Industrial Engineering and Management

Industrial engineering and management focuses on production systems that produce goods or provide services for customers. Industrial engineers define, design, build, operate, and improve production processes that convert resources to high quality products or services effectively, efficiently, and safely.

People are the fundamental component of production systems. People provide the creativity and leadership essential to make things happen. Hence, industrial engineering is the most people-oriented discipline within the engineering family. Industrial engineers are trained to think in both broad and specific terms. Practicing industrial engineers understand business parameters as well as physical and social parameters within production systems. This breadth allows industrial engineers to function effectively in a wide spectrum of activities ranging from strategic business planning to detailed task design. The wide-angle vision of industrial engineering provides career flexibility, leading to high-level leadership or specialized technical responsibilities.

Industrial engineers are found in manufacturing organizations (e.g., automotive, electronics, medical, and food manufacturers), service enterprises (e.g., hospitals, banks, airlines, and consulting groups), and governmental organizations (e.g., public service and regulatory organizations).

Vision

IEM’s vision is to place industrial engineers in a wide variety of industries including manufacturing, service, energy, healthcare, humanitarian, and others, so that our society at large can benefit from systems that efficiently produce goods or provide services, effectively use an optimal set of resources, and enrich the quality of life for all.

Mission

The School of Industrial Engineering and Management’s mission is to develop professionals and leaders in industrial engineering and management by being a leader in education, research, and outreach.

Core Values

Faculty, students, and staff work together to build and maintain a learning/mentoring environment where:

• Innovative practices are developed, tested, and validated.
• Knowledge and practices are shared.
• Each individual develops to his/her full potential.
• Professional ethics are practiced at all times.

Educational Objectives and Outcomes

Within a few years after graduation, Industrial Engineering program graduates will become professionals, managers or leaders in a wide variety of industries and apply discovery, problem solving, leadership, and management skills for the benefit of their organization and society at large.

Student Learning Outcomes

Graduating baccalaureate students possess an understanding of fundamental industrial engineering and management concepts, methodologies and technologies as demonstrated by:

• an ability to apply knowledge of mathematics, probability and statistics, science, engineering.
• an ability to design and conduct experiments involving risk and uncertainty, as well as to analyze and interpret data.
• an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
• an ability to function on multi-disciplinary teams.
• an ability to identify, formulate and solve engineering problems.
• an understanding of professional and ethical responsibility.
• an ability to communicate effectively.
• the broad education necessary to understand the impact of engineering solutions in a global economic, environmental and societal context.
• a recognition of the need for, and an ability to engage in, life-long learning.
• a knowledge of contemporary issues.
• an ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

The curriculum consists of three primary parts:

1. general studies,
2. core engineering, and
3. professional school topics.

General studies consist of courses such as mathematics, statistics, chemistry, physics, English, behavioral science, history, humanities, and arts. Core engineering courses consist of engineering sciences such as materials, statics, electrical circuits, fluid mechanics, and thermodynamics. Professional school courses consist of topics such as systems thinking and analysis in engineering, economic analysis, manufacturing processes, computer-aided modeling, work analysis, operations research, quality control, experimental design, facility location and layout, management and leadership, production control, system simulation modeling, information systems, ergonomics and human factors, and energy and water management. A capstone design experience, working with a real-world organization, integrates classroom and lab work together in the senior year. Details regarding degree requirements are available in the Undergraduate Programs and Requirements publication.

The IEM program is accredited by the Engineering Accreditation Commission of the ABET under the industrial engineering criteria.

Each IEM student, along with the faculty adviser, develops an individual plan of study that guides the student through the curriculum. Course work is sequenced and interrelated to provide theoretical and applied knowledge, along with hands-on laboratory and project experience. Students work as individuals and as teams to integrate and apply mathematical, scientific, and engineering knowledge and concepts in order to address both traditional academic questions as well as open-ended design and analysis challenges. Instruction in experimental methods is integrated in the curriculum through the design, execution, analysis and interpretation of experiments. Project work is used to
develop both technical and communications skills. Technical skills are used to identify, formulate and address engineering problems, both simple and complex. Communications skills are developed and practiced in written, oral and team interaction formats.

