

INDUSTRIAL AND MFG ENGINEERING (IE)

IE 112, SPREADSHEET SKILLS FOR INDUSTRIAL & MANUFACTURING ENGINEERS, 1 Credit

Basic spreadsheet functionality needed to create spreadsheet applications for common industrial and manufacturing engineering information processing tasks, including simple databases, statistical analysis, quality control, forecasting, production planning and control, and operations analysis and improvement. Topics include creating spreadsheets, formatting, data types, formulas, charts, user-defined functions, and pivot tables.

IE 199, SPECIAL TOPICS, 1-16 Credits

Special topics in industrial engineering.
This course is repeatable for 16 credits.

IE 212, COMPUTATIONAL METHODS FOR INDUSTRIAL ENGINEERING, 4 Credits

Engineering problem solving using computational methods. Data structures. Modular programming. Sorting and search algorithms. Algorithms for inventory models, production scheduling, production line analysis, and optimization.

Prerequisite: ENGR 112 with C or better and IE 112 (may be taken concurrently) [C]

Recommended: Algebra, calculus, differentiation and integration

IE 255, INTRODUCTORY QUANTITATIVE ANALYSIS OF INDUSTRIAL AND MANUFACTURING SYSTEMS, 3 Credits

An introduction to basic analysis concepts that will be utilized in subsequent industrial and manufacturing engineering courses. Emphasis will be placed on fundamental concepts such as data collection, commonly applied quantitative analysis methods, and how these are utilized to support decisions in different industrial and manufacturing system applications. Examples include resource utilization calculations, equipment fraction equations, queuing models, basic statistical inference procedures, and probability models used in discrete event simulation.

Prerequisite: MTH 252 with C or better

IE 285, INTRODUCTION TO INDUSTRIAL AND MANUFACTURING ENGINEERING, 3 Credits

Introduction to selected topics in industrial and manufacturing engineering, including history and philosophy, product design and manufacturing cycle, integrate role of engineering and business, and multi-objective nature of organizations. Surveys of selected design problems in resource allocation, operations and quality management, and production engineering. CROSSLISTED as IE 285/MFGE 285.

Prerequisite: IE 112 (may be taken concurrently) with C or better or FOR 112 (may be taken concurrently) with C or better

Equivalent to: MFGE 285

IE 299, SPECIAL TOPICS, 1-16 Credits

Special topics in industrial engineering.
This course is repeatable for 16 credits.

IE 355, STATISTICAL QUALITY CONTROL, 4 Credits

Control of quality through the use of statistical analysis; typical control techniques and underlying theory. Development of reliability models and procedures for product assurance. Lec/lab.

Prerequisite: IE 255 with C or better or ST 314 with C or better

Equivalent to: IE 351

IE 356, EXPERIMENTAL DESIGN FOR INDUSTRIAL PROCESSES, 4 Credits

Systematic analysis of processes through the use of statistical analysis, methods, and procedures. Application of statistical techniques including use of classic process analysis techniques, regression and design of experiments. Lec/rec.

Prerequisite: IE 255 with C or better or ST 314 with C or better

Equivalent to: IE 352

IE 366, WORK SYSTEMS ENGINEERING, 4 Credits

Principles and techniques of work measurement, methods engineering, workplace design, work sampling, and predetermined time systems. Basic human factors engineering and ergonomics principles applied to workplace design. The work systems engineering process. Lec/lab/rec.

Prerequisite: (IE 255 with C or better or ST 314 with C or better) and PH 212 [C] and PH 213 [C]

Equivalent to: IE 341

IE 367, PRODUCTION PLANNING AND CONTROL, 4 Credits

Forecasting techniques, inventory analysis, master production scheduling, material and capacity requirements, planning and scheduling methods.

Prerequisite: IE 255 with C or better or ST 314 with C or better

Equivalent to: IE 362

IE 368, FACILITY DESIGN AND OPERATIONS MANAGEMENT, 4 Credits

Design and analysis of industrial facilities including just-in-time systems, queuing, material handling systems, material flow analysis, line balancing, systematic layout planning, design of warehouse facilities, and facilities location.

Prerequisite: ENGR 248 with C or better and (IE 255 [C] or ST 314 [C])

Equivalent to: IE 365

IE 380, *THE RESPONSIBLE ENGINEER, 3 Credits

The idea of responsibility and the ethical responsibilities of the engineer.

