Industrial Engineering (INEG)

Courses

INEG 513V. Master's Research Project and Report. 1-6 Hour.
Required course for students electing the report option. (Typically offered: Fall, Spring and Summer)

INEG 514V. Special Topics in Industrial Engineering. 1-3 Hour.
Consideration of current industrial engineering topics not covered in other courses. Prerequisite: Graduate standing. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

INEG 515V. Individual Study in Industrial Engineering. 1-3 Hour.
Opportunity for individual study of advanced subjects related to a graduate industrial engineering program to suit individual requirements. Prerequisite: Graduate standing. (Typically offered: Fall, Spring and Summer)

INEG 5163. Introduction to Modern Statistical Techniques for Industrial Applications. 3 Hours.
This application-oriented course is driven by real problems arising from industry and focuses on problem solving using both modern and classic statistical methods. For both senior undergraduate and graduate students, the main goal of this course is to provide a comprehensive introduction to those most popular statistical learning methods and tools (such as R and Apache Spark) which are widely used in industry today. For graduate students, this course will also cover the fundamental theory behind some of the methodologies. Students will not receive graduate degree credit for both INEG 410V with the same title, and INEG 5163. (Typically offered: Spring)

INEG 5253. Leadership Principles and Practices. 3 Hours.
The course is designed to expose students to multiple approaches to leadership in a wide variety of settings. Leadership styles, the knowledge areas and competencies expected of today's leaders, the challenges leaders face, the historical and philosophical foundations of leadership, the relationships among leadership theory, leadership practice, and the moral-ethical aspects of leadership are among the topics covered in the course. A number of respected regional, national, and international leaders share "lessons learned" in their leadership journeys. Plus, a number of highly regarded leadership books and case studies on leadership are read and discussed. Students may not receive credit for INEG 4253 and INEG 5253/OMGT 5253. (Typically offered: Fall)
This course is cross-listed with OMGT 5253.

INEG 5263. Engineering Statistics. 3 Hours.
A graduate level engineering statistics course covering functions of random variables, properties and distributions of random samples, theory of statistical inference, and rationales of testing hypotheses and constructing confidence intervals. Prior knowledge of material equivalent to MATH 2574 and INEG 2333 is expected. (Typically offered: Fall)

INEG 5313. Engineering Applications of Probability Theory. 3 Hours.
Introduction to probability, discrete random variables, continuous random variables, multiple random variables, sequences of Bernoulli trials. Applications of these topics from inventory, reliability, quality control. (Typically offered: Fall)

INEG 5323. Engineering Applications of Stochastic Processes. 3 Hours.
Renewal processes, Poisson processes, discrete-time Markov chains, continuous-time Markov chains. Applications of these topics from inventory, reliability, quality control, queueing. (Typically offered: Spring)

INEG 5333. Design of Industrial Experiments. 3 Hours.
Statistical analysis as applied to problems and experiments in engineering and industrial research; experiment design and analysis; probability; and response surface analysis. (Typically offered: Irregular)

INEG 5393. Applied Regression Analysis for Engineers. 3 Hours.
Present concepts and applications to introduce statistical tools for discovering relationships among variables. Focus on fitting and checking linear and nonlinear regression models. Practical tools for engineers. (Typically offered: Irregular)

INEG 5423. Advanced Engineering Economy. 3 Hours.
Preparation of feasibility studies, including cost estimation, risk and uncertainty, sensitivity analysis and decision making. Effects of taxes, depreciation and financing costs on cash flows. Graduate degree credit will not be given for both INEG 4423 and INEG 5423. (Typically offered: Irregular)

INEG 5433. Cost Estimation Models. 3 Hours.
Overview of cost estimation techniques and methodologies applied to manufacturing and service organizations. Accomplished through detailed analysis of the cost estimation development process and various cost estimation models. Topics include data collection and management, learning curves, activity based costing, detailed and parametric estimation models, and handling risk and uncertainty. (Typically offered: Irregular)
This course is cross-listed with OMGT 5433.

