

INDUSTRY AND TECHNOLOGY (ITEC)

ITEC 101: 3 s.h.

Introduction to Engineering (G2)

This course engages learners in using scientific and mathematical reasoning to explore and engage in engineering design, covers the fundamentals of the engineering design process, and exposes students to a wide range of career paths available to engineers, including engineering, applied engineering, and engineering technology areas. In this course, students will follow the creativity-based engineering design process through laboratory-based activities. Students will design and manufacture physical artifacts to meet a specific engineering challenge, and must defend their decisions with scientific and mathematical reasoning. This course focuses on how engineers apply their creativity, resourcefulness, mathematical, scientific and technical knowledge and skills in the creation or refinement of technological products/systems.

ITEC 110: 3 s.h.

Communication/Info Systems

Communication technology to design, compose, send, receive and understand ideas and information. Emphasis on graphic and electronic media. Experiences with graphic design, graphic reproduction, desktop publishing, web-page development, photography, and digital video and audio. 2 hrs. lec., 3 hrs. lab. Offered fall, spring.

ITEC 120: 3 s.h.

Energy & Power Systems

An introduction to energy and power systems. Principles of conventional and alternative energy resources and energy conservation, and electrical, fluid, and mechanical power will be studied along with environmental concerns associated with power production. 2 hours lecture, 3 hours lab.

ITEC 130: 3 s.h.

Prod Materials and Process

The integration and interrelationships of materials and processes for construction and manufacturing, including the application of math and scientific principles and the technological impacts on industry and society. Requires experiences in materials processing and production tooling. 2 hrs. lec., 3 hrs lab. Offered fall, spring.

ITEC 140: 3 s.h.

Bio-related Technologies

Agriculture, medicine and other technologies in which living organisms are used to solve problems and modify products and systems. Includes problem solving, design and research activities for understanding biorelated technologies, issues and impacts. 2 hrs. lec., 3 hrs. lab. Reserved for EDTE majors. Offered fall, spring.

ITEC 140H: 3 s.h.

Hon: Bio-Related Tech

ITEC 179: 3 s.h.

Experimental

Experimental

ITEC 241: 3 s.h.

Drafting Communications

Introductory technical sketching, conventional drafting and computer-aided drafting (CAD). Experiences with equipment use and care, lettering, geometric constructions, multiview projection, dimensioning, sectioning and pictorial representation. 2 hrs. lec., 3 hrs. lab. Offered fall, spring.

ITEC 243: 3 s.h.

Tech Sketching/Design/Rendrng

Freehand sketching and basic elements of two-dimensional design and rendering. Various sketching and shading techniques are developed. Elements and principles of design, methods of designing, and evaluation and design of products are included. An application software is used to render design sketches. 2 hrs. lec., 3 hrs. lab.

ITEC 251: 3 s.h.

Print Media Systems

Contemporary resources, processes and impacts of graphic reproduction. Emphasis on workflows relative to offset lithography, flexography, gravure, digital printing and screen printing. Covers graphic design; digital-image composition; digital photography; scanning; prepress, press and postpress production. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: ITEC 110 or ART 244 or COMM 201 or by permission.

ITEC 252: 3 s.h.

Web Publishing Systems

Planning, creating, and publishing of web media. Topics include information design, optimization of graphic and audio files, navigation systems and website technologies. Multimedia authoring software will be utilized to produce and publish websites that include digital animations and interactive forms. 2 hrs. lec., 3 hrs. lab. Prereq: ITEC 110 or permission of instructor.

ITEC 261: 3 s.h.

Electronic Systems

Survey of electricity and electronics, including typical direct current and alternating current applications, safe practices and technological impacts. Experiences include breadboarding, design and problem solving, use of test equipment and electronic project assembly/troubleshooting. 2 hrs. lec., 3 hrs. lab. Offered fall, spring.

ITEC 261H: 3 s.h.

H:Electronic Systems

ITEC 262: 3 s.h.

Semiconductor Electronics

In-depth study of semiconductor theory, including diodes, transistors and silicon-controlled rectifiers. Emphasizes digital, linear and hybrid integrated circuits. Covers surface mount and emerging technologies, such as nanotechnology and biotechnology. Practical applications include prototyping circuits, design and problem solving, use of test equipment and troubleshooting. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: ITEC 261 or permission of instructor.

ITEC 271: 3 s.h.

Nonmetallic Materials

Various nonmetallic materials, processes, products and impacts, including polymers, ceramics, wood, clay, composites and glass. Instruction and experiences provided on safety and the use of tools and machines associated with nonmetallics. Includes production activities in each of the specified nonmetallic material areas. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: ITEC 130.

