INDUSTRIAL ENGINEERING, BS

Program Description

The Industrial Engineering curriculum prepares graduates to design, develop, implement, and improve integrated systems that include people, materials, information, equipment and energy. The curriculum includes in-depth instruction to accomplish the integration of systems using appropriate analytical, computational, and experimental practices.

Industrial Engineering, BS

Industrial Engineers apply science, mathematics, and engineering methods to complex system integration and operations. Because these systems are so large and complex, IEs need to have knowledge and skills in a wide variety of disciplines, the ability to work well with people, and a broad, systems perspective. Industrial engineers use their knowledge and skills to improve systematic processes through the use of statistical analysis, interpersonal communication, design, planning, quality control, operations management, computer simulation, and problem solving.

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Program Educational Objectives

In accordance with ABET accreditation requirements, the Program Educational Objectives (PEOs) describe the professional accomplishments that Industrial Engineering graduates are expected to achieve, within a few years of graduation. The PEOs are:

1. Within two years of graduation from TAMU-CC, our graduates who have chosen to pursue a career in engineering or a related field will be working in industry, government, construction, or other professional service as industrial engineers, or will be pursuing graduate degrees in industrial engineering or post-baccalaureate degrees in other fields, such as law, business, or medicine.
2. Within five years of graduation from TAMU-CC our graduates who have chosen to pursue a career in engineering or a related field will have
   - advanced in their careers as indicated by obtaining promotions and positions of leadership, awards, recognitions as subject matter experts, and/or registration as professional engineers or in other professional disciplines; or by entrepreneurial activities, products or processes developed, patents, and/or publications;
   - demonstrated the ability to increase their knowledge and expertise through continuing education or advanced degrees; and
   - contributed to the improvement of the profession and of society through research, national and/or international collaboration, and/or professional and public service including mentoring.

Student Learning Outcomes

Graduates will have:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Fundamentals of Engineering (FE) Exam

All engineering students are encouraged to take the Fundamentals of Engineering (FE) exam. This is exam is an important step toward licensure as a Professional Engineer (P.E.), which many engineers find useful and necessary in their careers. Close to the end of the B.S. degree program is an excellent time to take the exam, because the student has the best preparation for the exam at that point in the student's academic career.

Admission from pre-engineering

For all students admitted into a pre-engineering program at TAMU-CC who wish to transfer into one of the TAMU-CC engineering programs (CEEN, EEEN, IEEN, MEEN), the cumulative GPA for all MATH, CHEM, PHYS, ENGR, COSC, CEEN, EEEN, IEEN, or MEEN courses that appear in the CEEN, EEEN, IEEN, or MEEN program curricula, plus any ENTC courses, taken at TAMU-CC, or their equivalents taken at other institutions, should be 2.5 or greater to be admitted into the CEEN, EEEN, IEEN, or MEEN programs at TAMU-CC. There should be a minimum of at least 12 hours of such courses taken at TAMU-CC or elsewhere before a transfer / admission to CEEN, EEEN, IEEN, or MEEN may be considered. All such students must also meet the requirements to take MATH 2413 Calculus I (4 sch) if they have not already done so.

Master of Business Administration (MBA) Option

Industrial engineering students who have completed 96 credit hours toward the Industrial Engineering B.S. degree and earned a cumulative GPA of 3.0 or higher may elect the MBA option in senior year. Students who elect the MBA option are required to take three MBA foundation courses to satisfy the Technical Elective Block requirements:

Code	Title	Hours
ACCT 5312	Foundations of Accounting	3
ECON 5311	Foundations in Economics	3
FINA 5311	Financial Management Concepts	3

Students who plan to elect the MBA Option are encouraged to have summer internship experience before senior year, and will be able to complete an MBA degree study with 2 regular semesters and 1 summer session beyond an Industrial Engineering B.S. degree study.

General Requirements

The Industrial Engineering curriculum consists of a minimum of 123 credit hours. It can be divided into five main areas:

Requirements	Credit Hours
Core Curriculum Program (http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/)	42
University Seminar (when applicable)[1]	0-2
Common Engineering, Math and Science Courses	48
Required Industrial Engineering Courses	21
Capstone Project	3
Technical Elective Block	9
Total Credit Hours	**123-125**

[1] Full-time, first time in college students are required to take university seminar.

