INDUSTRIAL ENGINEERING AND MANAGEMENT

Courses

IEM 2903 Introduction to Industrial Engineering
Prerequisites: UNIV 1111 with grade of "C" or better and Sophomore, Junior, or Senior Standing.
Description: Introduces students to enterprise/production systems from the perspective of industrial engineering. As a part of this introduction, the basic concepts and issues involved in professional practice will be discussed. Useful analytical methods and practices for collecting and working with data will be presented. Additionally, modern applications of industrial engineering practices will be introduced. After completion of this class, students will have the ability to describe and apply various industrial engineering methods in the manufacturing and service industries.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 2911 Lean Six Sigma
Description: Students will learn problem-solving skills to drive process improvement within various organizational settings. Learn Six Sigma methodologies, advanced techniques, and statistical tools essential for leading successful projects will be presented. After completion of the course students will be prepared to take the Six Sigma Green Belt Certification exam.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3103 Probability and Statistics for Engineers I
Prerequisites: MATH 2153 with grade of "C" or better.
Description: An introduction to key concepts and results in probability, random variables, discrete and continuous distributions, mathematical expectations, and joint probability distributions that support applications in industrial engineering and management.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3303 Design, Manufacturing and Inspection of Components
Prerequisites: (ENGR 1322 or ENGR 1332 or MET 1123) with minimum grade of "C" and (ENSC 3313 or MET 3343) with minimum grade of "C".
Description: Covers design, process physics, and inspection with emphasis on traditional and digital manufacturing. Topics include GD&T, measurement errors, casting, machining, welding, nontraditional and additive methods. Labs include SolidWorks, metrology, casting, machining, welding, AM, and digital inspection.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3 Contact: 5
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 3403 Engineering Project Management
Prerequisites: Junior standing or Senior Standing.
Description: Engineering management and group issues involved in project planning and implementation. Topics addressed include project management methodologies and software, ethics and social responsibility, organizational structures, situational leadership, individual behavior and motivation, teamwork structures, processes, collaborative technologies, process management, organizational culture, and diversity and inclusion.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3503 Engineering Economic Analysis
Prerequisites: MATH 2153 with grade of "C" or better or MATH 2133 with grade of "C" or better.
Description: Development and use of time value of money models. Bases for comparison of alternatives, including present worth, annual worth, rate of return and payout period methods. Decision-making among independent, dependent, capital-constrained and unequal-life projects. Replacement, breakeven and minimum cost analyses. Depreciation and depletion methods and their effect on corporate income taxes, leading to after-tax cash flow analysis. Introduction to financial reports.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3513 Economic Decision Analysis
Prerequisites: MATH 2123 with grade of "C" or better or MATH 2144 with grade of "C" or better.
Description: Quantitative evaluation of investment alternatives for non-engineering majors. The role of interest in economic equivalence and in formulating economic comparisons based on present worth, annual equivalent, rate of return and payout criteria. Accounting, depreciation and income tax considerations. Benefit-cost and cost-effectiveness analysis. Cost estimation and allowance for variance in estimates. Not available for credit in industrial engineering curriculum.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3523 Engineering Cost Information and Control Systems
Prerequisites: MATH 2144 with grade of "C" or better.
Description: Introduction to basic accounting concepts and operating characteristics of accounting systems relevant to engineering analysis and decision making. Principles of financial and managerial accounting, activity based costing, taxes and depreciation. Emphasis on interpretation and use of accounting information for decision-making.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3703 Probability and Statistics for Engineers II
Prerequisites: IEM 3103 with grade of "C" or better.
Description: An introduction to key concepts and results in statistics, including confidence intervals and hypothesis tests for the mean and the variance, analysis of variance, linear regression, correlation, goodness of fit tests and categorical data analysis that support applications in industrial engineering and management.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3713 Software Programming for Data Analytics
Prerequisites: ENGR 1412 with grade of "C" or better.
Description: This course introduces basic concepts and applications that are important for understanding software programming in data analytics, such as raw data manipulation, exploratory analysis, and machine learning. The primary focus in this course is on programming ideas, algorithm toolboxes, implementations and applications of data analytics methods in industrial applications (e.g., manufacturing, healthcare). Programming will be done using Python and R with a focus on real-world data analytics problems.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3813 Work Design, Ergonomics, and Human Performance
Prerequisites: ENSC 2113 with grade of "C" or better and IEM 2903 with grade of "C" or better and IEM 3103 with grade of "C" or better.
