IE 3310. Project Management for Engineers.
Basic principles governing the efficient and effective management of engineering projects. Topics include project planning, scheduling, and cost estimation procedures. Prerequisite: ENGR 3315 with a grade of "D" or better. (WI).
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter

Fundamentals of probability and statistical inference for engineering applications, probability distributions, parameter estimation, and hypothesis testing. Prerequisite: MATH 2472 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Grade Mode: Standard Letter

IE 3330. Quality Engineering.
Quality assurance systems, quality costs, statistical quality control, and approaches for engineering quality into products and processes. Prerequisite: IE 3320.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

This course teaches models in operations research including linear programs, the simplex method, duality theory, sensitivity analysis, integer programs, and network flows. The emphasis is in learning to recognize, formulate, solve, and analyze practical industrial problems. The course also teaches commercial mathematical programming languages. Prerequisites: CS 1428 and MATH 3377 and ENGR 3315, all with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3350. Supply-Chain Engineering.
The analysis of supply chain problems to include facility location, customer assignment, vehicle routing, inventory management, and the role of information and decision support systems in supply chains. Prerequisite: IE 3340 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3360. Methods Engineering and Ergonomics.
This course is a survey of methods for assessing and improving performance of individuals and groups in organizations. Techniques include various basic industrial engineering tools, work analysis, data acquisition and application, performance evaluation and appraisal, and work measurement procedures. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

Probabilistic models in operations research to include queuing theory, simulation, and Markov chains. Emphasis will be placed on modeling applications to solve problems in industry and computing. Prerequisite(s): IE 3320 and CS 1428, all with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3420. Integrated Production Systems.
Basic concepts in the design and control of integrated production systems to include forecasting, inventory models, material requirements planning, scheduling, planning, and shop floor control. Prerequisite: IE 3340 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3430. Reliability Engineering.
Reliability of components and systems, reliability models, life testing, failure analysis, and maintainability. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3440. Optimization Techniques.
Mathematical modeling and computational methods for linear, integer, and nonlinear programming problems. Prerequisite: IE 3340 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3450. Facilities Planning.
Planning, design, and analysis of facilities. Emphasizes the principles and methods used for solving plant layout, facility location, material handling, automation, computer integration, and warehouse operations. Prerequisite: ENGR 3315 and MFGE 2332.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 3460. Human Factors Design.
This course will emphasize the applications of human factors engineering to systems design. Prerequisites: IE 3360 with a grade of "D" or better. (WI).
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Lab Required|Writing Intensive
Grade Mode: Standard Letter

IE 3470. Probabilistic Design.
Probabilistic design of experiments for engineering applications. Topics include analysis of variance, randomized complete designs, factorial designs, empirical models generated from controlled experiments, and response surfaces. Prerequisite: IE 3320.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
IE 4380. Industrial Safety.
This course is a survey of occupational safety and hazards control. Topics include the history of occupational safety; hazard sources related to humans, environment, and machines; and engineering management of hazards.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter

IE 4390. Industrial Engineering Capstone Design.
Students form teams and apply industrial engineering principles to develop and implement solutions to industrial problems and/or systems engineering issues. Prerequisites: IE 3310, IE 3330, and at least two of: IE 3360, IE 4310, IE 4355, IE 4370 and MFGE 4396. Corequisites: IE 4320 and IE 4350.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.

IE 4392. Industrial Engineering Design I.
Students apply engineering principles and standards under realistic constraints to develop solutions for industrial problems and/or systems engineering issues. This course is the first part of a two-course sequence and is followed by Industrial Engineering Design II (IE 4393). Prerequisite: IE 3330, IE 3340, and IE 3360. Corequisite: At least two of IE 4310, IE 4355, and IE 4370.
3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter

IE 4393. Industrial Engineering Design II.
Students complete implementation of solutions to industrial problems and/or systems engineering issues with realistic constraints. This course is the second in a two-course sequence, and is continuation of Industrial Engineering Design I (IE 4392). Prerequisite: IE 4392, at least two of: IE 4310, IE 4355, or IE 4370. Corequisite: At least two of IE 4320, IE 4350, and MFGE 4396.
3 Credit Hours. 2 Lecture Contact Hours. 2 Lab Contact Hours.
Course Attribute(s): Writing Intensive
Grade Mode: Standard Letter

IE 4399A. Lean Six Sigma Methodologies.
This course covers the principles and methodologies of Six Sigma and Lean Manufacturing. Emphasis is on the tools and techniques used in Lean Six Sigma projects, including statistical process control, experimental design, project management and lean tools. Students will develop and complete a Lean Six Sigma project in industry. Prerequisite: IE 3330 and IE 4310.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

IE 4399D. Modern Heuristic Optimization Techniques.
Heuristic methods that search beyond local optima such as simulated annealing, tabu search, genetic algorithms, ant-colony systems, and particle swarm. Papers from the literature, problem-specific heuristics, evaluation methods and serial/parallel implementations are discussed. This course is an advanced undergraduate course for students in engineering and related fields. Prerequisites: IE 3340, CS 1428.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

IE 4399E. Introduction to Systems Engineering.
This course includes introductory topics in systems engineering and the systems-thinking process. The focus of the course is on the development of complex systems. Important topics include system understanding, modeling and design, the system development process, needs analysis, concept exploration and definition, design, integration and evaluation, and systems engineering management. Prerequisite: IE 3320 with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