- USSE 1201 University Seminar (2 sch)

Program Requirements

Code	Title	Hours
Full-time, First-year Students		
USSE 1201	University Seminar	2
Core Curriulum Program		
University Core Curriculum		42
Industrial Engineering students should take: [1]		
CHEM 1411	General Chemistry I (Science requirement)	
MATH 2413	Calculus I (Mathematics requirement)	
MATH 2414	Calculus II (Component Area Option)	
PHYS 2425	University Physics I (Science requirement)	
Common Engineering, Math and Science Courses		
CHEM 1411	General Chemistry I (included in University Core)	
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	3
ENGR 1201	Introduction to Engineering	2
ENGR 1312	Engineering Graphics I	3
ENGR 3316	Thermodynamics	3
ENGR 3322	Materials Science	3
ENGR 2325	Statics	3
ENGR 2025	Statics Recitation	0
ENGR 2460	Circuit Analysis	4
ENGR 3350	Manufacturing Processes	3
ENGR 4240	Project Management	2
ENGR 4420	Engineering Lab Measurements	4
MATH 2413	Calculus I (included in University Core)	
MATH 2414	Calculus II (3 lecture hours included in University Core)	1
MATH 2415	Calculus III	4
MATH 3311	Linear Algebra	3
MATH 3315	Differential Equations	3
MATH 3342	Applied Probability and Statistics	3
PHYS 2425	University Physics I (included in University Core)	
PHYS 2426	University Physics II	4
Required Industrial Engineering Courses		
IEEN 2302	Engineering Economics	3
IEEN 3302	Operations Research	3
IEEN 3320	Human Factors	3
IEEN 3324	Human Systems Interface	3
IEEN 3330	Robotics and Automation	3
IEEN 4312	Experimental Design and Analysis	3
IEEN 4330	Digital Systems Simulation	3
Technical Electives Block		
Students must complete 9 hours of elective courses. These may include upper-division Engineering (CEEN, EEEN, IEEN, MEEN) and 4000-level Engineering Technology (ENTC) courses outside of the required courses in their degree plans, any 4000-level MATH, COSC, BIOL, CHEM, or PHYS courses, the specified courses in the 5-year BS/MBA program, and other courses approved by the Department of Engineering.		9
Capstone Project		
ENGR 4370	Capstone Projects	3
Total Hours		**125**

[1] The 3 lecture hours in MATH 2413 Calculus I (4 sch), CHEM 1411 General Chemistry I (4 sch), and PHYS 2425 University Physics I (4 sch) satisfy the required 3 and 6 core curriculum hours in math and science, respectively. The 1 lab hour from each of these three courses, and the 3 lecture hours from MATH 2414 Calculus II (4 sch), satisfy the 6-hour component area option requirement in the core curriculum. Students transferring to Texas A&M University - Corpus Christi from other institutions may have various means for fulfilling the core curriculum. Please refer to the "General Education Requirement" in the catalog section entitled "Undergraduate Programs (http://catalog.tamucc.edu/undergraduate/undergraduate-programs/)."

Capstone Project

All industrial engineering students must complete a senior-level capstone project in ENGR 4370 Capstone Projects (3 sch). Students will work with practicing engineers and engineering faculty. The Capstone Project will give engineering students practical, professional experience to prepare them for careers in electrical engineering.

Course Sequencing

First Year

Fall		Hours
USSE 1201	University Seminar	2
MATH 2413	Calculus I	4
ENGL 1301	Writing and Rhetoric I	3
HIST 1301	U.S. History to 1865	3
CHEM 1411	General Chemistry I	4
ENGR 1201	Introduction to Engineering	2
	Hours	**18**