The means to define and design detailed solutions to address customer needs from a system-wide perspective is introduced in the sophomore year, and reinforced through the capstone senior design project. Additionally, global perspectives or production systems are introduced and emphasized in the sophomore year so that students understand the nature of global customer bases as well as global competition early in their studies. The curriculum is continually updated to assure that contemporary issues, thinking, and tools are integrated in course content as well as instructional delivery. Professional responsibility and ethical behavior are introduced and reinforced throughout the curriculum. Additionally, the need for life-long learning after graduation is stressed.

Students are offered opportunities to enhance their classroom and laboratory experiences through student organizations such as the student chapter of the Institute of Industrial and Systems Engineers, the Institute for Operation Research and the Management Sciences, and the American Society for Quality. Outstanding scholars are recognized by Alpha Pi Mu, the national honor society for industrial engineering students. Additionally, opportunities for internship and co-op experiences are offered to IEM students so that they can gain professional experience during their collegiate program. Please visit our Internet site http://iem.okstate.edu for more information.

Courses

IEM 2903 Manufacturing and Service Systems and Tools I
Prerequisites: ENGR 1111; MATH 2144.
Description: Introduction to definition, design, operation, and improvement of systems that produce goods and services. Case studies featuring classical and contemporary issues in industrial engineering and management. Issues include system effectiveness and efficiency in meeting customer needs, demands and expectations. Introduction to computer-aided tools useful in documentation, analysis, and modeling within contemporary organizations.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3103 Introduction to Probabilistic Modeling
Prerequisites: MATH 2153.
Description: Introduction to concepts and models of randomness, which support industrial engineering and engineering management analyses and decision-making. Includes probability models, statistical models and distributions, Markov processes and Little's Law.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3203 Manufacturing Processes
Prerequisites: ENGR 1322 and ENSC 3313.
Description: Manufacturing processes used to transform new materials including metals and non-metals into finished goods. Traditional and nontraditional manufacturing processes. Introduction to CAD/CAM. Basic process selection. Metrology and measurement fundamentals.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 3403 Collaborative Engineering Project Management
Prerequisites: Junior standing.
Description: Engineering management and group issues involved in project planning, implementation and topics addressed include project management methodologies and software; teamwork structures, processes, and collaborative technologies; process management, leadership and other team roles.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3503 Engineering Economic Analysis
Prerequisites: MATH 2153.
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
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3513 Economic Decision Analysis
Prerequisites: MATH 2123.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3303 Manufacturing Processes
Prerequisites: ENGR 1322 and ENSC 3313.
Description: Manufacturing processes used to transform new materials including metals and non-metals into finished goods. Traditional and nontraditional manufacturing processes. Introduction to CAD/CAM. Basic process selection. Metrology and measurement fundamentals.
Credit hours: 3
Contact hours: Lecture: 2 Lab: 3
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 3403 Collaborative Engineering Project Management
Prerequisites: Junior standing.
Description: Engineering management and group issues involved in project planning, implementation and topics addressed include project management methodologies and software; teamwork structures, processes, and collaborative technologies; process management, leadership and other team roles.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3503 Engineering Economic Analysis
Prerequisites: MATH 2153.
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
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3513 Economic Decision Analysis
Prerequisites: MATH 2123.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt
IEM 3523 Engineering Cost Information and Control Systems
Prerequisites: MATH 2144.
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
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3703 Manufacturing and Service Systems and Tools II
Prerequisites: ENGR 1111, MATH 2144.
Description: Introduction to definition, design, operation, and improvement of systems that produce goods and services. Case studies featuring classical and contemporary issues in industrial engineering and management. Issues include system effectiveness and efficiency in meeting customer needs, demands and expectations. Introduction to computer-aided tools useful in documentation, analysis, and modeling within contemporary organizations.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 3813 Work Design, Ergonomics, and Human Performance
Prerequisites: IEM 3103.
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
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: Other: 1
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 4013 Introduction to Operations Research
Prerequisites: IEM 3103, MATH 3263.
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
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4020 Undergraduate Engineering Practicum
Prerequisites: Consent of IEM adviser, admission to the Professional School of Industrial Engineering and Management 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: Other: 1
Levels: Undergraduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 4103 Introduction to Quality Control
Prerequisites: IEM 3103.
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. Quantitative and qualitative quality tools to solve problems and capture opportunities for improvement.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4113 Industrial Experimentation
Prerequisites: IEM 3103.
Description: Analytical methods for the purpose of process improvement. Experimental designs including single, blocked and multiple factors. Introduction to fractional factorial designs, central composite designs, and Taguchi robust designs. Data collection, analysis, and interpretation, including graphical methods, confidence intervals, and hypothesis tests. Multiple linear regression analysis methods. Industrial applications.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4163 Service Systems and Processes
Prerequisites: IEM 3103, IEM 3503, IEM 4613.
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
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4165 Quality and Service Engineering Management
Prerequisites: IEM 3103.
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
Levels: Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt
IEM 4203 Facilities and Material Handling System Design
Prerequisites: IEM 4013 and IEM 4713.
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
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4413 Industrial Organization Management
Prerequisites: IEM 2903, IEM 3703.
Description: Issues, concepts, theories and insights of engineering management and applications emphasizing effective performance.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4613 Production Planning and Control Systems
Prerequisites: IEM 4013.
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
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4623 Introduction to Supply Chain Management
Prerequisites: IEM 3103, IEM 4013 and consent of instructor.
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. May not be used for graduate credit with IEM 5763.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4713 Introduction to Systems Simulation Modeling
Prerequisites: IEM 4013.
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
Levels: Graduate, Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