Description: Evaluation and design of work systems and processes employing humans. Emphasis on simultaneously achieving high productivity and employee health, safety and satisfaction.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3 Contact: 5
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 4010 Industrial Engineering Projects
Prerequisites: Consent of school head.
Description: Special undergraduate projects and independent study in industrial engineering. Offered for variable credit, 1-3 credit hours, maximum of 6 credit hours.
Credit hours: 1-3
Contact hours: Contact: 1-3 Other: 1-3
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 4013 Operations Research
Prerequisites: MATH 3013 with grade of "C" or better.
Description: Introduction to operations research, analytics, and mathematical optimization with an emphasis on topics in linear, integer, and network optimization. Effective model formulation and software solution of strategic, tactical and operational problems encountered in manufacturing, and service industries. Covers the simplex method, duality theory, sensitivity analysis, branch-and bound, network simplex, and Dijkstra's algorithm. Previously offered as IEM 4014.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4020 Undergraduate Engineering Practicum
Prerequisites: Consent of IEM adviser and satisfactory completion of at least 12 hours of IEM 3000- or IEM 4000-level courses.
Description: Professionally supervised experience in real life problem solving involving industrial projects for which the student assumes a degree of professional responsibility. Activities approved in advance by the instructor. May consist of full- or part-time engineering experience, on-campus or in industry, or both, either individually or as a responsible group member. Periodic reports both oral and written required as specified by the adviser. Offered for variable credit, 1-3 credit hours, maximum of 4 credit hours.
Credit hours: 1-3
Contact hours: Contact: 1-3 Other: 1-3
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 4103 Quality Control and Reliability Analysis
Prerequisites: IEM 3703 with grade of "C" or better.
Description: Performance excellence in an enterprise, including relationships between industrial engineering and quality control. Statistical quality control concepts to measure, monitor, diagnose, and improve performance at the enterprise level, the operational level, and the project level. Perform basic reliability analysis. Quantitative and qualitative quality tools to solve problems and capture opportunities for improvement.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4113 Experimental Design and Analysis for Engineering
Prerequisites: IEM 3703 with grade of "C" or better.
Description: Introduces the design of experiments (DoE) methods with statistical analysis for the purpose of process/system improvement in engineering. The covered DoE methods include single-factor & multiple-factor design, factorial design, blocked design, and fractional design. The related statistical analysis including hypothesis test, analysis of variance (ANOVA), linear regression, and response surface will also be introduced with various examples in engineering. Recommended statistical software is R.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4163 Service Systems and Processes
Prerequisites: IEM 3103 with grade of "C" or better and IEM 3503 with grade of "C" or better.
Description: Design and analysis of service systems and processes from the perspective of industrial engineering and engineering management. Application of basic industrial engineering principles and tools applied to service systems. Basics of service quality and productivity, including metrics, measurement and improvement.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4203 Facilities and Material Handling System Design
Prerequisites: IEM 3703 with grade of "C" or better and IEM 4013 with grade of "C" or better.
Description: Design principles and analytical procedures for determining facility location and location of physical assets within a facility. Introduction to material-handling concepts, technologies and methods. Considerations include production processes, product volume, material flow and information flows.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4383 Additive Manufacturing: Fundamentals, Processes, Applications, and Implications
Prerequisites: (ENGR 1322 with a "C" or better OR ENGR 1332 with a "C" or better OR MET 1123 with a "C" or better) AND (ENSC 3313 with a "C" or better OR MET 3343 with a "C" or better OR IEM 3303 with a "C" or better OR MAE 3123 with a "C" or better).
Description: This course covers fundamental, advanced, and emerging additive manufacturing (AM) topics. It has 4 modules: 1) AM fundamentals, 2) processes & capabilities, 3) AM applications, and 4) business & societal implications. Students gain design and process planning skills, hands-on experience with popular AM processes, learn about new applications in industries like medical and aerospace, and explore the business side of AM implementation and industry disruption. May not be used for degree credit with IEM 5383.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3 Contact: 5
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 4413 Industrial Organization Management
Prerequisites: IEM 2903 with minimum grade of "C" and IEM 3403 with minimum grade of "C".