ITEC 279: 3 s.h.

Experimental

ITEC 279

ITEC 281: 3 s.h.**Metallic Materials & Prod Mthd**

Examination of metallic materials, including their structures, properties and the processes used to convert them into products. Particular attention is paid to the relationship between microstructural characteristics, physical and mechanical properties and production methods. Connections are made between the properties of metals and their applications. Laboratory experiences include manual and automated production techniques, conditioning processes and characterization methods to quantify process-property-performance relationships. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: ITEC 130.

ITEC 300: 3-12 s.h.**Co-Op Ed Experience in ITEC**

Co-Op Ed Experience in ITEC

ITEC 301: 3 s.h.**Technology and Humans (P)**

Analysis of the development of technology and its impact on humans and a realization of the importance of human technological behavior on the environment, social/cultural systems and the future. Students use analytical skills on a written independent research project and oral skills to present and defend positions on technological problems facing our society. Prereq: COMM 100, ENGL 110 and junior class standing.

ITEC 301H: 3 s.h.**Hhrs:Technology and Humans (P)**

Hhrs:Technology and Humans

ITEC 302: 3 s.h.**Futurology (P)**

A nontechnical interdisciplinary course to help students identify and analyze forces causing technological and social change. Using an understanding of the processes of technological and social change and research techniques for forecasting the future, students complete a written independent research project. Develops skills to project future technological and social developments and their impacts. Offered periodically. Prereq: COMM 100, ENGL 110 and junior class standing.

ITEC 302H: 3 s.h.**H: Futurology (P)****ITEC 303: 3 s.h.****Tech Assessmnt:Amish and Others (D, P)**

A nontechnical course designed for all students to help learners analyze the use of technology, with focus on Anabaptists (particularly Amish, Old Order Mennonites and certain Brethren groups) of Lancaster County. Contrasting the way these groups assess and use technology with that of their own culture will allow students to better understand their own approach to technology. Students will develop their own technology-assessment system based on independent research. Offered in summer. Prereq: COMM 100, ENGL 110 and junior class standing.

ITEC 303H: 3 s.h.**H:Tech Assessmnt:Amish/Others (D, P)****ITEC 304: 3 s.h.****Energy, Sustainability & Envir (P)**

A non-technical course for all students dealing with energy sustainability, energy resources and conservation, and the effects of energy use on our environment. This course contains up-to-date information on essential subjects such as solar energy, wind energy, nuclear energy and energy conservation. Contemporary alternatives such as photovoltaic electricity and wind power generation will be addressed. Individual transportation to field sites is required (discuss with instructor before registering for class if this is an issue). Prereq: COMM 100, ENGL 110, MATH 100 or higher and Junior class standing.

ITEC 322: 3 s.h.**Transportation & Robotics**

Includes the application of scientific and mathematical principles to the solution of land, air, space, and/or water transportation challenges. Incorporates the investigation of a variety of robotics and control systems with emphasis on computational thinking. 2 hours lecture, 3 hours lab. Prerequisites: ITEC 120, ITEC 261, Math 100 or higher

ITEC 325: 3 s.h.**Power Conversion and Control**

Electric motors as conversion devices explored. Experiences include designing, creating and testing fluid and electrical energy conversion circuitry to perform specific control applications. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: ITEC 120 or 261.

ITEC 326: 3 s.h.**Fluid Power**

Investigation of scientific, mathematical and technological principles. Experiences with the design, creation, use and repair of hydraulic and pneumatic systems. A research and development activity required. 2 hrs. lec., 3 hrs. lab. Offered annually. Prereq: ITEC 120 or 325.

ITEC 327: 3 s.h.**Engineering Structures**

Students will design, construct, and evaluate model structures. Emphasis is placed on the use of science, technology, engineering, and mathematical (STEM) principles as they relate to structures. 2 hours lecture, 3 hours lab. Prerequisites: ITEC 120, 130, 241, and Math 100 or higher.

ITEC 331: 3 s.h.**Construction Technology 1**

Utilization of materials for the construction of residential and light commercial structures. Includes the effects of these changes on people and their environment. 2 hrs. lec., 3 hrs. lab. Offered spring. Prereq: ITEC 271 or permission of instructor.

ITEC 332: 3 s.h.**Construction Technology 2**

Methods, materials and processes employed in heavy and industrial construction technologies. Includes field-engineering techniques, equipment, civil engineering fundamentals and use of modeling and simulation techniques. Emphasis given to construction projects such as bridges, roads, industrial and commercial buildings, utilities, tunnels and dams. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 271 or permission of instructor.

