, and decision-making. In addition, creating and working in cross-functional teams to produce products for consumer use is addressed.

**Prerequisite:** Sophomore standing, ETDD 1390 or ETDD 1361.

**ETDD 3379. Industrial Systems Drafting. 3 Hours.**

This course includes the illustration and preparation of drawings and the related symbolism used in electrical and fluid fields. Related and required piping and fitting fundamentals are also covered.

**Prerequisite:** ETDD 1390 or ETDD 1361 and Sophomore standing.

**ETDD 4096. Directed Study. 1-6 Hours.**

Arranged professional and developmental learning experiences incorporating a practical application of design and development skills and practices. To include internships, individual research and industry studies. Variable Credit (1-6).

**Prerequisite:** Sophomore standing.

**ETDD 4339. Advanced Computer-Aided Drafting and Modeling. 3 Hours.**

This is a computer applications course for design and drafting and introduces students to the techniques used to produce technical models/drawings. Students will learn drafting practices and how to apply them using computer-aided software. Prior knowledge of drafting software and/or prior experience of working with computers is advantageous, but not required/expected. Students will produce technical drawings using various computer design and drafting practices. Concepts of 2D drawings will be covered along with an introduction to three dimensional parametric modeling. The intent is to develop fundamental knowledge and skills that are conceptually applicable to any computer-aided design (CAD) system.

**Prerequisite:** ETDD 1361 and Junior standing.

**ETDD 4369. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new engineering design development topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010, ETDD 1361, and Junior Standing.

**ETDD 4380. Material Hand & Plant Layout. 3 Hours.**

This course is the study of the basic requirements needed to develop the most efficient layouts of equipment and of operating and service facilities whether in manufacturing plants, warehouses, or other industrial or business applications. Special emphasis is on the necessary coordination between plant layout, materials handling, work simplification and production planning, and operation control. Junior standing.

**Prerequisite:** ETDD 1361.

**ETDD 4388. 3D Parametric Design. 3 Hours.**

This is a computer applications course for parametric design and drafting, in which the computer is used to produce parametric technical models/drawings. Students will learn drafting practices and how to apply them using computer aided software. Students will further be able to produce technical drawings using 3D CAD packages. Concepts of creating 2D drawings will be covered along with introduction to 3D parametric modeling. The course will enable the student to use Autodesk Inventor in advanced parametric design/drafting and other courses.

**Prerequisite:** ETDD 1390 or ETDD 1361.

## Engineering Technology

**ETEC 1010. Engineering Foundations. 1-2 Hours.**

This course focuses on leadership and study skills necessary for succeeding in the many career options available to professionals in industrial technology, business, and engineering education. Variable Credit (1 to 2).

**ETEC 1371. Descriptive Geometry. 3 Hours. [TCCN: ENGR 1304]**

This course emphasizes problems of space relations of points, lines, surfaces, intersections, and developed surfaces, and their application to the graphical solution of engineering problems.

**ETEC 2382. Manufacturing Processes. 3 Hours. [TCCN: ENGT 2310]**

Students examine a broad range of manufacturing processes with an emphasis on understanding manufacturing procedures and changes of physical properties of material during these processes. Topics may include forming and shaping processes, material removal processes, joining processes, casting and solidification processes, engineering metrology and instrumentation, and other aspects of manufacturing.

**ETEC 2396. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new engineering technology topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010.

**ETEC 3300. Technology Innovations. 3 Hours.**

This course provides a study of societal technologies and their effects on the daily lives of consumers. The course presents the pervasive nature of technology innovations and increases the awareness of the promises of uncertainty associated with the use of technology as a human enterprise. .

**Prerequisite:** ETEC 1010 and Sophomore standing.

**ETEC 3340. Solar and Wind Energy Systems. 3 Hours.**

This course will examine grid-connected and stand-alone solar photovoltaic and wind energy systems. System components including batteries, PV modules, charge controllers, maximum power point trackers, vertical and horizontal axis turbines, aerodynamics of wind turbines, wind farms and sighting, and inverters will be discussed. A comprehensive review of power production methods from solar and wind resources will be included, along with site surveying, commercial development, economics and environmental impacts.