Spring		
ENGL 1302 or COMM 1311	Writing and Rhetoric II or Foundation of Communication	3
MATH 2414	Calculus II	4
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	3
PHYS 2425	University Physics I	4
ENGR 1312	Engineering Graphics I	3
	Hours	**17**
Second Year		
Fall		
HIST 1302	U.S. History Since 1865	3
PHYS 2426	University Physics II	4
MATH 2415	Calculus III	4
ENGR 2325	Statics	3
ENGR 2025	Statics Recitation	0
IEEN 2302	Engineering Economics	3
	Hours	**17**
Spring		
MATH 3315	Differential Equations	3
ENGR 2460	Circuit Analysis	4
ENGR 3316	Thermodynamics	3
ENGR 3322	Materials Science	3
	Hours	**13**
Third Year		
Fall		
POLS 2305	U.S. Government and Politics	3
MATH 3342	Applied Probability and Statistics	3
MATH 3311	Linear Algebra	3
IEEN 3330	Robotics and Automation	3
ENGR 3350	Manufacturing Processes	3
	Hours	**15**
Spring		
POLS 2306	State and Local Government	3
IEEN 3320	Human Factors	3
IEEN 3302	Operations Research	3
Technical elective		3
Language, Philosophy & Culture Core Requirement		3
	Hours	**15**
Fourth Year		
Fall		
ENGR 4420	Engineering Lab Measurements	4
ENGR 4240	Project Management	2
IEEN 4312	Experimental Design and Analysis	3
IEEN 3324	Human Systems Interface	3
Social and Behavioral Sciences Core Requirement		3
	Hours	**15**
Spring		
ENGR 4370	Capstone Projects	3
IEEN 4330	Digital Systems Simulation	3
Creative Arts Core Requirement		3
Technical elective		3
Technical elective		3
	Hours	**15**
	Total Hours	**125**

Courses

Engineering Courses

ENGR 1201 Introduction to Engineering
2 Semester Credit Hours (1 Lecture Hour, 2 Lab Hours)
Introduction to the engineering profession, ethics, and disciplines; development of skills in teamwork, problem solving and design; other topics include computer applications and programming; Newton's laws, unit conversions, statistics. Offering: Fall and Spring.
Prerequisite: MATH 1314.

ENGR 1312 Engineering Graphics I
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Topics include, depending on the major: emphasis on computer applications and programming and solids modeling using CAD tools or other software; fundamentals of engineering science; advanced graphic skills. Pre-req: MATH 1314 - College Algebra or equivalent academic preparation. Offered Fall and Spring.
Prerequisite: MATH 1314.
TCCNS: ENGR 1304

ENGR 2025 Statics Recitation
0 Semester Credit Hours
2 Lab hours, 0 Semester Credit Hours. General problem-solving techniques for Engineering students in the context of Statics topics and problems. ENGR 2325 and ENGR 2025 must be taken together in the same semester. ENGR 2025 is not counted toward graduation.
Co-requisite: ENGR 2325.

ENGR 2105 Electrical Circuits Laboratory
1 Semester Credit Hour (3 Lab Hours)
Laboratory experiments supporting theoretical principles presented in ENGR 2305 involving DC and AC circuit theory, network theorems, time, and frequency domain circuit analysis. Introduction to principles and operation of basic laboratory equipment; laboratory report preparation.
Prerequisite: ENGR 2305*.
* May be taken concurrently.
Co-requisite: ENGR 2305, SMTE 0099.

ENGR 2106 Digital Systems Laboratory
1 Semester Credit Hour (3 Lab Hours)
Basic laboratory experiments supporting theoretical principles presented in ENGR 2306 involving design, construction, and analysis of combinational and sequential digital circuits and systems, including logic gates, adders, multiplexers, encoders, decoders, arithmetic logic units, latches, flip-flops, registers, and counters; preparation of laboratory reports.
Co-requisite: ENGR 2306, SMTE 0099.

ENGR 2305 Electrical Circuits
3 Semester Credit Hours (3 Lecture Hours)
Principles of electrical circuits and systems. Basic circuit elements (resistance, inductance, mutual inductance, capacitance, independent and dependent controlled voltage, and current sources). Topology of electrical networks; Kirchhoff 's laws; node and mesh analysis; DC circuit analysis; operational amplifiers; transient and sinusoidal steady-state analysis; AC circuit analysis; first- and second-order circuits; Bode plots; and use of computer simulation software to solve circuit problems.
Prerequisite: PHYS 2426 and MATH 2414.
Co-requisite: ENGR 2105.