ITEC 342: 3 s.h.**Cmptr-Aided Engineering Drawng**

Advanced study of threads, gears and standard fasteners; geometric dimensioning and tolerancing (GD&T); schematic, production and assembly drawings; and introduction to solids modeling. Builds on view orientation, projection systems and basic CAD. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: ITEC 241.

ITEC 344: 3 s.h.**Product Design**

An exploration of the thinking processes, problem solving strategies, documentation techniques, and making skills used by designers toward creating new products. The use of the elements and principles of design, aesthetics, ergonomics, and social/cultural considerations as tools toward designing for manufacture, designing for sustainability, and universal design are emphasized. Other topics explored include the role of human emotion toward design and design's influence on human history.

ITEC 344H: 3 s.h.**Hhrs: Product Design****ITEC 345: 3 s.h.****Statics/Strength of Materials**

Elementary, analytical and practical approaches to the principles and physical concepts of statics. Covers force systems; equivalent force/moment systems; distributed forces; internal forces; principles of equilibrium; application to trusses, frames and beams; stress and strain; and mechanical properties of materials. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 241 and MATH 151, 160 or 161; or permission of instructor.

ITEC 346: 3 s.h.**Architectural Drawing**

Study of principles of residential design and architectural styles with an emphasis on the development of a complete set of original working and presentation drawings using computer-aided design (CAD) and Building Information Modeling (BIM). 2 hours lecture, 3 hours lab. Prerequisite: ITEC 241.

ITEC 347: 3 s.h.**Engineering Visualization**

Students study the relationships of three-dimensional lines, angles, surfaces, and solids by projecting three-dimensional reality onto a two-dimensional surface such as a computer screen. The students gain the necessary tools and principles to graphically visualize, manipulate, and solve engineering and architectural design problems. Traditionally these problems were solved by doing mathematical calculations. In contrast, this class uses descriptive geometry to solve three-dimensional spatial problems graphically. The computer is used as the main drafting tool. Engineering visualization extends beyond the principles of descriptive geometry. Students use visualization techniques and spatial reasoning to solve fundamental engineering concepts and related problems, represent their design proposals, view the 3D environment from any angle using a flying camera, and support their spatial, numeric, algebraic and quantitative thinking. 2 hrs. lec., 3 hours lab. Prereq: ITEC 241.

ITEC 348: 3 s.h.**Green Buildings**

This course covers fundamentals of green buildings and sustainable energy technologies and their dynamic costs and benefits. Green buildings are designed and constructed to maximize the energy efficiency of the envelope and provide superior quality in the indoor environment. This course allows students to explore the integration of design principles and application of renewable energy, natural building materials, and ecological landscape into building design and community development. Pre-requisite: MATH 130 and ITEC 241

ITEC 351: 3 s.h.**Digital Imaging**

Create digital images using cameras and scanners. Set up and characterize a digital workstation and produce digitally imaged products. Hands-on activities will require students to demonstrate their proficiency using contemporary hardware and software to compose, capture, convert, color and tonal correct, manipulate and print digital images and products. 2 hrs. lec., 3 hrs. lab. Offered annually.

ITEC 355: 3 s.h.**Contemporary Printing**

Advanced study of today's major printing processes, especially offset and screen. Experiences include layout and design, computerized electronic composition, copy preparation, line and halftone photography, special-effects photography, exposure unit calibration, image assembly, platemaking, printing and finishing complex graphic products. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 251.

ITEC 356: 3 s.h.**Desktop Publishing (W)**

Utilization of desktop microcomputer systems to design, compose and publish graphic materials. A research and development activity required. 2 hrs. lec., 3 hrs. lab. Prereq: ENGL 110.

ITEC 357: 3 s.h.**Packaging Specialty Printing**

In-depth study of problems and processes related to printing and converting in package, label and specialty printing. Students study and experience package design structures, materials flexographic printing, screen container printing, converting methods and bar code applications. Current industry practices explored. 2 hrs. lec., 3 hrs. lab. Prereq: ITEC 241 and 251; or ART 348.

ITEC 357H: 3 s.h.**Hon: Packaging Spec Prnting****ITEC 364: 3 s.h.****Digital Electronics**

Practical applications of digital logic for processing electronically encoded information. Covers numbering systems, logic design, basic gates, sequential and combination logic, and digital troubleshooting. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 262 or permission of instructor.

ITEC 375: 3 s.h.**Polymer and Ceramic Tech**

Design, development and production of polymer and ceramic products. Covers contemporary pattern and molding materials along with industrial forming processes. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 271.