IEM 4723 Information Systems Design and Development
Prerequisites: IEM 2903, IEM 3703.
Description: Information systems development methodologies, modeling methods and software tools for the design and development of information systems. Different phases of system design and implementation. Data modeling using entity-relationship diagrams and process modeling using data flow diagrams, IDEF0 and IDEF3. Introduction to enterprise resource planning systems and their use within different enterprise functional units.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate, Undergraduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 4913 Senior Design Projects
Prerequisites: IEM 3403, IEM 3503, consent of instructor; IEM majors only.
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. Additional flat fee of $80.00 applies.
Credit hours: 3
Contact hours: Lecture: 1 Lab: 4
Levels: Undergraduate
Schedule types: Lab, Lecture, Combined lecture and lab
Department/School: Industrial Engr & Mgmt

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
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.
Credit hours: 3
Contact hours: Lecture: 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: Other: 1
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: Other: 1
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
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: Other: 1
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 programming with an emphasis on linear programming, integer programming, minimum cost network flows and convex programming. Effective formulation techniques, basic mathematical and algorithmic concepts, and software solution of large-scale industrial engineering problems arising in manufacturing and service applications.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5020 Graduate Engineering Practicum
Prerequisites: Consent of IEM adviser and satisfactory completion of 12 hours of IEM 5000- or IEM 6000-level courses.
Description: Professionally supervised experience in real-life problem solving involving projects for which the student assumes a degree of professional responsibility. Activities approved in advance by the instructor and must reflect graduate level analysis. 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 3 credit hours.
Credit hours: 1-3
Contact hours: Other: 1
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5030 Engineering Practice
Prerequisites: Approval of adviser.
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 adviser. 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, 1-9 credit hours, maximum of 12 credit hours.
Credit hours: 1-9
Contact hours: Other: 1
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 applications in transportation and logistics planning. Covers basics of graph theory and complexity theory; algorithms for shortest paths, max flows and min cut, min cost flows, assignments and matchings, min spanning trees, traveling salesman problem, local search and metaheuristics including simulating annealing, genetic algorithm and tabu search. Previously offered as IEM 6013.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5103 Breakthrough Quality
Prerequisites: IEM 4103, IEM 4113 and IEM 5003.
Description: Structured, systematic approach and advanced statistical and modeling tools to achieve breakthrough improvement across all areas of an enterprise. Rigorous application, integration, and betterment of strategies and tools for improving or redesigning products and processes such that performance gains are noticeably higher or quicker than those achieved under traditional incremental improvement approaches.
Credit hours: 3
Contact hours: Lecture: 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
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
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
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
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5203 Facility Location, Warehousing and Freight Transportation
Prerequisites: IEM 4013, IEM 4203 and IEM 5003.
Description: Analytical models for single and multi facility location problems. Algorithms for network location problems including the median, center and covering problems. A discussion of storage location policies such as dedicated, randomized and class-based and their relationship to the warehouse layout problem. Analysis and design of warehouse material handling systems. Introduction to warehouse management systems, freight movement modeling and transportation infrastructure planning.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5350 Industrial Engineering Problems
Prerequisites: IEM 4413 or equivalent industrial experience.
Description: Advanced study of the engineering and technical organization. Engineering and technical functions, management process, roles, and activities. Individual study of current technical management issues of student interest.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Independent Study
Department/School: Industrial Engr & Mgmt

