Industrial Engineering (IE)

Courses

IE 118. Energy for Sustainable Society. 3 hours.
Focuses on how energy systems work today and how they can work in a decarbonized sustainable future, while still meeting the critical energy needs of global developed and developing societies. Course Information: Same as ME 118. Individual and Society course.

IE 198. Special Topics in Engineering Graphics. 1-4 hours.
Specific topics are announced each term. Course Information: May be repeated. Students may register in more than one section per term. Prerequisite(s): Prerequisite may vary by section according to topic.

IE 201. Financial Engineering. 3 hours.
Principles and techniques of economic analysis in engineering; Financial decision making; Single and multi project selection techniques. Course Information: Prerequisite(s): MATH 181.

IE 312. Dynamic Systems and Control. 3 hours.
Dynamics of linear systems. Modeling of mechanical, electrical, fluid, and thermal systems. Analysis and design of feedback control systems. Analytical, computer and experimental solution methods. Time and frequency domain techniques. Course Information: Same as ME 312. Prerequisite(s): CS 109 and ECE 210 and MATH 220; and sophomore standing or above; or approval of the department.

IE 342. Probability and Statistics for Engineers. 3 hours.
Probability, random variables, mathematical expectation, discrete and continuous distributions, sampling distributions, estimation theory, and test of hypothesis. Course Information: Prerequisite(s): MATH 181.

IE 345. Regression Applications and Forecasting in Engineering. 3 hours.
Single and multiple regression analysis of variance, examination of residuals, introduction to time series analysis, and analytical forecasting techniques; application to engineering system. Course Information: Prerequisite(s): IE 342.

IE 365. Work Productivity Analysis. 4 hours.
Operations analysis; man-machine relationship; motion study; micromotion study, time study; predetermined time systems; performance rating; standard data techniques; work sampling; wage payment plans. Course Information: Prerequisite(s): IE 342. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion and one Lecture-Discussion.

IE 380. Manufacturing Process Principles. 3 hours.
Introduction to basic manufacturing processes such as casting, bulk deformation, sheet metal forming, metal cutting. Interaction between materials, design and manufacturing method. Economics of manufacturing. Course Information: Same as ME 380. Prerequisite(s): CME 203.

IE 391. Industrial Engineering Practicum. 1 hour.
Provides students with the opportunity to apply the skills and knowledge gained in previous engineering courses within a professional, working environment. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. A maximum of 1 hour awarded toward degree requirements. Prerequisite(s): Approval of the Department.

IE 392. Undergraduate Research. 1-3 hours.
Research under close supervision of a faculty member. Course Information: May be repeated to a maximum of 6 hours. Prerequisite(s): Consent of the head of the department.

IE 394. Senior Capstone Design. 4 hours.
Systematic approach to the design process. Creative problem solving. Design methodology and engineering principles applied to open-ended design problems with inherent breadth and innovation. Course Information: Same as ME 394. Credit is not given for IE 394 if the student has credit for ME 396 or IE 396. Prerequisite(s): Senior standing or above; or approval of the department.

IE 396. Senior Design I. 0-3 hours.
Systematic approach to the design process. Creative problem solving. Design methodology and engineering principles applied to open-ended design problems with inherent breadth and innovation. Course Information: Same as ME 396. Credit is not given for IE 396 if the student has credit in IE 444 or ME 444 or IE 445 or ME 445. Prerequisite(s): ME 347; or IE 345. Open only to seniors. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture-Discussion.

IE 397. Senior Design II. 2 hours.
The systematic approach to the design process; creative problem solving; design methodology and engineering principles learned in ME 396 are applied to complete the Senior Design project. Course Information: Same as ME 397. Credit is not given for IE 397 if the student has credit for IE 444 or ME 444 or IE 445 or ME 445. Prerequisite(s): ME 396; or IE 396; and senior standing or above; or consent of the instructor. Requires concurrent registration in ME 499 or IE 499.