ITEC 376: 3 s.h.**Woodworking Technology**

Use of hand tools and machine woodworking techniques to fabricate wood products. Covers technological problems and contributions of using wood in daily living. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 271.

ITEC 379: 3 s.h.**Experimental
Experimental**

ITEC 382: 3 s.h.**Automated Manufacturing**

A comprehensive experience in the design, programming and implementation of computer-controlled manufacturing processes. Emphasis is placed on understanding machine code, utilizing computer-aided design and manufacturing (CAD/CAM) software and identifying proper process controls to increase productivity and reduce cost. Laboratory experiences develop a combination of software and hardware competencies. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 130; and ITEC 241; and ITEC 271 OR 281 OR 342; or permission of instructor.

ITEC 392: 3 s.h.**Intro to Industrial Training (W)**

Techniques and procedures required to conceptualize, prepare, deliver and evaluate training programs. Includes experiences in preparing instructional media, presenting a unit of instruction and developing appropriate evaluation instruments. Offered fall, spring. Prereq: ENGL 110.

ITEC 400: 3-12 s.h.**Co-Op Ed Experience in ITEC**

Co-Op Ed Experience in ITEC

ITEC 425: 3 s.h.**Industrial Robotic Systems**

This course focuses on the study of industrial robotics and modern machine vision technology. Topics include the evaluation, justification, programming, safety, and integration of industrial robotic devices with machine vision systems. 2 hours lecture, 3 hours lab. Prerequisite: ITEC 325.

ITEC 427: 3 s.h.**Programmable Logic Controllers**

Focus on the integration and application of the programmable logic controller (PLC). Students design, construct and troubleshoot a variety of industrial control systems utilizing programmable logic controllers, networks, human-machine interfaces, variable frequency drives, control loops and sensors. A research and development component required. 2 hrs. lec., 3 hrs. lab. Prereq: ITEC 425; and MATH 151 or 161 or permission of instructor.

ITEC 433: 3 s.h.**Construction Project Management**

Methods, processes and information necessary to manage a construction project. Includes cost and risk control; developing and applying policies and procedures; subcontractor management; specifying and purchasing materials; scheduling; and contract development. Experiences include use of project-planning and cost-estimation software for development of a complete project plan. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 332 or permission of instructor.

ITEC 435: 3 s.h.**Manufacturing Enterprise**

Exploration of the technological and management processes for conceptualizing and manufacturing a product. Experiences with product engineering, production engineering, manufacturing management and enterprise operations in a student-centered learning environment. 2 hrs. lec., 3 hrs. lab. Offered periodically. Prereq: ITEC 110, 120, 130, 140, 241 and 271 or 281, and a major in technology education (TECE).

ITEC 448: 3 s.h.**Machine Tool Design**

Analysis, planning, design, construction and application of tools, methods and procedures necessary to increase manufacturing productivity. Integrated with machining and fabrication practices. 2 hrs. lec., 3 hrs. lab. Offered annually. Prereq: ITEC 342.

ITEC 455: 3 s.h.**R and D in Graphic Communicatns**

This course involves testing various components of the manufacturing processes involved in creating print and digital/web media. Typical activities will involve testing colorants (e.g., inks, toners, etc.) and substrates used in lithography, flexography, screen-printing and digital printing systems. Optimum conditions for specific printing methods will be determined through controlled testing and examination. Students may also propose to examine specific interrelationships between production procedures used in various digital media processes. The course will also cover color separation and reproduction, which includes the study of process color theory, desktop color separations and color reproduction. 2 hrs. lec., 3 hrs. lab. Prereq: ITEC 355 or permission of instructor.

ITEC 457: 3 s.h.**Print Prod Mgmt/Cost Estimatng**

A study of current topics and systems for setting printing production standards, cost estimating, production scheduling, job planning and the consideration of new equipment and technologies. Students will integrate the technical knowledge learned through previous graphics laboratory classes with other course work in management, marketing, science, business, etc., with a focus on how it all relates specifically to the printing production process. The course is structured to offer an overview in several areas of print production management, with emphasis on cost estimating and current printing industry topics. 2 hours lecture/3 hours lab. Prereq: ITEC 355 and MATH 130, or permission of instructor.

ITEC 466: 3 s.h.**Wireless Communication Systems**

This course utilizes both theory and applications related to wireless communications systems. Topics include amplitude modulation (AM) and frequency modulation (FM) as well as the principles of television broadcasting and reception systems. Transmission lines, antennas and wave propagation are also described. New applications include microwave, wireless telephony, satellite communications and Wireless Fidelity (WiFi™). A research and development activity is required. 2 hrs. lec., 3 hrs. lab. Prereq: ITEC 262 or permission of instructor.