**Prerequisite:** ETEE 1340 and Junior Standing.

**ETEC 3360. Related Sci Mth & Tech In Occ. 3 Hours.**

This is the written portion of an 18-hour segment of proficiency examinations. Consent of department chair.

**Prerequisite:** Sophomore standing.

**ETEC 3361. Related Science, Mathematics, and Technology in Occupations. 3 Hours.**

This is the written portion of an 18-hour segment of proficiency examinations.

**Prerequisite:** Consent of department chair.

**ETEC 3362. Manipulative Skills In Occupptn. 3 Hours.**

This segment is for the manipulative portion of the proficiency examination. Consent of department chair.

**Prerequisite:** Sophomore standing.

**ETEC 3363. Manipulative Skills in Occupations. 3 Hours.**

This segment is for the manipulative portion of the proficiency examination.

**Prerequisite:** Consent of department chair.

**ETEC 3364. Rel Subj In Occupptnl Pers Qual. 3 Hours.**

This is the oral portion of the proficiency examination. Consent of department chair.

**Prerequisite:** Sophomore standing.

**ETEC 3365. Related Subjects in Occupations and Personal Qualifications. 3 Hours.**

This is the oral portion of the proficiency examination.

**Prerequisite:** Consent of department chair.

**ETEC 3367. Engineering Materials Techn. 3 Hours.**

This course consists of the principles and techniques involved in designing and drawing machine parts and other items normally required in an industrial setting. Topics include sectioning, dimensioning, view rotation, symbols, legends, developments, and blueprint details. Junior standing.

**Prerequisite:** ETDD 1390 or ETEC 1361.

**ETEC 3374. Time And Motion Study. 3 Hours.**

A study of the principles of motion economy, work measurement and improvement of production methods as they apply to modern industry. Attention is given to human relations, work simplification, and selected charting procedures.

**Prerequisite:** Sophomore standing.

**ETEC 3375. Statics. 3 Hours.**

This course examines qualitative and quantitative treatments of forces and moments. Designing trusses, constructing free body diagrams, and performing equilibrium analysis for coplanar systems are included.

**Prerequisite:** PHYS 1301, PHYS 1101, and MATH 1316 or MATH 1430 or MATH 2399.

**ETEC 3376. Microcontroller Applications. 3 Hours.**

This course introduces microcontroller architecture and microcomputer systems, including memory and input/output interfacing. Topics include low-level language programming, bus architecture, I/O systems, interrupts, and other related topics. The functional and technological characteristics of microcontroller structures, memory components, peripheral support devices, and interface logic will be examined. Various hardware configurations and interfacing techniques will be discussed.

**Prerequisite:** ETEE 1340 and ETEE 2320 and Junior Standing or Consent of Instructor.

**ETEC 4096. Directed Study. 1-6 Hours.**

Arranged professional and developmental learning experiences incorporating a practical application of engineering technology skills and practices. To include internships, individual research and industry studies. Variable Credit (1-6).

**Prerequisite:** Sophomore standing.

**ETEC 4099. Engineering Innovation. 1-3 Hours.**

In this course, students work closely with faculty to design, develop, and implement innovative engineering projects as part of their capstone experience. Variable credit 1-3.

**Prerequisite:** Faculty Approval.

**ETEC 4340. Alternative Energy Technology. 3 Hours.**

This course examines existing and potential ambient alternative energy sources, production capacities, energy harvesting, conversion, and storage techniques. The course will also examine fundamental concepts, terminology, definitions, and nomenclature common to all energy systems.

**Prerequisite:** ETEE 1340.

**ETEC 4350. Utilities Project Management. 3 Hours.**

Students examine key energy and industry utility competencies including project management, bidding and negotiation, technical job execution, and safety management. This class is designed to immerse students into the field of Engineering, Procurement, and Construction (EPC), through real projects from the industry.

**Prerequisite:** Junior standing and consent of instructor.

**ETEC 4369. Spec Topics in Industrial Tech. 3 Hours.**

Individual study in specialized areas of Industrial Technology. To be directed and approved by the Industrial Technology advisor. This course is designed to be a multitopic course. The student can take the course under various special topics being offered. Sophomore standing.