IE 4399F. Introduction to Data-Intensive Analysis and Simulation.
This course covers the foundational topics in data science and consists of three parts: The first part focuses on data extraction from databases, sensors and social media. The second part reviews data-intensive analysis through statistics and machine learning tools. The third part introduces the concept of farming data using design of experiments methodologies and computer simulation. Prerequisites: IE 3340 and IE 4310, all with a grade of "D" or better.
3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

IE 5310. Advanced Statistical Design of Experiments for Engineers.
This course examines the design and analysis of controlled experiments, demonstrating engineering applications of design of experiments (DOE) in the manufacturing and service industries. Topics include full and fractional factorial designs, response surface methodology, and Taguchi methods. In a semester-long project, students apply DOE to improve a real manufacturing process. Prerequisite: ENGR 5310 with a grade of "C" or better, or instructor's approval. Restricted to students enrolled in the MS Engineering program.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

This course covers the methods for modeling and analyzing manufacturing systems. Critical manufacturing issues that are addressed by these models include sustainable production systems, material handling systems, scheduling, and supply chains. Prerequisites: IE 3320 and IE 3340 and MFGE 4396, all with a grade of "C" or better; or instructor’s approval. Restricted to students enrolled in the MS Engineering program.
3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter
IE 5330. Advanced Quality Control and Reliability Engineering.
This course provides in-depth knowledge in reliability modeling and maintenance optimization for components and systems. The course also covers advanced quality control techniques including multivariate process control. Methodologies are applied to solve practical problems arising from various industry domains. Prerequisite: ENGR 5310 with a grade of "C" or better, or approval of instructor. Restricted to students enrolled in the MS Engineering program.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

This course introduces students to modeling of linear, non-linear, and integer problems applied to engineering design, manufacturing, service, supply chain, healthcare and electrical systems. Mathematical programming software is emphasized in class exercises, homework, and project. Techniques including revised simplex method, duality theory, sensitivity analysis, and networks are also covered. Prerequisites: CS 1428 and MATH 3377 all with a grade of "C" or better, or approval of instructor. Restricted to students enrolled in the MS Engineering program.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5343. Non-Linear Optimization Techniques for Engineers.
This course covers engineering applications of mathematical modeling and computational methods for nonlinear programming problems. The primary goal of this course is to present techniques and strategies essential to optimize non-linear models. Prerequisite: IE 3340 or equivalent, or approval of instructor. Restricted to students enrolled in the MS Engineering program.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5345. Advanced Optimization.
This course covers advanced concepts in linear and integer programming. Solution techniques for stochastic and dynamic programming and formuation and solution of decision models in manufacturing, service, supply chain, healthcare and electrical systems are presented. Prerequisite: IE 5340 with a grade of "C" or better. Restricted to students enrolled in the MS Engineering program.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5347. Modern Heuristic Optimization.
This course covers heuristic methods that search beyond local optima such as simulated annealing, tabu search, genetic algorithms, ant-colony systems and particle swarm. Papers from the literature, problem-specific heuristics, evaluation methods, and implementations are discussed. Prerequisite: IE 3340 with a grade of "C" or better, or equivalent, or approval of instructor. Restricted to students enrolled in the MS Engineering program.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5397. System Thinking and Analysis.
This course is an introduction to systems engineering and the systems thinking process, providing important considerations related to the engineering of large scale systems. These considerations include system understanding, modeling and design, the system development process, needs analysis, concept exploration and definition, design, integration and evaluation, and systems engineering management. Prerequisite: ENGR 5310 with a grade of "C" or better, or approval of instructor. Restricted to students enrolled in the MS Engineering program.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Grade Mode: Standard Letter

IE 5398A. Healthcare Systems Engineering.
This course provides an introduction into healthcare delivery with particular attention to the application of systems engineering techniques. Topics include the organization of healthcare systems, characteristics of US healthcare, decision-making in the healthcare environment, health informatics, and performance measurement tools. Student project involves integration and application of systems engineering methodologies. Restricted to students enrolled in the MS Engineering program. Prerequisite: IE 5340 with a grade of "C" or better, or instructor’s approval.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

IE 5398B. Response Surface Methodologies.
This course continues the examination of the design and analysis of controlled experiments, demonstrating how design of experiments (DOE) and response surface methodologies (RSM) are used in product optimization and process improvement. Topics include factorial and fractional factorial designs, steepest ascent, fitting response surfaces, variance-optimal design, and mixture experiments. Restricted to students enrolled in MS Engineering, MS Computer Science, MS Mathematics, MS Physics or MS Technology Management. Prerequisite: IE 5310 with a grade of "C" or better, or Instructor’s approval.

3 Credit Hours. 3 Lecture Contact Hours. 0 Lab Contact Hours.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter

IE 5398C. Data-Intensive Analysis and Simulation for Engineers.
This course covers foundational topics in data science, including data-intensive analysis and simulation. Specific topics include data science, data extracting and preprocessing, data visualization, and design of simulation experiments. Prerequisite: IE 5310 with a grade of "C" or better, or Instructor’s Approval.

3 Credit Hours. 3 Lecture Contact Hours. 1 Lab Contact Hour.
Course Attribute(s): Exclude from 3-peat Processing
Grade Mode: Standard Letter