ENGR 2306 Digital Systems
3 Semester Credit Hours (3 Lecture Hours)
Introduction to theory and design of digital logic, circuits, and systems. Number systems, operations and codes; logic gates; Boolean Algebra and logic simplification; Karnaugh maps; combinational logic; functions of combinational Logic; flip-flops and related devices; counters; shift registers; sequential logic; memory and storage.
Prerequisite: MATH 2305*.
* May be taken concurrently.
Co-requisite: ENGR 2106.

ENGR 2325 Statics
3 Semester Credit Hours (3 Lecture Hours)
Theory of engineering mechanics involving forces, moments, and couples on stationary structures; equilibrium in two and three dimensions; free body diagrams; truss analysis; friction; centroids; centers of gravity and moments of inertia.
Prerequisite: PHYS 2425 and MATH 2414*.
* May be taken concurrently.
Co-requisite: ENGR 2025.
TCCNS: ENGR 2301

ENGR 2326 Dynamics
3 Semester Credit Hours (3 Lecture Hours)
Theory of engineering mechanics involving the motion of particles, rigid bodies and systems of particles; Newton's Laws; work and energy relationships; principles of impulse and momentum; application of kinetics and kinematics to the solution of engineering problems.
Prerequisite: ENGR 2325.
TCCNS: ENGR 2302

ENGR 2460 Circuit Analysis
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
This course covers principles of electronics: charge, voltage, resistance, current, and power; Ohm's Law; Kirchhoff's voltage and current laws; RC and LC circuits; periodic functions, average and RMS measurements; transformers, electrical measurement instruments. The laboratory provides hands-on experience with devices and circuits discussed in the classroom.
Prerequisite: (PHYS 2426, MATH 2414 and 3315*).
* May be taken concurrently.
Co-requisite: SMTE 0099.
TCCNS: ENGR 2305

ENGR 3315 Fluid Mechanics
3 Semester Credit Hours (3 Lecture Hours)
Fluid properties, fluid statics, dynamics, and kinematics, conservation of energy and momentum incompressible, laminar and turbulent flow. Similitude and dimensional analysis, and viscous flow. Offered: Fall Spring.
Prerequisite: MATH 3315*, ENGR 2326 and MATH 2415.
* May be taken concurrently.

ENGR 3316 Thermodynamics
3 Semester Credit Hours (3 Lecture Hours)
Theory and application of energy methods in engineering; conservation of mass and energy; energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics and entropy; gas, vapor and refrigeration cycles.
Prerequisite: (PHYS 2425 and MATH 2414).

ENGR 3320 Strength of Materials
3 Semester Credit Hours (3 Lecture Hours)
Concepts in strength of materials, stress, strain; deformation under load, direct, shear, and combined stresses; stress concentrations, bending stresses and torsional shear stresses, deflection in beams and shafts; columns, and pressure vessels.
Prerequisite: ENGR 2325 and 3322 or ENGR 2322.

ENGR 3322 Materials Science
3 Semester Credit Hours (3 Lecture Hours)
Structure and properties of metallic and nonmetallic materials; microstructure, mechanical testing, phase diagrams, heat treatment, testing, ceramics, polymers, composites, construction materials, failure analysis, nondestructive evaluation, corrosion and thermal properties of materials.
Prerequisite: (CHEM 1411 and PHYS 2425).

ENGR 3350 Manufacturing Processes
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Introduction to metal and non-metallic manufacturing processes; casting, forging, rolling, extrusion, sheet metal forming, cutting tools turning and milling operations, abrasive machining, welding and joining, powder compaction, molding, forming of plastics, surface treatment, human factors and safety.
Prerequisite: ENGR 1312 and 3322.
Co-requisite: SMTE 0099.

