

# Industrial Engineering (IE)

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## **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 348. Artificial Intelligence and Data Mining for Engineering Applications. 3 hours.**

Provides a comprehensive understanding of artificial intelligence (AI), data analytics, and ethics in AI in the context of Operations and Industrial Engineering Applications. Course Information: Same as ME 348. Extensive computer use required. 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. 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 and IE 201; or IE 345 and IE 201. 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 or 3 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. 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.**

Covers 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.**

Systematic approach to the design process. Creative problem solving. Cross-functional teams (w/students from other departments/colleges) research and apply new product concepts to open-ended design problems. Course Information: Same as ME 444. 3 undergraduate hours. 4 graduate hours. Credit for IE 444 is not given if the student has credit in ME 396 or ME 397 or IE 396 or IE 397. Year-long (with IE/ME 445) project course. Prerequisite(s): ME 347 and IE 201; or IE 345 and IE 201; and senior standing or above; and consent of the instructor.

**IE 445. Interdisciplinary Product Development 2. 4 hours.**

Cross-functional teams (w/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. Systematic approach to the design process. Creative problem solving. Cross-functional teams (w/students from other departments/colleges) research and apply new product concepts to open-ended design problems. Focus on solutions to the opportunities. Course Information: Same as ME 445. Credit is not given for IE 445 if the student has credit in ME 396 or ME 397 or IE 396 or IE 397. 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. Advanced 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 defectives 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 and IE 365; or consent of the instructor.

**IE 463. Manufacturing Facilities Design and Material 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 201 and Credit or concurrent registration in IE 345 and Credit or concurrent registration in IE 365 and Credit or concurrent registration in IE 472.

**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): CS 107 or CS 108. Class Schedule Information: To be properly registered, students must enroll in one Lecture-Discussion, and one Laboratory.

**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 Lecture-Discussion.

**IE 466. Production Operation Analytics 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, and supply chain management. Course Information: 3 undergraduate hours. 4 graduate hours. Prerequisite(s): IE 345 and Credit or concurrent registration in IE 472.

**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 109, 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.