**Prerequisite:** Approval of faculty, program coordinator and chair.

**ETEC 4376. Strength of Materials. 3 Hours.**

This courses focuses on the analysis of stresses, strains, deflection, and deformation in bodies under the action of loads. Topics include statically indeterminate axially loaded members, thermal deformation, distribution of bending and shearing stresses in beams, stress and shear flow formulas, combined stresses and Mohr's circle, torsion on a circular shaft, empirical column formulas, and bolted joint failures.

**Prerequisite:** ETEC 3375.

**ETEC 4378. HVAC Systems. 3 Hours.**

Students study the concepts of heating, refrigeration, and air conditioning technology and associated systems. Topics may include heat transfer, controls, electric motors, refrigeration and air-conditioning, chilled-water systems, domestic and commercial Heating, Ventilation, and Air Conditioning (HVAC) systems. Hardware and equipment such as condensers, compressors, evaporators, and expansion devices, as well as safety, tools, equipment, and shop practices may also be discussed.

**ETEC 4384. Supervisory Personnel Practice. 3 Hours.**

This course introduces students to the principles of management as pertaining to personnel. Responsibilities of management, industrial economics, supervisory information, training, group dynamics, work simplification, labor and human relations, working conditions, morale, motivation, and mental health are covered.

**Prerequisite:** ETEC 1010 or Junior standing.

**ETEC 4390. Directed Studies. 3 Hours.**

Designed to provide students with the opportunity to gain specialized experience in one or more of the following areas: internship, laboratory procedures, individualized study, innovative curricula, workshops, specialized training schools, and seminars. Internship is required of all teacher education majors. May be repeated or taken concurrently to a maximum of 9 hours. Faculty, Program Coordinator and Chair approval required.

**Prerequisite:** Sophomore standing.

**ETEC 4391. Work Base Mentorship. 3 Hours.**

Students work in their specialization in the industry. Students may complete their internship in one or two semesters. Students must work 100 clock hours for 1 college credit. Faculty, Program Coordinator and Chair approval required.

**Prerequisite:** Junior standing.

**ETEC 4399. Senior Design. 3 Hours.**

Students learn advanced topics and gain hands-on skills in engineering technology fields while working in team environments. Topics and activities may include design and implementation processes, application of project management that culminates with analysis, drawings, installation or prototype, and testing of a significant project. Presentation and technical reports are required.

**Prerequisite:** Senior Standing.

## Electronics Technology

**ETEE 1340. Introduction to Circuits. 3 Hours. [TCCN: ENGT 1401]**

This course is designed to provide fundamental understanding of electronics in DC circuits. Emphasis is on knowledge and application of electrical safety, power generation, metering instruments and circuit analysis. Laboratory experiences include hands-on circuit construction and basic troubleshooting.

**ETEE 2320. Circuits and Systems. 3 Hours. [TCCN: ENGT 1402]**

This course is an in-depth study of the electronic principles associated with AC circuits. Topics of study include network theorems, circuit analysis methods, resonance, filters and frequency responses of reactive circuits.

**Prerequisite:** ETEE 1340 or consent of instructor.

**ETEE 2396. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new electrical and electronics technology topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010 and ETEE 1340.

**ETEE 3313. Industrial Robotics. 3 Hours.**

Students learn and apply the knowledge of industrial robotics hardware and software to integrate automation in manufacturing. Laboratory experience includes hands-on programming of a robotic arm and various troubleshooting techniques. Completion of this course helps prepare students for a robotics certification.

**Prerequisite:** ETEE 1340.

**ETEE 3345. Digital Electronics. 3 Hours.**

This course is a study of the principles and applications of digital logic circuits including logic gates, counters, shift registers, and combinational logic circuits. Laboratory experiences consist of experimental problems.

**Prerequisite:** ETEE 1340, ETEE 2320, and ETEE 3350.

**ETEE 3350. Analog Electronics. 3 Hours.**

This course is designed to provide in-depth knowledge and experience in the principles and applications of solid-state devices. Specific emphasis is placed on the construction, characteristics and applications of diodes, rectifiers, transistors, thyristors and integrated circuits. Laboratory experience is gained through circuit construction, testing and troubleshooting.

**Prerequisite:** ETEE 2320 or consent of instructor.



**ETEE 3360. Electrical Power & Machinery. 3 Hours.**

Students learn single and polyphase circuits, DC machines, AC single and polyphase synchronous and induction machines, power transformers, and are introduced to smart-grid power systems with renewable energy resources. This course includes a laboratory and requires the completion of projects.

