

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.

Prerequisites: ENGR 112 with C or better

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.

Prerequisites: 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 MFGE 285.

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.

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

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.

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

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.

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

IE 367. PRODUCTION PLANNING AND CONTROL. (4 Credits)

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

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

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.

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

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.

Prerequisites: IE 212 with C or better

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.

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.

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

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.

Prerequisites: IE 212 with D- 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.

Prerequisites: 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.

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

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.

Prerequisites: (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.

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.

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.

Prerequisites: ENGR 390 with C or better

IE 497. ^MIME CAPSTONE DESIGN. (4 Credits)

Product design; selection and replacement of major tools, processes, and equipment; paperwork controls; subsystem revision; system or plant revision; selection and training of personnel; long-run policies and strategy. CROSSLISTED as ESE 497 and ME 497. (Writing Intensive Course)

Attributes: CWIC – Core, Skills, WIC

Prerequisites: ((IE 355 with C or better and IE 356 [C] and IE 366 [C] and IE 367 [C] and IE 368 [C] and WR 327 [C])) or ((ENGR 322 [C] or MATS 322 [C] and (ENGR 391 [C] or ENGR 391H [C]) and ME 250 [C] and (ME 312 [C] or ME 312H [C]) and (ME 317 [C] or ME 317H [C]) and (ME 383 [C] or ME 383H [C]) and WR 327 [C] and (ST 314 [C] or ST 314H [C])) or ((ENGR 390 [C] or BA 360 [C]) and IE 425 [C] and (ME 312 [C] or ME 312H [C]) and (ME 331 [C] or ME 331H [C]) and ESE 355 [C] and ESE 360 [C] and WR 327 [C] and (ST 314 [C] or ST 314H [C]))

Equivalent to: ESE 497, ME 497

IE 498. ^MIME CAPSTONE DESIGN. (4 Credits)

Product design; selection and replacement of major tools, processes, and equipment; paperwork controls; subsystem revision; system or plant revision; selection and training of personnel; long-run policies and strategy. CROSSLISTED as ESE 498 and ME 498. (Writing Intensive Course)

Attributes: CWIC – Core, Skills, WIC

Prerequisites: ESE 497 with C or better or IE 497 with C or better or ME 497 with C or better

Equivalent to: ESE 498, ME 498

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.

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.

Prerequisites: 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.

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.

Prerequisites: IE 521 with C or better

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.

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.

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).

Prerequisites: 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.

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.

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.

Prerequisites: IE 582 with B or better

Recommended: IE 571

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.

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.

Prerequisites: IE 582 with B or better

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

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.

Prerequisites: IE 582 with B- or better

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

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.

Prerequisites: IE 582 with B or better

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

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.

Equivalent to: CCE 552

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.

Prerequisites: IE 582 with B or better

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.

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

Recommended: IE 584

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.

Equivalent to: CCE 554

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.

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

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.

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.

This course is repeatable for 99 credits.

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.