IE 411. Mechatronics I. 0-4 hours.
Elements of mechatronic systems, sensors, actuators, microcontrollers, modeling, hardware in the loop simulations, real time software, Electromechanical systems laboratory experiments. Course Information: Same as ME 411. 3 undergraduate hours. 4 graduate hours. Extensive computer use required. Prerequisite(s): Senior standing or above or approval of the department. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture.

IE 412. Dynamic Systems Analysis I. 3 or 4 hours.
Classical control theory, concept of feedback, laplace transform, transfer functions, control system characteristics, root locus, frequency response, compensator design. Course Information: Same as ME 412. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): ME 308.

IE 441. Ergonomics and Human Factors. 3 or 4 hours.
The study of principles and techniques associated with ergonomic problems. Topics include human information input and processing, human output and control, and ergonomic considerations in safety. Course Information: Same as EOHS 441. Previously listed as IE 341. 3 undergraduate hours; 4 graduate hours. Prerequisite(s): Credit or concurrent registration in IE 342 or consent of the instructor.

IE 442. Design and Analysis of Experiments in Engineering. 0-4 hours.
Cover different methods for statistical design of engineering experiments, executing them and analyzing their results. Course Information: Prerequisite(s): IE 342. Class Schedule Information: To be properly registered, student must enroll in one Lecture-Discussion and one Laboratory-Discussion.
IE 444. Interdisciplinary Product Development I. 3 or 4 hours.
Cross-functional teams (with students from AD 420/423 and MKTG 594) research and develop new product concepts. Focus on the identification of technologically appropriate product design problems. Course Information: Same as ME 444. 3 undergraduate hours. 4 graduate hours. Year-long (with IE/ME 445) project course. Prerequisite(s): Senior standing or above; and consent of the instructor.

IE 445. Interdisciplinary Product Development 2. 4 hours.
Cross-functional teams (with students from AD 420 and MKTG 594) research and develop new product concepts. Focus on solutions to the opportunities identified in IE/ME 444 to functional prototypes. Serves as a replacement for IE/ME 396. Course Information: Same as ME 445. Year-long (with IE/ME 444) project course. Prerequisite(s): IE 444 or ME 444; and senior standing or above; and consent of the instructor.

IE 446. Quality Control and Reliability. 3 or 4 hours.
Principles of statistical quality control including control by variable and by attribute, construction and use of control charts for variables, fraction defective and number of defects and use of standard plans, reliability and life cycle testing. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): IE 342.

IE 461. Safety Engineering. 3 or 4 hours.
Human protection systems; accident and emergency handling; manufacturing and service hazard systems. Course Information: Same as EOHS 460. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): IE 342 or consent of the instructor.

IE 463. Plant Layout and Materials Handling. 3 or 4 hours.
Facilities design functions, computer-aided plant layout, facility location, warehouse layout Minimax location, deterministic and probabilistic conveyor models. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Credit or concurrent registration in IE 345 and Credit or concurrent registration in IE 472 and IE 473 and IE 365 and IE 201 and IE 467.

IE 464. Virtual Automation. 0-4 hours.
Fundamentals of manufacturing and automation modeling using CAD/CAM and computer-integrated manufacturing methods; concepts of virtual manufacturing; industrial robots and automated factory models within virtual environments. Course Information: Same as ME 464. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Consent of the instructor.

IE 465. Manufacturing Information Systems. 0-4 hours.
Design and implementation of supervisory control and data acquisition systems; manufacturing systems controller and communication networks. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Senior or graduate standing, or consent of the instructor; and familiarity with computer programming. Class Schedule Information: To be properly registered, students must enroll in one Laboratory-Discussion, and one Laboratory.

IE 466. Production Planning and Inventory Control. 3 or 4 hours.
Principles of production planning, master scheduling, job sequencing, design and control of deterministic and stochastic inventory systems, material requirement planning. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): Credit or concurrent registration in IE 345 and Credit or concurrent registration in IE 472 and IE 473.