ITEC 467: 3 s.h.**Mobile Robotics**

Study of the development of mobile robotic solutions. Emphasis is placed on the programming and interfacing of microcontrollers to control autonomous mobile robots in known environments. A research and development activity is required. 2 hrs. lec., 3 hrs. lab. Prereq: ITEC 262 or permission of instructor.

ITEC 479: 3 s.h.**Experimental**

ITEC 485: 3 s.h.**Adv Manufacturing Systems**

Computer-integrated manufacturing (CIM) systems, strategies and implementation across the manufacturing enterprise. Focus on the integration of systems such as design of products; computer-aided engineering (CAE); the control of quality, design and construction of production tooling, rapid prototyping, computer-aided process planning (CAPP), finite element analysis (FEA), computer-aided design (CAD), computer-aided manufacturing (CAM) and computer numerical control (CNC). Manufacturing, automation and robotics emphasized. Advanced-level production experiences with an intensive research and development component required. 2 hrs. lec., 3 hrs. lab. Offered periodically.

ITEC 489: 1-4 s.h.**Honors Course**

Preparation of honors thesis proposal. For the definition of honors course and student eligibility, refer to the departmental honors section of this catalog. EDTE, AETM and OSEH majors may enroll in the Department of Applied Engineering, Safety & Technology honors program. Contact the department office for guidelines and an application.

ITEC 492: 3 s.h.**Technical Entrepreneurship**

A capstone Applied Engineering & Technology Management course in which students study and apply technical, managerial, and entrepreneurial concepts to the development and operation of a student-centered venture. Students organize and operate a model enterprise to develop manufacture and market a consumer product.

ITEC 494: 3 s.h.**Total Quality Management**

The history and development of quality movements; factors influencing the total quality concept; the scope of modern quality systems; management organization and strategies for quality; engineering technology for quality; and statistical tools for measurement and monitoring of quality. 2 hrs. lec., 3 hrs. lab. Offered fall, spring. Prereq: MATH 130 or permission of instructor.

ITEC 498: 1-4 s.h.**Independent Study**

See Independent Study section of this catalog. Written permission of faculty sponsor and department chairperson required.

ITEC 499: 1-4 s.h.**Departmental Honors (W)**

Completion and defense of thesis research. See departmental honors section of this catalog. Contact the Department of Applied Engineering, Safety & Technology office for guidelines.

ITEC 500: 3-12 s.h.**Co-Op Ed Experience in ITEC**

Co-Op Ed Experience in ITEC

ITEC 515: 3 s.h.**Adv Prob:**

Resources, processes and outcomes of selected technical areas in technology education. Technical area emphasized (e.g., computer-aided drafting and design, computer numerical control, desktop publishing, digital electronics, manufacturing, photography and robotics) varies with the course offering. Laboratory experiences focus on technological problem solving. 2 hrs. lec., 3 hrs. lab.

ITEC 525: 3 s.h.**Adv Prob:**

Resources, processes and outcomes of selected technical areas in technology education. Technical area emphasized (e.g., computer-aided drafting and design, computer numerical control, desktop publishing, digital electronics, manufacturing, photography and robotics) varies with the course offering. Laboratory experiences focus on technological problem solving. 2 hrs. lec., 3 hrs. lab.

ITEC 535: 3 s.h.**Adv Prob:**

Resources, processes and outcomes of selected technical areas in technology education. Technical area emphasized (e.g., computer-aided drafting and design, computer numerical control, desktop publishing, digital electronics, manufacturing, photography and robotics) varies with the course offering. Laboratory experiences focus on technological problem solving. 2 hrs. lec., 3 hrs. lab.

ITEC 579: 3 s.h.**Experimental**

Experimental

ITEC 586: 1-3 s.h.**Special Topics:**

Investigation of one or more topics of current interest in technology and innovation. Topics vary according to needs and interests of students and faculty involved. Offered periodically.

ITEC 587: 1-3 s.h.**Special Topics:**

Investigation of one or more topics of current interest in technology and innovation. Topics vary according to needs and interests of students and faculty involved. Offered periodically.

ITEC 588: 1-3 s.h.**Special Topics:**

Investigation of one or more topics of current interest in technology and innovation. Topics vary according to needs and interests of students and faculty involved. Offered periodically.

ITEC 589: 1-3 s.h.**Special Topics:**

Investigation of one or more topics of current interest in technology and innovation. Topics vary according to needs and interests of students and faculty involved. Offered periodically.