**Prerequisite:** ETEE 2320.

**ETEE 3373. Control Systems Technology. 3 Hours.**

The principles and operation of electrical switching, timing and control devices are studied with emphasis on industrial solid state and digital controls. Topics of coverage include servomechanisms, transducers, motor control systems and closed-loop industrial systems. Sophomore standing.

**Prerequisite:** ETEE 2320 and ETEE 1340.

**ETEE 4096. Directed Study. 1-6 Hours.**

Arranged professional and developmental learning experiences incorporating a practical application of electronics technology skills and practices. To include internships, individual research and industry studies. Variable Credit (1-6).

**Prerequisite:** Sophomore standing.

**ETEE 4351. Automation & Control Systems. 3 Hours.**

This course explores the concepts of automation, electrical control systems, and programmable logic controllers. Topics may include principles of control system operations, numbering systems as applied to electrical controls, types of programmable logic controllers and their operation, equipment interfacing, and ladder logic programs. Application-oriented laboratory experiments and design problems are used to enhance students' knowledge and skills.

**Prerequisite:** ETEE 3350.

**ETEE 4352. Instrumentation & Interfacing. 3 Hours.**

This course focuses on computer-aided instrumentation and interfacing. Topics include real-time industrial data acquisition hardware and software, sensors, signal conditioning, and the design of data acquisition systems using software tools.

**Prerequisite:** ETEE 1340, ETEE 2320, and ETEE 3350.

**ETEE 4355. Electronic & Digital Communication. 3 Hours.**

Students learn fundamental technologies and advanced concepts for electronic and digital communications. Topics include propagation, AM/FM modulation/demodulation, receivers/transmitters, antennas, digital coding, wire and wireless communications, and other related subjects.

**Prerequisite:** MATH 1420 and ETEE 3350.

**ETEE 4369. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new electrical and electronics technology topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010, ETEE 1340, and Junior Standing.

**ETEE 4375. Digital VLSI Design and Field Programmable Gate Arrays. 3 Hours.**

Students design and build a digital system, such as a CMOS integrated circuit. Topics include CMOS transistor operation, manufacturing process for CMOS VLSI chips, implementation of logic gates in CMOS, specifically layout, design rules, and circuit families. Students also learn advanced digital circuit design techniques for analyzing and optimizing timing and power at the circuit level, synthesis, timing analysis, functional verification, design-for-test, and layout with the aid of CAD, and FPGA/VHDL tools.

**Prerequisite:** ETEE 3345 and ETEE 3350.

## Mechanical Engineering Tech

**ETME 2305. Engineering Analysis Methods. 3 Hours. [TCCN: MATH 2414]**

Students learn modeling and analysis of engineering systems that contain mechanical, electrical, thermal, and fluid components. Both steady and dynamic state models involving applications of analysis tools such as integration, differentiation, matrices, and statistics will be introduced.

**Prerequisite:** ETEC 1010 and MATH 1420.

**ETME 3376. Engineering Dynamics. 3 Hours.**

Students learn engineering mechanics regarding the motion of bodies under the action of forces. Topics may include kinematics, force-momentum formulation for systems of particles and rigid bodies in planar motion, work-energy concepts, virtual displacements and virtual work, Lagrange's equations for systems of particles, linearization of equations of motion, and free and forced vibration in mechanical systems.

**Prerequisite:** MATH 1420, PHYS 1301, and PHYS 1101.

**ETME 3378. Applied Fluid Mechanics. 3 Hours.**

Students learn principles of fluid mechanics, including both statics and dynamics, and their application to engineering systems. Topics may include properties of fluids, viscosity of fluids, pressure measurement, forces due to static fluid, buoyancy and stability, the Bernoulli equation, Reynolds number, various pipeline systems, selection and application of pumps, and flow measurements.

**Prerequisite:** ETME 2305 and PHYS 1411.

**ETME 4376. Applied Thermodynamics. 3 Hours.**

Students learn the fundamentals of gas concepts, gas measuring devices, and calibration of measuring instruments. Topics may include vapor and gas cycles, ideal gas mixtures, reading of psychrometric charts, determining fuel combustion efficiency of a steam generating system, and measuring or analyzing humid air and steam conditions including heat content. Concepts of Rankine cycle as the basis for steam and heat engine operations will also be discussed.