INEG 5443. Decision Models. 3 Hours.
Focus on quantitative decision models for technical and managerial problems for private and public organizations. Topics include shareholder value, stakeholder value, Value-Focused Thinking, axioms of decision analysis, decision making challenges, decision traps, cognitive biases, decision processes, decision framing, influence diagrams, value hierarchy structuring, designing creative alternatives, singe objective models, multiobjective additive value model, swing weights, sensitivity analysis, portfolio decision models with binary linear programming, probability elicitation, Bayes Law, decision trees, Monte Carlo simulation, expected value, dominance (deterministic and stochastic), tornado diagrams, value of information, risk preference, utility models, expected utility, and communicating analysis insights. (Typically offered: Irregular)
This course is cross-listed with EMGT 5443, OMGT 5443.

INEG 5453. Systems Engineering and Management. 3 Hours.
Overview of the fundamental concepts underlying the management of engineering. Reviews the engineering decision process within the life cycle. Examines implementation of basic management functions in technical organizations and development of strategy tools within a complex organization. Graduate degree credit will not be given for both INEG 4433 and INEG 5453. (Typically offered: Fall)

INEG 5463. Project Management. 3 Hours.
Analysis of the strategic level of project management including planning, organizing, and staffing for successful project execution. Professional creativity, motivation, leadership, and ethics are also explored. At the tactical level, project selection, control, and systems management are analyzed. Systems development and decision support tools for project management are studied. (Typically offered: Irregular)

INEG 5533. Network Optimization in Transportation Logistics. 3 Hours.
Focus on quantitative modeling and analysis of network optimization problems and their application in logistics system design and operation. Topics include network design and routing and location analysis, with emphasis on the application of both exact and heuristic solution techniques for large-scale instances of such problems. Prerequisite: INEG 5613. (Typically offered: Spring)

INEG 5563. Industrial Robotics. 3 Hours.
An interdisciplinary treatment of industrial robotics; manipulator anatomy, control, and programming; end-of arm tooling; sensors & sensing; system integration and safety; current research topics. Graduate-level lab assignments and examinations. Significant literature review and writing assignments. Not open to students with credit for INEG 4563. Prerequisite: Graduate standing or instructor consent. (Typically offered: Fall)

INEG 5613. Introduction to Optimization Theory. 3 Hours.
A graduate level introduction to the foundational rationales of numerical optimization methods including linear programming, integer programming, network flows, and discrete dynamic programming. Model formulation and tractability, search strategies, characterization of optimal solutions, duality and sensitivity, outcome justification. Prerequisite: Graduate standing. (Typically offered: Fall)

INEG 5623. Analysis of Inventory Systems. 3 Hours.
Elements of production and inventory control, economic lot size models, price breaks models using Lagrangian method, deterministic dynamic inventory model, probabilistic one-period and multi-period models, zero and positive lead time models, and continuous review models. Prerequisite: INEG 5313. (Typically offered: Irregular)

INEG 5683. Nonlinear Programming. 3 Hours.
An introduction to the theory and methodology of nonlinear programming. Focus on engineering and management science applications of nonlinear optimization. Both single and multi-variable as well as unconstrained and constrained problems are addressed. (Typically offered: Irregular)

INEG 5693. Heuristic Optimization. 3 Hours.
Theory and applications of methodological approaches explicitly addressed to heuristic or approximate optimization of integer and combinatorial models. Prerequisite: INEG 5613. (Typically offered: Irregular)

INEG 5803. Simulation. 3 Hours.
The development and use of discrete-event simulation models for the analysis and design of systems found in manufacturing, distribution, and service contexts. Coverage includes conceptual modeling, model translation to computer form, statistical input models, random number generation and Monte Carlo methods, experimentation and statistical output analysis, and queuing analysis. Includes the use of modern computer simulation languages. Cannot receive credit for both INEG 3624 and INEG 5803. Corequisite: Drill component. (Typically offered: Irregular)