Introduction to value, ethics, and ethical systems. Engineering as value creation and the ethical ramifications of engineering. Codes of engineering ethics. Recognizing and addressing ethical dilemmas in engineering. Examination of the individual, social, and environmental effects of engineering and technology. (Baccalaureate Core Course)

Attributes: CSST – Core, Synthesis, Science/Technology/Society

IE 399, SPECIAL TOPICS, 1-16 Credits

Special topics in industrial engineering.

This course is repeatable for 16 credits.

IE 403, THESIS, 1-16 Credits

This course is repeatable for 16 credits.

IE 405, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

IE 406, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

IE 407, SEMINAR, 1-16 Credits

This course is repeatable for 16 credits.

IE 410, INTERNSHIP, 1-16 Credits

This course is repeatable for 16 credits.

IE 411, VISUAL PROGRAMMING FOR INDUSTRIAL APPLICATIONS, 4 Credits

Object-oriented modeling, Unified Modeling Language, software development concepts, file and database connectivity, and visual programming skills (Microsoft Visual Basic) for use in developing industrial applications, such as process monitoring and supply chain management.

Prerequisite: IE 212 with C or better

Equivalent to: IE 414

IE 412, INFORMATION SYSTEMS ENGINEERING, 4 Credits

Framework for enterprise information systems. Engineering and scientific systems. Requirements definition, enhanced entity relationship modeling, logical modeling, structured query language, relational model, referential integrity. Lec/lab.

Prerequisite: IE 212 with C or better

IE 415, SIMULATION AND DECISION SUPPORT SYSTEMS, 4 Credits

Analysis of operations and production systems through the application of computer simulation modeling techniques. Fundamentals of computer simulation including random number generation, input/output data analysis, model validation and verification. Lec/lab.

Prerequisite: IE 112 with C or better and (IE 255 [C] or ST 314 [C])

IE 418, TELECOMMUNICATION CONCEPTS, 3 Credits

Telecommunication concepts for industrial applications. OSI reference model, local area networks, wide area networks, internet architecture.

Taught fall in even years.

Prerequisite: IE 212 with C or better

Recommended: Previous programming experience

IE 419, WIRELESS NETWORKS, 3 Credits

RF fundamentals, ISO 802.11 standards, spread spectrum technology, narrow band technology, direct sequence and frequency hopping transmission schemes, electromagnetic interference, design of indoor wireless networks.

Prerequisite: IE 418 with C or better

IE 425, INDUSTRIAL SYSTEMS OPTIMIZATION, 4 Credits

A first course in operations research. Topics include mathematical programming formulations and solutions, the simplex method, network optimization, introduction to metaheuristics, and linear programming under uncertainty.

Prerequisite: (IE 255 with C or better or ST 314 with C or better) and (MTH 306 [C] or MTH 341 [C])

Equivalent to: IE 421, IE 422

IE 426, STOCHASTIC MODELS OF INDUSTRIAL SYSTEMS, 4 Credits

The application of probabilistic and stochastic modeling methodologies to analyze the performance of production and service systems. Major topics include probability models for space planning, Poisson arrival processes, discrete and continuous time Markov chain models of machine cycle times, and queuing models applied to various industrial systems. Other applications of these tools to model inventories, process behavior, and equipment reliability is illustrated.

Prerequisite: (IE 255 with C or better or ST 314 with C or better) and IE 425 [C]

IE 470, MANAGEMENT SYSTEMS ENGINEERING, 4 Credits

Improvement of organizational performance through the design and implementation of systems that integrate personnel, technological, environmental, and organizational variables. Topics include performance assessment and measurement as well as improvement methodologies.

Prerequisite: ENGR 390 with C or better and IE 355 [C] and IE 366 [C] and IE 367 [C] and IE 368 [C]

Equivalent to: IE 474

IE 471, PROJECT MANAGEMENT IN ENGINEERING, 3 Credits

Critical issues in the management of engineering and high-technology projects are discussed. Time, cost, and performance parameters are analyzed from the organizational, people, and resource perspectives. Network optimization and simulation concepts are introduced. Resource-constrained project scheduling case discussions and a term project are included.

Prerequisite: ENGR 390 with C or better and IE 355 [C] and IE 366 [C] and IE 367 [C] and IE 368 [C]

IE 475, ADVANCED MANUFACTURING COSTING TECHNIQUES, 3 Credits

Costing techniques applicable in advanced manufacturing enterprises: activity-based costing, economic value added, Japanese cost management techniques, life cycle costing, throughput accounting, cost of quality, and financial versus operational performance measures.