ENGR 4181 Engineering Co-op
1 Semester Credit Hour
Students participating in an Engineering co-op program will register for this course each off-campus work semester to maintain continuous enrollment status at TAMU-CC. Each student and the student's supervisor will both submit to the instructor end-of-term reports at the end of the off-campus work semester. Students will receive 1 semester credit hour (SCH) for each internship semester completed. The course may be repeated; if a student takes the course three times, the student may count the 3 SCH as one technical elective. Completion of required courses in first year of student's Engineering degree plan with at least a 3.0 GPA.

ENGR 4240 Project Management
2 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Foundations of engineering economy, cash flow and equivalence, and project justification. Introduction to project management, planning, scheduling, and control, use of project management software, GANTT charts, PERT charts, and critical path. Students prepare proposals, including specifications, timelines, schedule, and budget, for projects to be implemented in ENGR 4370 - Capstone Projects. This course should be taken the semester preceding ENGR 4370 - Capstone Projects.
Prerequisite: (MEEN 3330 and 3345) or (EEEN 3330, 3350 and 3418*) or (IEEN 3302 and 3320) or (CEEN 3320 and 3321).
* May be taken concurrently.
Co-requisite: SMTE 0099.

ENGR 4350 Machine Vision and Image Processing Applications
3 Semester Credit Hours (3 Lecture Hours)
Introduces students to automated vision systems and components, camera models, testing and measurement, and fundamentals of image processing. Topics include image analysis and processing in binary, gray scale and color images in spatial- and frequency-domain. Texture and shape analysis, hyperspectral imaging, other transforms, and filters are discussed and applied.
Prerequisite: (COSC 1330 or 1435) and ENGR 2460 and MATH 2414.

ENGR 4351 Internet of Things (IoT): Devices and Communication
3 Semester Credit Hours (3 Lecture Hours)
In this course, the concepts for Internet of Things (IoT), and related devices, sensors, and communication protocols will be introduced. The students will engage in hands-on assignments with the IoT kits. These hands-on experiences will allow students to develop skill to create specific tools and programs that are applicable to the hardware, software, and the cloud. Final project will involve the incorporation of learned concepts to solve a real-world problem using IoT devices, sensors, and communication protocols. Final project will be a team assignment. Junior or Senior standing.
Prerequisite: COSC 1320 or (COSC 1330 or 1435).

ENGR 4352 Artificial Intelligence (AI) in Engineering and Science Applications
3 Semester Credit Hours (3 Lecture Hours)
This course will introduce the student to AI, ML and Deep Learning topics. In addition, the students will investigate different AI applications in engineering and sciences. The course entails general concepts of AI as well as AI models, selecting an AI model for an application. Some theory will be covered. Transfer learning and reinforcement learning in deep convolutional neural networks will be discussed. Ethics in AI and limitations of AI will also be discussed. The course culminates in a class team project that involves use of AI tools for machine learning/deep learning for data classification/regression analysis or other applications selected by students and approved by instructor. Different AI implementations will be surveyed in a variety of AI applications. Students will get hands on experience with programming in MATLAB, Python or other AI tools. Junior/Senior standing.
Prerequisite: COSC 1330, 1320 or 1435.

ENGR 4370 Capstone Projects
3 Semester Credit Hours (1 Lecture Hour, 5 Lab Hours)
This course allows students to employ the knowledge attained in other courses to implement (including building, testing, and documenting) an approved project, within budget and on schedule. Course requirements include a written report and oral presentations.
Prerequisite: ENGR 4240.
Co-requisite: SMTE 0099.

ENGR 4380 Engineering Internship
3 Semester Credit Hours
Three SCH may be earned by working in an internship position in a governmental agency, private industry, or other appropriate venue for a full-time, 8- to 10-week summer internship. At least Junior standing; requires approval of a faculty member who will review and approve the proposed work to be submitted for a grade and administer the internship. May not be repeated.

ENGR 4390 Special Topics in Engineering
1-3 Semester Credit Hours (1 Lecture Hour)
Subject material variable. May be repeated for credit when topics are different.