Description: Issues, concepts, theories and insights of engineering management and applications emphasizing effective performance.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4613 Production Planning and Control Systems
Prerequisites: IEM 4013 with grade of "C" or better.
Description: Concepts of planning and control for production and control systems. Design of operation planning and control systems. Techniques used in demand forecasting, operations planning, inventory control, scheduling, and progress control.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4623 Supply Chain and Logistics
Prerequisites: IEM 3103 with grade of "C" or better and IEM 4013 with grade of "C" or better.
Description: Introducing basic concepts and methods in supply chain management. Developing managerial insights into supply chain strategies in the global economy. Measuring supply chain performance under dynamic market conditions.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4693 Decentralized Blockchain Computing for Engineering Applications
Prerequisites: ENGR 1412 with minimum grade of C or CS 2433 with minimum grade C.
Description: This course covers fundamental, advanced and emerging paradigms in blockchain computing. Students gain basic understanding of distributed and decentralized computing paradigms; develop skills for deploying scalable, enterprise ML and analytics applications.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4713 Systems Simulation Modeling
Prerequisites: IEM 3703 with grade of "C" or better and IEM 4013 with grade of "C" or better.
Description: Simulation of discrete-event systems, including problem formulation, translation to a computer model, and use of a model for problem solution as well as concepts of random variable selection and generation, model validation and statistical analysis of results.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3 Contact: 5
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 4723 Information Systems Design and Development
Prerequisites: Junior Standing or Senior Standing.
Description: Overview of IS/IT concepts. Systems development methodology, modeling methods, and software tools for the design and development of information systems, especially relational database applications. Data modeling using the Entity Relationship Diagram (ERD). Implementing and manipulating relational databases using SQL and MS Access. Process modeling using the UML Activity Diagram. Introduction to Enterprise Resource Planning and Geographic Information systems.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4783 Applied Statistical Analysis in R for Engineers
Prerequisites: IEM 3703 or equivalent with minimum grade of "C".
Description: The overall goal of this course is to provide an applied overview to statistical learning for real industrial engineering problems using R programming. Topics In this course cover advanced linear and non-linear methods of statistical learning such as multivariate regression, mixed-effects regression, advanced logit regression, clustering methods, generalized additive models, tree-based methods, support vector machines. and Bayesian methods. May not be used for degree credit with IEM 5783.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4823 Human Factors Engineering
Prerequisites: IEM 3813 with minimum grade of "C".
Description: Design-focused course that introduces students to human factors engineering, human-centered design, and cognitive engineering; provides an overview of human factors psychology, how the human body and its limitations affect engineering design and then discuss how human factors engineering design leads to a reduction of human error in complex systems.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4913 Senior Design Projects
Prerequisites: Terminal semester only and IEM majors only and IEM 3403 with grade of "C" or better and IEM 3503 with a grade of "C" or better.
Description: Student teams work on professional-level engineering projects selected from a wide range of participating organizations. Projects are equivalent to those normally experienced by beginning professionals and require both oral and written reports. Normally taken during student's last semester of undergraduate work.
Credit hours: 3
Contact hours: Lecture: 1 Lab: 4 Contact: 5
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt
Additional Fees: IEM 4913 indust Equip Use fee of $80 applies.

IEM 4931 Industrial Engineering and Management Seminar
Prerequisites: Senior standing.
Description: Designed to orient seniors to their professional work environment. Topics include placement procedures, resume construction, interviewing skills, professional dress, graduate school, professional societies and registration, personal management of time and money, and job-related expectations. Taught by senior faculty; utilizes outside speakers.
Credit hours: 1
Contact hours: Lecture: 1 Contact: 1
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4953 Industrial Assessment and Improvement
Prerequisites: Senior standing and consent of instructor.
Description: Plant assessment and improvement-based concepts, strategies, and tools for manufacturing operations. Emphasis is on small to medium-sized manufacturing operations. Issues include energy, water, waste, quality, and productivity analysis across the organization from a systems perspective. Justification of improvement projects and measurement of results. May not be used for degree credit with IEM 5953 or MET 4953.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4990 Selected Topics in Industrial Engineering and Management
Prerequisites: Consent of instructor.