IE 467. Discrete Event Computer Simulation Application. 3 or 4 hours.
The solution of industrial application problems by means of discrete event computer simulation. Simulation model building. Input analysis. Output analysis. In depth study of some specific simulation programming languages, with projects. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): IE 342.

IE 468. Virtual Manufacturing. 3 or 4 hours.
Virtual reality applications in manufacturing systems design, manufacturing applications of networked virtual reality, virtual reality modeling of occupational safety engineering. Course Information: Same as ME 468. 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 107 or CS 108.

IE 471. Operations Research I. 3 or 4 hours.
Introduction to operations research, formulation of linear programming problems, simplex methods, duality theory, sensitivity analysis, network models, and integer linear programming. Course Information: 3 undergraduate hours. 4 graduate hours. No graduate credit for industrial engineering majors. Prerequisite(s): MATH 310.

IE 472. Operations Research II. 3 or 4 hours.
Nonlinear programming problems, unconstrained optimization search techniques. Kuhn-Tucker theorems, quadratic programming, separable programming, meta heuristics, goal programming, and dynamic programming. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): CS 107 or CS 108, and IE 471 or graduate standing.

IE 473. Stochastic Processes and Queuing Models. 3 or 4 hours.
Stochastic dynamic systems, queuing networks, probabilistic state transition models and nondeterministic decision making models. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): IE 342 and Credit or concurrent registration in IE 471 and MATH 210.

IE 481. Additive Manufacturing Process. 3 or 4 hours.
Covers aspects of additive manufacturing. The types that are covered are generic process, design, vat photopolymerization, extrusion based, jetting, direct writing, 3D bio-printing, powder bed fusion, slicing, and data representation. Course Information: Same as ME 481. 3 undergraduate hours. 4 graduate hours. Recommended background: Manufacturing Processes.

IE 494. Special Topics in Industrial Engineering. 3 or 4 hours.
Particular topics vary from term to term depending on the interests of the students and the specialties of the instructor. Course Information: 3 undergraduate hours. 4 graduate hours. May be repeated. Prerequisite(s): Consent of the instructor.

IE 496. Undergraduate Senior Design Thesis I. 0-8 hours.
Introduction to the principles and practice of product design: specifications, evaluation of design alternatives, technical reports, and oral presentations, through independent design projects. Course Information: Same as ME 496. Credit only given to nondegree students. No graduation credit given to students enrolled in Engineering. Extensive computer use required. Field trips required at a nominal fee. Prerequisite(s): Consent of the instructor.
IE 497. Undergraduate Senior Design Thesis II. 0-8 hours.
Introduction to engineering design and research methods: design tools, product conception and development, simulation, prototyping, technical reports and presentations, literature survey and undergraduate thesis. Course Information: Same as ME 497. Credit only given to nondegree students. No graduation credit given to students enrolled in Engineering. Extensive computer use required. Field trips required at a nominal fee. Prerequisite(s): Consent of the instructor.

IE 499. Professional Development Seminar. 0 hours.
Students are provided general information about their role as UIC MIE alumni in society and the role of the University in their future careers. Students provide evaluations of their educational experience in the MIE department. Course Information: Same as ME 499. Satisfactory/Unsatisfactory grading only. Prerequisite(s): Open only to seniors; and approval of the department. Must be taken in the student's last semester of study.

IE 511. Mechatronics II. 4 hours.
Microcontrollers used in electro-mechanical systems for measurement and control purposes, interface hardware, real time software and development tools, applications in robotic motion control and factory automation. Course Information: Same as ME 511. Prerequisite(s): ME 411 and consent of the instructor. Class Schedule Information: To be properly registered, students must enroll in one Laboratory and one Lecture.

IE 525. Technology to Promote Physical Activity Among Persons with Disabilities. 3 hours.
Applications of new and emerging technologies to promote participation in and adherence to healthful physical activity by people with disabilities. Considers ways of redesigning physical, social and attitudinal environments to achieve these outcomes. Course Information: Same as DHD 525. Recommended background: DHD 515 or an equivalent course on interpreting research findings.