IEM 5413 Managing the Engineering and Technical Function
Prerequisites: IEM 4413 or equivalent industrial experience.
Description: Advanced study of the engineering and technical organization. Engineering and technical functions, management process, roles, and activities. Individual study of current technical management issues of student interest.
Credit hours: 3
Contact hours: Lecture: 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.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt
IEM 5603 Project Management
Prerequisites: IEM 4413 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
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
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5633 Advanced Production Control
Prerequisites: IEM 4013, IEM 4613.
Description: Advanced concepts and quantitative techniques used in production planning and control, including demand forecasting using regression, time series analysis, and Box-Jenkins models, mathematical programming approaches, to aggregate planning and disaggregation, static and dynamic scheduling of machines and cells, and independent demand inventory management. Deterministic and stochastic models and their relationship to Just-In-Time and Zero Inventory practices.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5703 Discrete System Simulation
Prerequisites: IEM 4013, IEM 4203 and 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
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: Logical and physical models in the analysis, design and improvement of enterprise systems. Structured and object-oriented analysis and design techniques. Data modeling using entity-relationship diagrams and IDEF1x. Data normalization techniques. Process modeling using data flow diagrams, IDEF0, IDEF3, and Petri nets. Object modeling using the unified modeling language (UML).
Credit hours: 3
Contact hours: Lecture: 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
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
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt

IEM 5773 Supply Chain Modeling
Prerequisites: IEM 5763 and IEM 5013 or IEM 5033 and IEM 4713 or IEM 5703 or equivalents.
Description: Supply chain analysis using different approaches to the supply chain modeling, including the Supply Chain Council’s SCOR (Supply Chain Operations Reference) model, optimization and simulation. Specialized software is used to develop each modeling approach.
Credit hours: 3
Contact hours: Lecture: 3
Levels: Graduate
Schedule types: Lecture
Department/School: Industrial Engr & Mgmt
IEM 5813 Performance Measurement Systems  
**Prerequisites:** IEM 3813, IEM 4413 or equivalents.  
**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  
**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. Small to medium-sized manufacturing operations. Energy, water, waste, quality, and productivity analysis across the organization from a systems perspective. Justification of improvement projects and measurement of results.  
**Credit hours:** 3  
**Contact hours:** Lecture: 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:** Other: 1  
**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:** Other: 1  
**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 programming 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  
**Levels:** Graduate  
**Schedule types:** Lecture  
**Department/School:** Industrial Engr & Mgmt  

IEM 6043 Nonlinear Optimization  
**Prerequisites:** IEM 5033, or consent of instructor.  
**Description:** Mathematical theory and algorithms of nonlinear programming. Convexity, local/global optima, optimality conditions and duality in nonlinear programming and their effect on model and algorithm development. Convex analysis, optimality conditions and algorithms for unconstrained/constrained optimization, Lagrangian duality, relaxation-linearization techniques and interior point algorithms for convex optimization. Previously offered as IEM 5043.  
**Credit hours:** 3  
**Contact hours:** Lecture: 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:** Mathematical theory of linear programming 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.  
**Credit hours:** 3  
**Contact hours:** Lecture: 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:** This course introduces the basic concepts, principles, and techniques of optimization under uncertainty methods. The course covers: Two-stage Stochastic Linear Programs, Decomposition Methods, Stochastic Integer Programming, Sample Average Approximation, Chance Constrained Programs, Robust Linear Optimization, Robust Conic Optimization, Robust Multi-stage Optimization, Data-Driven Optimization.  
**Credit hours:** 3  
**Contact hours:** Lecture: 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:** Other: 1  
**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.  
**Credit hours:** 3  
**Contact hours:** Lecture: 3  
**Levels:** Graduate  
**Schedule types:** Lecture  
**Department/School:** Industrial Engr & Mgmt  

IEM 6133 Dynamic Programming and Stochastic Control  
**Prerequisites:** IEM 5013, IEM 5133.  
**Description:** Models and solution techniques for problems of sequential decision making under uncertainty. Deterministic discrete-time optimal control, deterministic continuous-time optimal control, stochastic optimal control with perfect state information, stochastic optimal control with imperfect state information, suboptimal control, and infinite horizon problems.  
**Credit hours:** 3  
**Contact hours:** Lecture: 3  
**Levels:** Graduate  
**Schedule types:** Lecture  
**Department/School:** Industrial Engr & Mgmt  