Description: Study of selected contemporary topics in industrial engineering and management, including operations research; quality; manufacturing systems; engineering management; enterprise systems and supply chains; facilities, energy, and environmental management. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5000 Master's Research and Thesis
Prerequisites: Approval of major adviser.
Description: Research and thesis for master's students. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5003 Probability and Statistics for Engineers
Prerequisites: STAT 4033 or IEM 3103.
Description: Probability and statistical topics and methods used in various areas of industrial engineering including random numbers, probability theory, conditional probabilities, parameter estimation, confidence intervals, hypothesis testing, and regression models.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5010 Industrial Engineering Projects
Prerequisites: Consent of school head and approval of major adviser.
Description: Special graduate projects and independent study in industrial engineering. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5013 Introduction to Optimization
Prerequisites: IEM 4013 or equivalent.
Description: Introduction to mathematical optimization with an emphasis on linear, integer, network, and convex optimization. Effective formulization techniques, basic mathematical and algorithmic concepts, and software solution of large-scale problems arising in the practice of operations research, industrial and systems engineering, management sciences, and analytics.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5020 Graduate Engineering Practicum
Prerequisites: Consent of School Head, approval of IEM advisor, and satisfactory completion of two consecutive regular (Fall/Spring) semesters.
Description: Professionally supervised experience in a real-life problem involving authentic projects for which the student assumes a degree of professional responsibility. Activities must be approved in advance by the student's advisor. May consist of full or part-time engineering experience, on-campus or in industry, or both, either individually or as a responsible group member. Periodic reports, both oral and written, required as specified by the advisor. All eligible IEM 5020 credit hours should be included in the Plan of Study. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5063 Network Optimization
Prerequisites: IEM 5013 or equivalent.
Description: Network flows and combinatorial optimization models and algorithms with an emphasis on mathematical and algorithmic fundamentals. Covers basics of graph theory, algorithmic analysis, and complexity theory. Covers Classical Algorithms for shortest paths, minimum spanning trees, max-flow and min-cut, min-cost flows; P versus NP, traveling salesman problem, local search, metaheuristics, Christofides algorithm. Previously offered as IEM 6013.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5083 Data Science and Applications
Prerequisites: Minimum grade of "B" in IEM 5003 or equivalent and Math 3013 or equivalent.
Description: Touches on linear algebra concepts of eigenvalues SVD with applications to optimization, regression analysis, and classification. Reviews linear, logistic regression techniques, including geometric and statistical interpretations, and hypothesis tests, while illustrating least square problems through optimization. Introduces neural nets, backpropagation, and gradient descent, with kernel functions and SVMs, and PCA. Projects and problems connect theory to industrial engineering applications.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5103 Breakthrough Quality and Reliability
Prerequisites: IEM 5003 of equivalent.
Description: Performance excellence in an enterprise, including relationships between industrial engineering and quality control. Statistical quality control concepts to measure, monitor, diagnose, and improve performance at the enterprise level, the operational level, and the project level. Perform basic reliability analysis. Quantitative and qualitative quality tools to solve problems and capture opportunities for improvement.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5113 Strategic Quality Leadership
Prerequisites: STAT 4013 and IEM 5003.
Description: Quality-related strategies. Critical elements that differentiate high performing organizations from their competitors. Delivering value to customers. Quality leadership, strategic planning, customer value, learning organizations, knowledge management, quality systems and business results.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5123 Service Quality
Prerequisites: STAT 4013 or equivalent.
Description: Theory and application of service quality, including characteristics of services (intangibility, heterogeneity, perishability and inseparability of production and consumption), dimensions of service quality, measurement methodologies for service quality and improvement methodologies for service quality. Certification and accreditation processes for service industries.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5133 Stochastic Processes
Prerequisites: MATH 2233, MATH 3013, and IEM 5003 or STAT 5123.
Description: Definition of stochastic processes, probability structure, mean and covariance function, the set of sample functions. Renewal processes, counting processes, Markov chains, birth and death processes, stationary processes and their spectral analyses. Same course as STAT 5133 & MATH 5133.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5143 Reliability and Maintainability
Prerequisites: STAT 4033 and IEM 5003.