**Prerequisite:** ETME 3378.

**ETME 4385. Mechanical Design. 3 Hours.**

Students learn advanced modeling, design, and integration of machine elements such as bearings, springs, gears, and cams. Hands-on laboratory experiences and design projects are part of the class wherein students disassemble machines, model, design, build, and test mechanical systems that are relevant to industrial applications.

**Prerequisite:** ETDD 1361, ETME 2305, and ETME 3376.

## Safety Management

**ETSM 2310. Intro. to Occupational Safety. 3 Hours.**

Students study safety and health issues and practices at work. Topics may include how and why accidents happen, what the total costs of accidents are, and how to use the risk management approach to achieve safety. Students are introduced to the concepts of reactive versus proactive practices and their role in creating sustainable businesses that protect both people and the environment. Safety-related governmental standards and various careers in safety are also examined.

**ETSM 2396. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new safety management topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010.

**ETSM 3323. Construction Safety. 3 Hours.**

Students learn to manage the safety and compliance responsibilities of construction projects. Students examine the most current Occupational Safety and Health Administration (OSHA) standards for construction and essential safety topics beyond general standards, such as accident-causation theories and ethics of construction safety.

**Prerequisite:** Junior standing or Instructor approval.

**ETSM 3363. Safety Program Management. 3 Hours.**

This course presents an in-depth examination of the concepts, methods, and techniques involved in safety program management. Emphasis will be placed on the development of safety management programs for the industrial and construction industries. The strengths and weaknesses of existing safety programs, performance management techniques, behavior-based safety, design safety, legal aspects of safety and health management, and emerging trends in safety and health management will be covered.

**Prerequisite:** Junior standing.

**ETSM 3371. Safety Risk Assessment & Mgmt. 3 Hours.**

Students examine concepts, methods, and techniques involved in safety risk management. Emphasis is placed on the development of safety programs for the industrial and construction industries. Topics may include an overview of risk management processes, attributes, and disciplines; identification tools; analysis and evaluation; communication; risk analysis approach; and assessment framework.

**Prerequisite:** Junior Standing and MATH 3379 and ETEC 1010 and MATH 1314 or MATH 1410 or MATH 1420.

**ETSM 3372. Occupational Safety Standards. 3 Hours.**

Students examine the Occupational Safety and Health Act (OSHA), its rules, and the legal duty to comply with them. Topics may include record keeping, employers' and employees' rights, hazard communication, inspection and investigation, and criminal enforcement of violations. Contesting citations, judicial review of enforcement actions, and ethics in safety at the workplace may also be reviewed.

**Prerequisite:** ETEC 1010 and ETSM 3386 or ETSM 2310.

**ETSM 3380. Accident Investigation & Analysis. 3 Hours.**

Students explore aspects of safety analysis needed for accident investigation. Activities include examining theory of accident investigation; gathering, analyzing, and reporting data; and developing safety recommendations and corrective actions to prevent future accidents. Students apply analytical techniques of accident investigation to understand the strengths and limitations of these techniques.

**Prerequisite:** ETSM 3371.

**ETSM 3382. Issues In Nanotechnology Safty. 3 Hours.**

This course introduces students to the emerging technological frontier of nanotechnology. Areas of study will include: potential health concern, potential safety hazards, exposed control procedures occupational health surveillance, and research in the area of safety management for future nanotechnology workers.

**Prerequisite:** ETEE 1340, ETDD 1361 and Sophomore standing.

**ETSM 3386. Industrial Safety. 3 Hours.**

This course is a study of the problems involved in developing an integrated safety program for an industrial or commercial establishment. It involves safety education, safe worker practices, recognition and elimination of health hazards, machinery guards, in-plant traffic, material handling and emergency treatment for industrial accidents.

**Prerequisite:** ETEC 1010 and Junior standing.

**ETSM 4096. Directed Study. 1-6 Hours.**

Arranged professional and developmental learning experiences incorporating a practical application of safety management skills and practices. To include internships, individual research and industry studies. Variable Credit (1-6).