IE 542. Advanced Computational Methods for Product and Process Design. 4 hours.
Deterministic and statistical methods for modeling and optimizing engineering systems, in the broad context of product design, manufacturing process development, and designing for life cycle issues. Course Information: Same as ME 542. Prerequisite(s): Programming language experience.

IE 552. Applied Stochastic Processes. 4 hours.
Stationary point processes; Markov renewal theory; semi-Markov processes; regenerative processes; computational methods and applications to queues, inventories, dams, and reliability. Course Information: Prerequisite(s): IE 342.

IE 562. Supervisory Control of Discrete Event Systems. 4 hours.
Discrete event systems; languages and automata, supervisory control, timed models, supervisory control applications. Course Information: Extensive computer use required.

IE 565. Expert Systems in Manufacturing. 4 hours.
Industrial uses of expert systems; applicability to industrial processes; availability of commercial expert systems; design and implementation of expert systems; knowledge engineering, research uses of expert systems. Course Information: Prerequisite(s): CS 102 or CS 107 or the equivalent.

IE 567. Data Mining for Machine Health Diagnosis and Prognosis. 4 hours.
Theories and techniques of data mining to machinery health diagnosis and prognosis, case studies on rotor shafts, bearing, gearboxes fault diagnosis and remaining useful life prognosis.

IE 569. Advanced Virtual Manufacturing. 4 hours.
Manufacturing systems design optimization using virtual environments, optimization of manufacturing decision support using virtual reality interfaces, analysis and evaluation of virtual environments. Course Information: Same as ME 569. Prerequisite(s): Consent of the instructor.

IE 571. Statistical Quality Control and Assurance. 4 hours.
The importance of quality in products and services, quality surveillance, Deming's management method, Ishikawa's seven tools, control charts, acceptance sampling, quality improvement using directed experiments. Course Information: Same as IDS 571. Prerequisite(s): At least one term of statistics.

IE 575. Integer and Combinatorial Optimization. 4 hours.
Modeling, computational complexity, polyhedral theory, valid inequalities, duality and relaxation, branch-and-bound algorithms, cutting plane algorithms, heuristic algorithms, and real-world application. Course Information: Prerequisite(s): IE 471.

IE 576. Nonlinear Optimization. 4 hours.
Convex analysis, line search techniques, unconstrained and constrained optimization, optimality conditions, duality, convex and nonconvex optimization, large-scale optimization, and real-world application. Course Information: Prerequisite(s): IE 471 or the equivalent.

IE 591. Industrial Engineering Internship. 1 hour.
Provides students with the opportunity to apply the skills and knowledge gained in previous engineering courses within a professional, working environment. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. A maximum of 4 hours awarded toward degree requirements. Prerequisite(s): Approval of the Department.

IE 594. Current Topics in Industrial Engineering. 4 hours.
Particular topics vary from term to term depending on the interests of the students and the specialties of the instructor. Course Information: May be repeated. Prerequisite(s): Consent of the instructor.

IE 595. Industrial Engineering Seminar. 0-1 hours.
Advances in Industrial Engineering research will be discussed in a seminar setting. Course Information: Satisfactory/Unsatisfactory grading only. Must be taken every semester by all registered MS and PhD students in Industrial Engineering. Students taking the course for one credit hour submit reflective summaries of the presentations. Prerequisite(s): Graduate standing in industrial engineering.

IE 596. Independent Study. 1-4 hours.
Individual study under close supervision of a faculty member. Course Information: May be repeated to a maximum of 4 hours. Students may register in more than one section per term. Prerequisite(s): Consent of the instructor.

IE 598. M.S. Thesis Research. 0-16 hours.
Individual research in specialized problems under close faculty supervision. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.

IE 599. Ph.D. Thesis Research. 0-16 hours.
Individual research on specialized problems under close faculty supervision. Course Information: Satisfactory/Unsatisfactory grading only. May be repeated. Prerequisite(s): Consent of the instructor.