Description: Probabilistic failure models of components and systems. Detailed study of reliability measures, and static and dynamic reliability models. Classical and Bayesian reliability testing for point and interval estimation of exponential and Weibull failures. Reliability optimization through allocation and redundancy. Fundamentals of maintainability. Previously offered as IEM 6113.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5153 Process Design and Integration
Prerequisites: STAT 4033 or equivalent.
Description: Process design, integration, control, and improvement within and between enterprises. Analytical and systems approaches to address physical and statistical characterization of inputs, transformations, and outputs. Modeling issues, including process mapping, cause and effect analysis, and impact projection. Purpose, linkages, value, leverage, measurement, creativity and leadership.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5203 Facility Location, Warehousing and Transportation
Prerequisites: IEM 5003 and IEM 5013.
Description: Analytical models for single and multi-facility location problems. Algorithms for network location problems including the median, center, and covering problems. Storage policies such as dedicated, randomized and class-based and their relationship to the warehouse layout problem. Order picking and routing in warehouses. Warehouse material handling and storage/retrieval systems. Overview of the Vehicle Routing Problem (VRP). Clark and Wright heuristic for the single-depot VRP problem.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5350 Industrial Engineering Problems
Description: A detailed investigation into one area of industrial engineering with a required written report. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5383 Additive Manufacturing: Fundamentals, Processes, Applications, and Implications
Prerequisites: (ENGR 1322 with a "C" or better OR ENGR 1332 with a "C" or better OR MET 1123 with a "C" or better) AND (ENSC 3313 with a "C" or better OR MET 3343 with a "C" or better OR IEM 3303 with a "C" or better OR MAE 3123 with a "C" or better) OR equivalents.
Description: This course covers fundamental, advanced, and emerging additive manufacturing (AM) topics. It has 4 modules: 1) AM fundamentals, 2) processes & capabilities, 3) AM applications, and 4) business & societal implications. Students gain design and process planning skills, hands-on experience with popular AM processes, learn about new applications in industries like medical and aerospace, and explore the business side of AM implementation and industry disruption. May not be used for degree credit with IEM 4383.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3 Contact: 5
Levels: Graduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 5413 Engineering Entrepreneurship
Description: Advanced study of engineering entrepreneurship in the technical organization including: new product evaluation and selection, technology commercialization process, business plan preparation, intellectual property, patent search and discovery, new enterprise development, market analysis, and capital investment procurement strategies.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5503 Financial and Advanced Capital Investment Analysis
Prerequisites: IEM 3503, IEM 4013, STAT 4033 or IEM 3103 or equivalent.
Description: An understanding of financial concepts and markets, and an advanced treatment of proper methods of capital project selection under risk and uncertainty. Decision making under capital rationing. Financial environment and valuing securities, representing cash flows, selecting investments, avoiding common pitfalls, evaluating timing consideration, depreciation and corporate taxation, replacement analysis, and incorporating risk and uncertainty.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5603 Project Management
Prerequisites: IEM 3403 or equivalent.
Description: A systems approach to planning, organizing, scheduling and controlling projects. The behavioral and quantitative aspects of project management. Importance of working with personnel as well as technology. Project management software utilized.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5613 Integrated Manufacturing Control Systems
Prerequisites: IEM 4613.
Description: Advanced treatment of planning and control philosophies and techniques for manufacturing and production systems. Approaches focusing on demand-driven control and achieving competitive advantage through manufacturing. Material requirements planning, capacity planning, shop floor control, master scheduling, production planning and demand management. Just-in-time and the theory of constraints.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5633 Advanced Production and Inventory Control
Prerequisites: IEM 5013 and IEM 5763.
Description: Advanced concepts and quantitative techniques used in production planning and inventory control, including static and dynamic scheduling of machines and cells, deterministic and stochastic inventory control, multi-echelon supply chain management, demand forecasting, and revenue management.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5653 Data Engineering
Prerequisites: (STAT 5253 or STAT 5123 or IEM 5003) or equivalent with minimum grade of "C" and IEM 5083 or equivalent with minimum grade "C" and Intermediate knowledge of Python and R.