Emphasis on linkages to such advanced manufacturing systems as cellular manufacturing, flexible manufacturing, JIT, Lean, and ERP.
Prerequisite: ENGR 390 with C or better and IE 355 [C] and IE 366 [C] and IE 367 [C] and IE 368 [C]

Equivalent to: IE 495

IE 499, SPECIAL TOPICS, 1-5 Credits

Recent advances in industrial engineering pertaining to the theory and application of system studies. Analysis and design of natural resource systems; evaluation; detection extraction; processing and marketing systems; advanced design of production systems with reference to social, economic, and regional planning; human engineering studies of man-machine systems; applications of operations research techniques. Nonsequence course. Not offered every term.

This course is repeatable for 99 credits.

IE 503, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

IE 505, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

IE 506, PROJECTS, 1-16 Credits

Graded P/N.

This course is repeatable for 16 credits.

IE 507, SEMINAR, 1-16 Credits

This course is repeatable for 16 credits.

IE 511, VISUAL PROGRAMMING FOR INDUSTRIAL APPLICATIONS, 4 Credits

Object-oriented modeling, Unified Modeling Language, software development concepts, file and database connectivity, and visual programming skills (Microsoft Visual Basic) for use in developing industrial applications, such as process monitoring and supply chain management.

Equivalent to: IE 514

Recommended: IE 212

IE 512, INFORMATION SYSTEMS ENGINEERING, 4 Credits

Framework for enterprise information systems. Engineering and scientific systems. Requirements definition, enhanced entity relationship modeling, logical modeling, structured query language, relational model, referential integrity. Lec/lab.

IE 515, SIMULATION AND DECISION SUPPORT SYSTEMS, 4 Credits

Analysis of operations and production systems through the application of computer simulation modeling techniques. Fundamentals of computer simulation including random number generation, input/output data analysis, model validation and verification. Lec/lab.

Recommended: ST 314

IE 518, TELECOMMUNICATION CONCEPTS, 3 Credits

Telecommunication concepts for industrial applications. OSI reference model, local area networks, wide area networks, internet architecture. Taught fall in even years.

Recommended: IE 212 and previous programming experience.

IE 519, WIRELESS NETWORKS, 3 Credits

RF fundamentals, ISO 802.11 standards, spread spectrum technology, narrow band technology, direct sequence and frequency hopping transmission schemes, electromagnetic interference, design of indoor wireless networks.

Prerequisite: IE 518 with C or better

IE 521, INDUSTRIAL SYSTEMS OPTIMIZATION I, 3 Credits

Techniques for analysis and solution of problems in industrial and management systems. Emphasis on application of linear and integer programming and extensions.

Equivalent to: IE 525

Recommended: MTH 341

IE 522, INDUSTRIAL SYSTEMS OPTIMIZATION II, 3 Credits

Techniques for analysis and solution of problems in industrial and management systems. Emphasis on applications of dynamic programming. Markovian processes, and questions as applied to industrial problems.

Recommended: ST 314

IE 523, INTEGER PROGRAMMING, 3 Credits

Classic models and algorithms for discrete optimization. Includes intuition and theory about computational strategies for solution of integer programming and combinatorial optimization problems.

Prerequisite: IE 521 with C or better

IE 533, HUMAN ANALYTICS AND BEHAVIORAL OPERATIONS, 3 Credits

Introduces several quantitative applications related to determining workforce size, skill-sets, and multi-functionality in service and manufacturing systems based on measurable quality and productivity performance, at the intersection of human factors engineering and production planning. Modeling and solving problems in a context of the speed and accuracy trade-off. Models include learning, forgetting, teamwork, fatigue, procrastination, and individual difference measures.

Recommended: Introductory math programming

IE 542, DESIGN OF HUMAN FACTORS / ERGONOMICS EXPERIMENTS, 4 Credits

Designed to provide graduate students with introductions to a broad range of methods appropriate for studying humans, tasks, environments and their interaction along with various topics in the area of Human Factors/Ergonomics. Reading/discussion format.

Recommended: Graduate level statistics course

IE 545, HUMAN FACTORS ENGINEERING, 4 Credits

Analysis and design of work systems considering human characteristics, capabilities and limitations. Analysis and design of displays, controls, tools, and workstations. Human performance analysis. Human factors research methods.