INEG 5813. Introduction to Simulation. 3 Hours.
Development and use of discrete-event simulation models for the analysis and design of systems found in manufacturing, distribution, and service contexts. Coverage includes conceptual modeling, model translation to computer form, statistical input models, random number generation and Monte Carlo methods, experimentation and statistical output analysis, and queuing analysis. For off-campus, distance education students only. (Typically offered: Irregular)

INEG 5823. Systems Simulation I. 3 Hours.
Random number generation, random variate generation, timekeeping in simulations, discrete event modeling, construction of digital simulation models, statistical analysis of simulation results, and analysis of simulation experiments utilizing a computer programming language. (Typically offered: Irregular)

INEG 5833. Introduction to Database Concepts for Industrial Engineers. 3 Hours.
An introduction to the basic principles of database modeling and technologies for industrial engineers. Coverage includes analyzing user requirements , representing data using conceptual modeling techniques (e.g. UML, ERD), converting conceptual models to relational implementations via database design methodologies, extracting data via structured query language processing, and understanding the role of database technology in industrial engineering application areas such as inventory systems, manufacturing control, etc. The application of a desktop database application such as Access will be emphasized. (Typically offered: Irregular)

INEG 600V. Master's Thesis. 1-9 Hour.
Master's Thesis. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

INEG 6113. Linear Optimization. 3 Hours.
A precise treatment of linear programming. Theory of convex sets, linear inequalities; development of the simplex method; duality theory; post optimality application and interpretation. Variants of the simplex methods and interior-point algorithms are discussed. Prerequisite: INEG 5613. (Typically offered: Fall)

INEG 614V. Special Topics for Doctoral Students in Industrial Engineering. 1-3 Hour.
Consideration of current industrial engineering topics at the doctoral level that are not covered in other courses. Prerequisite: PhD student in Industrial Engineering or consent of the instructor. (Typically offered: Irregular) May be repeated for up to 6 hours of degree credit.

INEG 6313. Network Optimization. 3 Hours.
A theorem/proof based advanced study providing rigorous exposition of foundational network optimization concepts including relevant optimization theory, algorithm development techniques, complexity analysis, data structures, and important applications. Prerequisite: INEG 6113. (Typically offered: Fall)

INEG 6323. Advanced Stochastic Processes. 3 Hours.
This course prepares Ph.D. students with advanced topics in probability and stochastic processes, with a focus on deriving and analyzing probability and stochastic models, and theorem proving in related topics. Contents include review of probability theorems, limit and convergence theorems, generating functions, Poisson processes, renewal theory, discrete and continuous Markov chains, and other advance topics. Prerequisite: INEG 5313 and INEG 5323. (Typically offered: Spring)

INEG 6443. Advanced Decision Analysis. 3 Hours.
The purpose of this course is to prepare the student to perform PhD and MS level research and analysis using advanced decision analysis concepts and techniques. The course topics include the history of decision analysis, foundations of decision analysis, structuring decision problems, assessing probabilities, probability management, Bayesian networks, utility, risk preference, risk analysis for engineering applications, intelligent adversary risk analysis, behavioral and organizational context for decision analysis, and major decision analysis applications. Prerequisite: INEG 5443. (Typically offered: Spring)

INEG 6823. Systems Simulation II. 3 Hours.
Advanced topics in computer simulation including experimental design, simulation optimization, variance reduction, and statistical output analysis techniques applied to discrete event simulation. Prerequisite: (INEG 5263 or (INEG 5313 and INEG 5323)), and (INEG 5823 or INEG 3624 or INEG 5803). (Typically offered: Irregular)

INEG 6843. Scheduling Theory and Algorithms. 3 Hours.
The course will cover the theory and solution methods for scheduling several tasks over time. Topics include terminology, measures of performance, single machine sequencing, flow shop scheduling, the job shop problem, and priority dispatching. Side constraints within scheduling, such as precedence, release dates, and due dates are addressed. Integer programming, dynamic programming, and heuristic approaches to various problems are also presented. Prerequisite: INEG 5613 or equivalent, computer programming proficiency, and exposure to proofs. (Typically offered: Irregular)

INEG 700V. Doctoral Dissertation. 1-18 Hour.
Doctoral Dissertation. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.