ENGR 4420 Engineering Lab Measurements
4 Semester Credit Hours (2 Lecture Hours, 4 Lab Hours)
Principles of physical measurements; standards, calibration, error estimation; static and dynamic performance of measuring systems; laboratory experience, experiment planning, report writing. The purpose of this course is for students to gain proficiency in designing, assembling, and operating an experiment; and analyzing and presenting experimental results. This encompasses skills such as an understanding control and data acquisition electronics, operation and limitation of modern sensors, calibration and error analysis, assessing applicability of theory and the impact of secondary experimental variables, and writing and presenting reports and analysis.
Prerequisite: PHYS 2426 and (MATH 3342 or 3345).
Co-requisite: SMTE 0099.

Industrial Engineering Courses

IEEN 2302 Engineering Economics
3 Semester Credit Hours (3 Lecture Hours)
(3:0) Engineering management relies on the knowledge of engineering economics to be able to evaluate projects from a financial perspective. Optimizing financial performance of a project is a key responsibility of the engineer in the decision-making process. Examples of engineering projects would include but not limited to equipment replacement analysis, planning a new product line, and waste management. This course is designed to present engineering students the major concepts and techniques of engineering economic analysis that are needed in the decision-making process. The emphasis of this course is on the analytical analysis of money and its impact on decision making.
Prerequisite: MATH 2413.

IEEN 3302 Operations Research
3 Semester Credit Hours (3 Lecture Hours)
Introduction to operations research, linear programming, duality, other algorithms for linear programming, the transportation and assignment problems, dynamic programming, integer programming; offered: Fall and Spring.
Prerequisite: MATH 2414 and (MATH 3311* or MEEN 3310*).
* May be taken concurrently.

IEEN 3320 Human Factors
3 Semester Credit Hours (3 Lecture Hours)
The principles of the life sciences, engineering, and mathematics are applied to the investigation of existing and proposed socio-technical systems. Methods for the reduction of fatigue and human error are taught. Various fields of human factors and the fundamental concepts of the discipline are introduced. This course provides the basics of human perceptual, cognitive, and motor abilities relevant to human factors. This course also offers class project opportunities gain experience using human factors knowledge in actual applied settings. Offered: Fall and Spring.
Prerequisite: ENGR 1312 and MATH 3342*.
* May be taken concurrently.

IEEN 3324 Human Systems Interface
3 Semester Credit Hours (3 Lecture Hours)
The emphasis of this course is the design of the human-computer interface. The fundamental concepts of human-computer interaction and user centered design thinking are taught, through working in teams on an interaction design project, supported by lectures, readings, and discussions. The variety of evaluation methods and design principles of usable and appropriate computer interfaces are introduced based on psychological, social, and technical analysis. Topics will include usability and affordances, direct manipulation, systematic design methods, user conceptual models and interface metaphors, design languages and genres, human cognitive models, physical ergonomics, information and interactivity structures, and design tools and environments. Offered: Fall and Spring.
Prerequisite: ENGR 1312.
Co-requisite: IEEN 3320.

IEEN 3330 Robotics and Automation
3 Semester Credit Hours (3 Lecture Hours)
This course covers topics of concepts, principles, and relationships of automated assembly devices, computer aided drafting/design (CADD), computer-aided manufacturing (CAM), industrial robots, numerical control (NC), industrial lasers, programmable logic controllers (PLCs), automated guided vehicles (AGVs), flexible manufacturing systems (FMS), and computer- integrated manufacturing (CIM). Offered: Fall and Spring.
Prerequisite: ENGR 2460.

IEEN 4310 Process Engineering
3 Semester Credit Hours (3 Lecture Hours)
This course covers introduction to software design paradigms, system and software requirements, computer aided software engineering, and software design fundamentals using existing documentation for a proposed system. Relevant topics include in-depth survey of data flow-oriented, object-oriented, data-oriented, and real-time design. Team project involving the implementation of the proposed system using structured programming, information hiding, and strength and coupling measures is required. Each student will be required to make an oral presentation as part of the team project. Offered: Fall.
Prerequisite: IEEN 3330.