IEM 6900 Special Topics in Advanced, Emerging Areas of Industrial Engineering and Management  
**Prerequisites:** IEM 5003, STAT 4033, 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. Offered for variable credit, 1-6 credit hours, maximum of 18 credit hours.  
**Credit hours:** 1-6  
**Contact hours:** Other: 1  
**Levels:** Graduate  
**Schedule types:** Independent Study  
**Department/School:** Industrial Engr & Mgmt  

**Undergraduate Programs**  
- Industrial Engineering and Management, BSIE (http://catalog.okstate.edu/engineering-architecture-technology/industrial-engineering-management/bsie)  

**Graduate Programs**  
The School of Industrial Engineering and Management offers graduate programs leading to the Master of Science Industrial Engineering and Management degree and the Doctor of Philosophy degree.  

The Master of Science degree is characterized by a higher degree of technical specialization in a particular field of study (beyond a BS degree). This degree program is designed to prepare students for professional practice that may include research or consulting components. The Master of Science degree is especially attractive to industrial engineering graduates, engineering graduates from other disciplines, and many science majors. The MS degree includes a strong technical component and an orientation to business and engineering management that is complementary to a technical background.  

The Doctor of Philosophy degree is designed to position the student on the leading edge of knowledge in the profession of industrial engineering and engineering management. It is intended to prepare students for highly specialized positions, such as research and consulting in industry, government and service organizations, and for teaching or research positions in colleges and universities.  

The basic consideration in graduate education in industrial engineering and management is effective and efficient utilization of human, physical, and economic resources. Instruction in management embraces both qualitative and quantitative concepts, including analytical methodologies and social considerations pertinent to organizations.  

Advanced degree programs are designed with major emphasis in fields of interest such as engineering management, manufacturing systems, operations research, quality and reliability, facilities and energy-management, and enterprise systems and supply chains. Students may complement industrial engineering and management courses with work in other branches of engineering, as well as economics, business administration, computer science, statistics, mathematics, psychology, and sociology.
Admission Requirements

Admission to the Graduate College is required of all students pursuing the MS or PhD degree. Graduation from an industrial engineering curriculum with scholastic performance distinctly above average qualifies the student for admission to the School of Industrial Engineering and Management as a candidate for the master's and doctorate degrees. Graduates from related disciplines may be admitted if an evaluation of their transcripts and other supporting materials by the School of Industrial Engineering and Management indicates that they are prepared to take graduate-level course work in industrial engineering, or can be expected to do so after a reasonable amount of prerequisite work.

All applicants must submit GRE scores (minimum 145 in Verbal Reasoning and 158 in Quantitative Reasoning). In addition, the Graduate College may require certain international applicants to submit TOEFL scores.

Degree Requirements

The Master of Science degree in industrial engineering and management requires the completion of at least 30 credit hours beyond the bachelor's degree, including a research thesis of six credit hours. A 33 semester-credit-hour option is also permitted and must include a three credit-hour creative component. The creative component requirement can be met by completing a three credit-hour independent study project or a three credit-hour course approved by the student's committee.

The Doctor of Philosophy degree requires the completion of at least 90 credit hours beyond the bachelor's degree or 60 credit hours beyond the master's degree; including a minimum of 18 credit hours of dissertation research and a minimum of 30 credit hours of course work beyond the master's degree.

The School of Industrial Engineering and Management also participates in the Master of Science in Engineering and Technology Management program. Current IE&M program information can be found on the School website http://iem.okstate.edu.

Faculty

Sunderesh S. Heragu, PhD—Regents Professor and Head
Professor and Donald and Cathey Humphreys Chair: Sunderesh S. Heragu, PhD

Professor and Wilson Bentley Chair: William J. Kolarik, PhD
Professor: Manjunath Kamath, PhD
Associate Professors: Balabhaskar Balasundaram, PhD; Terry Collins, PhD, PE; Camille F. DeYong, PhD; Tieming Liu, PhD
Assistant Professor and Jim and Lynne Williams Chair: Chaoyue Zhao, PhD
Assistant Professors: Juan Borrero, PhD; Austin Buchanan, PhD; Kalyani Nagaraj, PhD; Farzad Yousefian, PhD
Lecturers: Tim Hardin, PhD; Jennifer Glenn, PhD