Equivalent to: IE 541

IE 546, HUMAN-MACHINE SYSTEMS ENGINEERING, 3 Credits

Development of safe, high performance human-machine systems. System/function/task analysis, function allocation, design, mockups and rapid prototyping, human factors test and evaluation. Critical examination of the human-factors and domain-specific literature to identify human factors problems, and knowledge and methods to address those problems.

Equivalent to: IE 542

Recommended: IE 545

IE 548, COGNITIVE ENGINEERING, 3 Credits

Theories and models of human sensory, cognitive, and motor performance pertaining to the operation of complex systems. Applications to human-machine systems engineering. Research topics and methods related to cognitive engineering.

Recommended: IE 545

IE 552, DESIGN OF INDUSTRIAL EXPERIMENTS, 3 Credits

A first course in design of experiments with an emphasis on applications and fundamental data analysis methods. Basic statistical inference, analysis of variance, blocking, general factorial designs, and two-level factorial designs are covered.

Recommended: ST 314

IE 553, DESIGN OF INDUSTRIAL EXPERIMENTS II, 3 Credits

This second course in design of experiments is a continuation of IE 552. The same textbook is used. Topics covered include two-level fractional factorial designs, regression models, response surface methods, rules for expected sum of squares and expected mean squares, a summary of the 'no-name' approach to DOE, and analysis of experiments with unbalanced data (time permitting).

Prerequisite: IE 552 with C or better

IE 563, ADVANCED PRODUCTION PLANNING AND CONTROL, 3 Credits

Application of quantitative and heuristic methods to problems of production, material, and capacity planning. Mathematical models for inventory systems, sequencing, and scheduling. Assembly line balancing methods. Just-in-time manufacturing.

Recommended: IE 521 and ST 314

IE 564, DESIGN AND SCHEDULING OF CELLULAR MANUFACTURING SYSTEMS, 3 Credits

Designing manufacturing cells. Impact of alternate process plan on cell design. Part-machine assignment to cells. Disaggregated manufacturing cells. Group scheduling.

Recommended: Computer experience

IE 570, MANAGEMENT SYSTEMS ENGINEERING, 4 Credits

Improvement of organizational performance through the design and implementation of systems that integrate personnel, technological, environmental, and organizational variables. Topics include performance assessment and measurement as well as improvement methodologies.

Equivalent to: IE 574

IE 571, PROJECT MANAGEMENT IN ENGINEERING, 3 Credits

Critical issues in the management of engineering and high-technology projects are discussed. Time, cost, and performance parameters are analyzed from the organizational, people, and resource perspectives. Network optimization and simulation concepts are introduced. Resource-constrained project scheduling case discussions and a term project are included.

Available via Ecampus

IE 575, SYSTEMS THINKING THEORY AND PRACTICE, 4 Credits

An introduction to systems science theory and practice. Systems science theory is explored through the fundamentals of systems thinking theory, and theory of knowledge. Systems science practice is explored through system dynamics modeling techniques for simulating socio-technical systems, structures, and processes.

IE 581, OPERATIONS MANAGEMENT, 4 Credits

Critical and current issues on the implementation of operations management strategies for the engineering manager. Includes aspects of operations in an engineering management environment such as work systems design, forecasting, strategy, facilities location and design, management of quality and resources planning and management.

Prerequisite: IE 582 with B or better

Recommended: IE 571

Available via Ecampus

IE 582, INTRODUCTION TO MANAGEMENT FOR ENGINEERS AND SCIENTISTS, 4 Credits

An introduction to concepts, tools, and practices necessary for a broad understanding of the roles of engineering and technical managers. A mix of research results, case studies, and experiential learning is used to bolster theories of management, with focus on technical organizations.

Available via Ecampus

IE 583, ADVANCED ENGINEERING ECONOMICS ANALYSIS, 4 Credits

Examines the economics dimension of engineering management, from costing techniques to financial analysis. Topics include industrial cost analysis and estimation, economic planning, forecasting, and budgeting, and financial analysis for engineering and engineering management.

Prerequisite: IE 582 with B or better

Recommended: Basic courses in engineering economic analysis (ENGR 390)

Available via Ecampus

IE 584, SYSTEMS ENGINEERING, 4 Credits

An overview of systems engineering within engineering management practice. Principles of systems engineering are explored through traditional and contemporary hard and soft systems of engineering techniques and practices, and through current future developments in the field.