IEEN 4312 Experimental Design and Analysis
3 Semester Credit Hours (3 Lecture Hours)
Main coverage: Basic principles of experimental design; Randomization; Completely randomized design; Paired design; Randomized blocks, Latin Squares, Greco-Latin Squares and related designs; Factorial design; Blocking in factorial design; 2k factorial design; Extension of 2k factorials; Blocking and confounding in 2k factorials; Partial confounding; Fractional factorial designs; Blocking in fractional factorials; Nested and split-plot designs; Replicated and un-replicated designs; Regression, ANOVA, and follow-up analysis; Sample size determination; Response surface model. Offered: Fall and Spring
Prerequisite: IEEN 3302 and 3320.

IEEN 4322 Cognitive Ergonomics
3 Semester Credit Hours (3 Lecture Hours)
This course is concerned with mental processes, such as perception, decision making, memory, reasoning, and response execution, as they affect interactions among humans and other elements of a work system. Relevant topics include skilled performance, attention, distraction, human error, work stress, risk perception, and Kansei engineering as these may relate to human-system design, safety and productivity. Assessment methodologies include hierarchical task analysis, cognitive task analysis, mental workload, human error identification/accident investigation, and situation awareness assessment. Offered: Fall.
Prerequisite: IEEN 3320.

IEEN 4324 Human Factors and Autonomous Systems
3 Semester Credit Hours (3 Lecture Hours)
This course introduces the survey of human factors and ergonomics with particular reference to human functions in human-machine systems and principles of human factors to demonstrate and apply a broad knowledge of various modern industrial engineering methods and tools associated with designing autonomous systems in manufacturing and other related fields. Applications of engineering design methods to represent, integrate and solve problems, including the ability to recognize problem context and integrate knowledge and skills appropriate sources are provided. Knowledge of basic human capabilities and the ways that these capabilities are taken into account in the design of human-machine systems and work environments. Offered: Fall.
Prerequisite: IEEN 3320.

IEEN 4326 Airborne Design of Experiments
3 Semester Credit Hours (3 Lecture Hours)
Definitions, concepts, and history, Aviation Human Factors, management, and the organization, Human performance in aviation operations, Human information processing and operational decision-making, Human error and threat management, Threat and Error Management (TEM) in flight operations, air traffic control and cabin operations, Resource management training on the flight deck and in air traffic control, Automation in the workplace, The design of Standard Operating Procedures (SOPs) and checklists. Offered: Fall and Spring.
Prerequisite: IEEN 3302.

IEEN 4330 Digital Systems Simulation
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Introduction (definitions and types of simulations), Mechanism of discrete event simulation, Random number/variate generation, Input data analysis (input distribution modeling), Simulation modeling using Arena package, Review of probability and statistics, Simulation output analysis, Monte Carlo simulation, Modeling continuous processes, Verification and validation of simulation models, Read/write simulation data from/to external files. Offered: Fall and Spring.
Prerequisite: IEEN 3302.

IEEN 4332 Distribution Center Design and Operation
3 Semester Credit Hours (3 Lecture Hours)
Introduction (issues, equipment, processes), layout, order-picking, automation, special topics: crossdocking, warehouse performance. Offered: Fall and Spring.
Prerequisite: IEEN 3330.

IEEN 4334 Scheduling and Sequencing
3 Semester Credit Hours (3 Lecture Hours)
Introduction and overview, EOQ Models, MRP, job shop scheduling rules & Gantt chart, algorithms for one machine problems, implicit enumerations & dynamic program, branch and bound, heuristics approaches, project Scheduling, parallel Machine Scheduling, relaxation of Assumptions, batch processing, sequence dependence, project presentations. Offered: Fall and Spring.
Prerequisite: IEEN 3302.

IEEN 4342 Construction Management
3 Semester Credit Hours (3 Lecture Hours)
The course focuses on management techniques to solve the unique problems associated with a construction project. Study of Construction Management functions including Project Management, Cost Management, Time Management, Quality Management, Contract Administration, and Safety Management will be covered. Emphasis is put on the application of each function throughout the project phases. Offering: Spring.
Prerequisite: IEEN 2302 and 3320.

IEEN 4396 Directed Independent Study
1-3 Semester Credit Hours
Requires a formal proposal of study to be completed in advance of registration, approval of supervising faculty and department chairperson. Offered Fall, Spring, and Summer.