Description: The course focuses on advanced data engineering and data mining under data-rich scenarios. This course covers a collection of methods including a review of supervised learning, detailed discussions of unsupervised learning, and a series of data engineering tools such as data visualization and preprocessing. Cutting-edge data mining methods will also be introduced. Real-world data sets will be used to showcase the application of the methods in various areas such as manufacturing, healthcare, and agriculture. Same course as MATH 5653 and STAT 5653.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5683 Advanced Data Analytics in Industrial Engineering
Prerequisites: IEM 5003 with a "C" or better.
Description: The course focuses on advanced data analytics methods tailored for engineering applications. Foundational topics include probability and statistics and generalized linear regression. The course covers neural networks, deep learning, and reinforcement learning along with the interpretability of models and considerations for data-driven decision-making. The methods will be taught while solving real-world problems (such as demand forecasting, failure prediction, defect detection, healthcare analytics, etc.).
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5693 Decentralized Blockchain Computing for Engineering Applications
Prerequisites: Minimum grade of "C" in ENGR 1412 or CS 2433 or equivalents.
Description: The course covers fundamental, advanced and emerging paradigms in blockchain computing. Students gain basic understanding of distributed and decentralized computing paradigms; develop skills for deploying scalable, enterprise ML and analytics applications.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5703 Discrete System Simulation
Prerequisites: IEM 5003.
Description: Discrete-event systems via computer simulation models. Model building and the design and analysis of simulation experiments for complex systems. Application to a variety of problem areas. Use of simulation languages and related software tools.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5723 Data, Process and Object Modeling
Prerequisites: Graduate standing or consent of instructor.
Description: Systems development life cycle and methodology. Structured and object-oriented analysis and design techniques. Data modeling using the Entity-Relationship Diagram and IDEF1x. Data normalization techniques. Relational database implementation using SQL and MS Access. Object-oriented analysis and design using the Unified Process and the Unified Modeling Language (UML). Process modeling using the UML Activity Diagram and Petri nets.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5743 Information Systems and Technology
Prerequisites: Graduate standing or consent of instructor.
Description: For current and potential engineering and technology managers. Knowledge of information systems and technology to lead the specification, selection, implementation, and integration of information technology in manufacturing and service organizations. Management issues involved in the use of information technology in organizations.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5763 Supply Chain Strategy
Prerequisites: IEM 4613 or equivalents.
Description: Supply chain strategy including the philosophical base of business practice and the analytical base of modeling. Supply chain strategy, including key objectives and financial considerations, supply chain dynamics, supply chain performance measurement, supply chain integration, characteristics of different supply chains and supply chain performance modeling.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5783 Applied Statistical Analysis in R for Engineers
Prerequisites: IEM 3703 or equivalent
Description: The overall goal of this course is to provide an applied overview to statistical learning for real industrial engineering problems using R programming. Topics In this course cover advanced linear and non-linear methods of statistical learning such as multivariate regression, mixed-effects regression, advanced logit regression, clustering methods, generalized additive models, tree-based methods, support vector machines. and Bayesian methods. May not be used for degree credit with IEM 4783.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5803 Human Factors Engineering
Prerequisites: Graduate Student Standing
Description: Design-focused course that introduces students to human factors engineering, human-centered design, and cognitive engineering; provides an overview of human factors psychology, how the human body and its limitations affect engineering design and then discuss how human factors engineering design leads to a reduction of human error in complex systems.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5813 Performance Measurement Systems
Prerequisites: IEM 3813 or equivalent.
Description: Strategies and methods to define, measure, and apply individual, group- and organizational-level performance metrics in a variety of service and production contexts. Implementation and effective use of metrics. Measurement's role in a management system, managerial decision styles and preferences, operational definitions of performance, processes for identifying and applying metrics, performance measurement tools and techniques, data collection, portrayal of quantitative and qualitative information, and the role of computer technology in measurement system application.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5953 Industrial Assessment and Improvement
Prerequisites: Senior standing and consent of instructor.
Description: Plant assessment and improvement-based concepts, strategies, and tools for manufacturing operations. Emphasis is on small to medium-sized manufacturing operations. Issues include energy, water, waste, quality, and productivity analysis across the organization from a systems perspective. Justification of improvement projects and measurement of results. May not be used for degree credit with IEM 4953 or MET 4953.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5990 Special Topics in Industrial Engineering and Management
Prerequisites: Consent of instructor.