Prerequisite: IE 582 with B- or better

Recommended: IE 581 and IE 583 and IE 586 and IE 587

Available via Ecampus

IE 585, LEGAL ASPECT OF ENGINEERING MANAGEMENT, 3 Credits

A survey of legal topics relevant to engineers, including basic of legal system, labor law, intellectual property, torts, and contracts. This is an introductory course, emphasizes on legal principles that can provide engineers with the ability to recognize legal issues that are likely to arise in the engineering profession and engineering management. Note: This is an introductory class and will in no way make a student a lawyer. Students are advised to seek legal representation if he/she encounters a legal issue.

Prerequisite: IE 582 with B or better

Recommended: IE 581 and IE 583 and (IE 586 or CCE 552)

Available via Ecampus

IE 586, PROJECT RISK MANAGEMENT, 4 Credits

An introduction to the concept of project risk in producing constructed engineering projects. Course content includes project baselining, risk definition and identification, risk assessment and management techniques, risk control, risk response, and risk management.

CROSSLISTED as CCE 552/IE 586.

Equivalent to: CCE 552

Available via Ecampus

IE 587, MANAGEMENT OF INFORMATION SYSTEMS, 4 Credits

An introduction to the management of information systems and their strategic importance in business. Topics covered include global e-business and collaboration, databases and information management, basics of telecommunications and wireless technology, security vulnerabilities of information systems, basics of business intelligence and business analytics, knowledge management and enhanced decision making.

Prerequisite: IE 582 with B or better

Available via Ecampus

IE 588, MANAGEMENT OF NEW PRODUCT DEVELOPMENT, 4 Credits

Introduces the new product development (NPD) process with the objective of understanding the underlying structure in NPD and exploring the methods to manage NPD processes by applying them to case studies and term project. The NPD process is investigated through its five key phases: (1) Opportunity identification/selection, (2) Concept generation, (3) Concept/project evaluation, (4) Development, and (5) Launch.

Prerequisite: IE 581 with B or better and IE 582 [B] and IE 583 [B]

Recommended: IE 584

Available via Ecampus

IE 589, PROFESSIONAL RESPONSIBILITY AND ETHICS, 3 Credits

An in-depth exploration of professional engineering ethics. Course content includes conceptual theoretical basis of ethics, ethics among professional organizations, ethical consideration of design, critical analysis of ethical situations, ethics in the workplace, and ethical considerations regarding the broader environment. CROSSLISTED as CCE 554/IE 589.

Equivalent to: CCE 554

Available via Ecampus

IE 590, STRATEGIC PLANNING IN ENGINEERING ORGANIZATIONS, 4 Credits

Provides an overview the strategic planning process from a variety engineering perspective. Variety engineering is explored via key management control theory concepts and through applying students' work experience.

Prerequisite: IE 581 with B or better and IE 582 [B] and IE 583 [B]

Available via Ecampus

IE 591, STATISTICAL CONCEPTS FOR ENGINEERING MANAGERS, 4 Credits

Provides a first review of basic probability and statistical inference concepts and methods relevant for engineering managers. This is followed by a presentation of frequently utilized statistical methods in industry. These include process control, regression analysis, and experimental design. For each method, the fundamental ideas will be covered, and simple examples will be presented to provide engineering managers with the background needed to initiate and manage applications of these methods in industry. The course will end with an overview of process optimization, and robust parameter design.

Prerequisite: IE 582 with B or better

Available via Ecampus

IE 594, RESEARCH METHODS IN ENGINEERING, 3 Credits

Introduction to research methodologies including surveys, interviews, quasi-experimentation, and case studies. Methods for research design, and collection and analysis of data.

Equivalent to: IE 574

IE 599, SPECIAL TOPICS, 1-5 Credits

Recent advances in industrial engineering pertaining to the theory and application of system studies. Analysis and design of natural resource systems; evaluation; detection extraction; processing and marketing systems; advanced design of production systems with reference to social, economic, and regional planning; human engineering studies of man-machine systems; applications of operations research techniques.

Nonsequence course. Not offered every term.

Equivalent to: IE 592

This course is repeatable for 99 credits.

Available via Ecampus

IE 603, THESIS, 1-16 Credits

This course is repeatable for 999 credits.

IE 605, READING AND CONFERENCE, 1-16 Credits

This course is repeatable for 16 credits.

IE 606, PROJECTS, 1-16 Credits

This course is repeatable for 16 credits.

IE 607, SEMINAR, 1-16 Credits

This course is repeatable for 16 credits.