**Prerequisite:** Sophomore standing.

**ETSM 4313. Industrial Hygiene. 3 Hours.**

Students explore the field of industrial hygiene, including the chemical, physical, and biological agents that affect the health and safety of employees. Students learn procedures for measuring and controlling various agents, threshold limit values for these agents, and concepts regarding occupational health toxicology.

**Prerequisite:** CHEM 1411 and MATH 1410 or MATH 1314 or MATH 1324 or consent of instructor.

**ETSM 4335. Human Factors & Ergonomics. 3 Hours.**

Students learn the foundations of human-centric engineering to design products, processes, and systems to optimize human well-being and overall system performance. Students apply principles of anthropometrics, the musculoskeletal system, biomechanics, psychophysics, work physiology, and engineering safety to common problems faced by safety professionals in work and systems design. Emphasis is on design and analysis of occupational systems and consumer products.

**Prerequisite:** MATH 1314 or MATH 1316 and Junior standing.

**ETSM 4345. Industrial Fire Safety. 3 Hours.**

Students learn to incorporate fire hazard awareness and protection into safety management plans. Topics may include fire prevention methods, extinguishment, detection, hazards, fire behavior, fire causes, types of building materials, structural features, flame spread, room/building occupancy, fire load, and inspection techniques.

**Prerequisite:** CHEM 1411 and PHYS 1301.

**ETSM 4369. Special Topic. 3 Hours.**

This course of faculty-led study is designed to provide exposure of undergraduate students to new safety management topics and concepts in a course setting. This course is designed to be a multi-topic course. The student can take the course under various special topics being offered.

**Prerequisite:** ETEC 1010 and Junior Standing.

**ETSM 4375. Safety Hazard Mitigation. 3 Hours.**

Students learn concepts, methods, and techniques involved in creating industrial and manufacturing facilities more resilient to the impacts of hazards. The students are provided with the tools to develop safety programs emergency managers can use to reduce the impact of different types of hazards. Emphasis is placed on mitigation, preparedness, resilience, measurement, and vulnerability. Topics may include risk management and communication, practical approaches, and assessment frameworks.

**Prerequisite:** ETSM 3371.

**ETSM 4377. Environmental Safety Mgmt. 3 Hours.**

Students examine the principles of effective environmental safety management systems. Laws and regulations that protect our environment and human health are studied. Topics may include hazard communication (HAZCOM) and hazardous waste operations (HAZWOPER). Students may also examine the roles of the Occupational Safety and Health Administration (OSHA), the U.S. Department of Transportation (DOT), and the Environmental Protection Agency (EPA).

**Prerequisite:** ETSM 3372.

**ETSM 4379. Emergency Management at Work. 3 Hours.**

Students learn a hands-on approach to emergency management and contingency planning in different work environments. Emphasis will be placed on key partnerships among all levels of government as well as those among the public and private industrial sectors. The topics may include physical and chemical hazards and biohazards, personal training, holistic planning, medical surveillance, personal protective clothing and equipment, hazard and risk reduction strategies, decontamination, related scientific data and information management.

**Prerequisite:** ETSM 3371.

## Industrial Education

**INED 4310. Occup. Human Relations in CTE. 3 Hours.**

This course is designed to prepare the student to develop interpersonal skills and a better understanding of working relationships with people.

**INED 4363. Preparation Of Instructnal Mtr. 3 Hours.**

This course is designed to prepare a student in the selection, development, organization, and effective use of instructional materials in Industrial Education classes. It involves the study of types, values, limitations and sources of instruction sheets and other teaching aids.

**INED 4364. Teaching in Schools & Industry. 3 Hours.**

A study of the objectives and the selection, organization and presentation of the subject matter of the various areas of Industrial Education including the organization of units of work, and demonstration teaching.

**Prerequisite:** Junior standing.

**INED 4379. Occupatnl Analysis & Curr Dvlp. 3 Hours.**

This course is designed to enable a student to analyze trades, occupational pursuits and jobs for divisions, operations and information in order to develop a curriculum compatible to his/her teaching field.

**INED 4391. Lab Mgt, Organization & Control. 3 Hours.**

This course is designed to prepare students to successfully manage laboratory activities, organize their labs in accordance with contemporary concepts, and to control materials/supplies within their laboratories.

**Prerequisite:** Junior standing or consent of instructor.

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