Description: Study of selected contemporary topics in industrial engineering and management including operations research; quality and reliability; manufacturing systems; engineering management; enterprise systems and supply chains; facilities, energy, and environmental management. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 6000 Doctoral Research and Dissertation
Prerequisites: Approval of major adviser and advisory committee.
Description: Independent research for PhD dissertation requirement under direction of a member of the Graduate Faculty. Offered for variable credit, 1-15 credit hours, maximum of 30 credit hours.
Credit hours: 1-15
Contact hours: Contact: 1-15 Other: 1-15
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 6033 Linear Optimization
Prerequisites: Concurrent Prerequisite IEM 5013 or consent of instructor.
Description: Mathematical theory of linear optimization and the implications for algorithm development. Fundamentals of convex analysis, polyhedral sets, development of the simplex method, Farkas' lemma, development of duality theory, sensitivity analysis, Dantzig-Wolfe decomposition, Benders decomposition, interior point algorithms. Previously offered as IEM 5033.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 6043 Nonlinear Optimization
Prerequisites: IEM 6033 or consent of instructor.
Description: Mathematical foundations of nonlinear optimization theory and algorithms. Introduction to convex analysis, local/global optima, optimality conditions, and their implications for model and algorithm development. Convex functions and generalizations, Fritz John and Karush-Kuhn-Tucker optimality conditions, constraint qualifications, Lagrangian duality and saddle point optimality conditions, gradient-based and quasi-Newton methods for unconstrained optimization. Previously offered as IEM 5043.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 6053 Integer and Combinatorial Optimization
Prerequisites: Concurrent prerequisites. IEM 5063, IEM 6033, or consent of instructor.
Description: Theory, algorithms, and applications of discrete optimization. Binary, pure, and mixed-integer linear optimization formulations, relaxations; preprocessing, branch and bound, formulation strength, polynomial equivalence of separation and optimization; theory of polyhedra, convex hulls and facets, valid inequalities for pure and mixed-integer problems, lifting, perfect formulations, extended formulations. Previously offered as IEM 6023.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 6063 Optimization Under Uncertainty
Prerequisites: IEM 5013, IEM 6033, IEM 5003 or consent of instructor.
Description: Introduction to concepts, principles, and techniques for optimization under uncertainty. Formulating two-stage stochastic linear and integer programs; sample average approximation and decomposition methods; conditional value-at-risk and chance-constrained optimization; robust linear optimization, robust conic optimization, and robust multi-stage optimization; distributionally robust and data-driven optimization.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 6110 Special Problems in Industrial Engineering
Prerequisites: Consent of school head and approval of major adviser.
Description: Special problems in industrial engineering and management under supervision of a member of the Graduate Faculty. Offered for variable credit, 1-6 credit hours, maximum of 6 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 6123 Queuing Systems: Theory and Manufacturing Applications
Prerequisites: IEM 5003, STAT 5133 or consent of instructor.
Description: Review of probability, stochastic processes, and Markov chains. Single-server and multi-server exponential queuing models. Queuing models with Poisson arrivals and general service times. Product form queuing network models: open and closed network models, mean value analysis algorithms for closed models, and single class and multiclass models. Approximations for general single server queues and non-product form networks. Applications of queuing models in the performance analysis of transfer lines, automatic assembly systems, and flexible manufacturing systems.
Credit hours: 3
Contact hours: Lecture: 3 Contact: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 6903 IEM Doctoral Seminar
Description: The IE&M Doctoral Seminar is designed to train the doctoral student in the doctoral dissertation research process and is normally taken in the first year of the student's program. The course involves significant work outside the classroom, under the supervision of the student's research advisor. The class meetings will be used for some formal instruction on research methods/process, discussion of current research in IEM lead by select faculty, guest speakers, and presentations by students.
Credit hours: 3
Contact hours: Lecture: 1 Contact: 3 Other: 2
Levels: Graduate
Schedule types: Independent Study, Lecture, Combined lecture & IS
Department/School: Industrial Engr & Mgmt

IEM 6990 Advanced Topics in Industrial Engineering and Management
Prerequisites: Consent of instructor.
Description: Advanced and emerging topics of interest to PhD-level students in Industrial Engineering and Management are discussed. Offered for variable credit, 1-6 credit hours, maximum of 18 credit hours.
Credit hours: 1-6
Contact hours: Contact: 1-6 Other: 1-6
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt