

# Industrial Engineering (INEG)

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## Courses

### INEG 20001. Industrial Engineering Seminar. 1 Hour.

Overview of the Department of Industrial Engineering: faculty and their backgrounds and interests, staff and the services they provide, facilities, curricular requirements, extracurricular opportunities, post-graduate opportunities. (Typically offered: Fall)

### INEG 21003. Introduction to Industrial Engineering. 3 Hours.

Survey of industrial engineering problems. Application of key concepts from linear algebra and calculus in solving industrial engineering problems. Use of spreadsheets in solving industrial engineering problems. Visualization of common types of industrial engineering data. Exploration of the principles of effective teamwork and professionalism. Prerequisite: MATH 24005 or MATH 25104 or MATH 24004. (Typically offered: Fall and Spring)

### INEG 22104. Computing Methods for Industrial Engineers I. 4 Hours.

Introduction to programming and computing methods within the context of traditional industrial engineering problem solving. Students will be exposed to classic industrial engineering problem scenarios. Basic techniques within object-oriented programming, including designing classes, using objects, creating methods, looping and decision constructs, arrays, and file handling, will be used to facilitate solving these problems. Pre- or Corequisite: INEG 21003. (Typically offered: Fall and Spring)

### INEG 22203. Computing Methods for Industrial Engineers II. 3 Hours.

A continuation of INEG 22104. Review of fundamental computing methods and exposure to advanced use of computing libraries. Developing and implementing algorithms using computing methods to solve illustrative and practical problems of interest to industrial engineers. Students will use existing computing libraries, data structures, and programming interfaces to implement software using problem-based learning. Prerequisite: INEG 22104. (Typically offered: Fall and Spring)

### INEG 23104. Statistics for Industrial Engineers I. 4 Hours.

Applications to industrial engineering of descriptive statistics, single-population point and interval estimation, single-population hypothesis testing, two-population point and interval estimation, two-population hypothesis testing, goodness-of-fit testing, contingency table testing, linear regression, correlation, design of experiments, and analysis of variance. Introduction to statistical quality control. Use of modern statistical analysis software is emphasized. Corequisite: Drill component. Prerequisite: IEQA or DTSC students only. Pre- or corequisite: INEG 21003 or DASC 25904. (Typically offered: Fall and Spring)

### INEG 231H4. Honors Statistics for Industrial Engineers I. 4 Hours.

Applications to industrial engineering of descriptive statistics, single-population point and interval estimation, single-population hypothesis testing, two-population point and interval estimation, two-population hypothesis testing, goodness-of-fit testing, contingency table testing, linear regression, correlation, design of experiments, and analysis of variance. Introduction to statistical quality control. Use of modern statistical analysis software is emphasized. Corequisite: Drill component. Prerequisite: Honors standing, and IEQA or DTSC students only. Pre- or corequisite: INEG 21003 or DASC 25904. (Typically offered: Fall and Spring)  
This course is equivalent to INEG 23104.

### INEG 23203. Probability and Stochastic Processes for Industrial Engineers. 3 Hours.

Development and analysis of industrial engineering applications of random experiments, random variables, renewal processes, Poisson processes, and Markov chains. Application areas include inventory, quality control, queueing, and reliability. Pre- or corequisite: INEG 21003 or DASC 25904. (Typically offered: Fall and Spring)

### INEG 23303. Applied Probability and Statistics for Engineers II. 3 Hours.

Applications to engineering problems of two-population point and interval estimation, two-population hypothesis testing, linear regression, correlation, design of experiments, analysis of variance, and nonparametric statistics. Introduction to statistical quality control. Corequisite: Drill component. Prerequisite: INEG 23104. (Typically offered: Fall and Spring)

### INEG 24103. Engineering Economic Analysis. 3 Hours.

Economic aspects of engineering, including current economic problems and the treatment of estimates when evaluating alternative courses of action. Methods of selection and replacement of equipment and break-even points of operation; desirability of new processes or projects where asset life, rate of return on investment, and first, fixed, differential, marginal, and sunk costs must be considered. Corequisite: Drill component. Prerequisite: MATH 24005 or MATH 25104 or MATH 24004. (Typically offered: Fall and Spring)

### INEG 26103. Introduction to Operations Research. 3 Hours.

Introduction to modeling and analysis of deterministic operations design and planning problems using formal optimization algorithms and software. Identification and formulation of appropriate applications, linear programming, sensitivity, network flows/transportation/assignment problems, shortest paths, and integer linear programming. Prerequisite: INEG 22104 or DASC 12004. Pre- or corequisite: INEG 21003 or MATH 30803 or DASC 25904. (Typically offered: Fall and Spring)

### INEG 33103. Engineering Probability and Statistics. 3 Hours.

Applications to engineering problems of data summary and presentation, random variables and probability distributions, point and interval estimation, hypothesis testing, linear regression, and design of experiments. Not for credit toward the Bachelor of Science in Industrial Engineering. Corequisite: Drill component. Prerequisite: MATH 25004. (Typically offered: Fall, Spring and Summer)

### INEG 33303. Statistics for Industrial Engineers II. 3 Hours.

Introduction to model statistical learning, statistical learning beyond linear regression, data-driven anomaly detection and process monitoring, optimal sampling for data collection. Prerequisite: INEG 22203, INEG 23104 and INEG 23203. (Typically offered: Fall and Spring)

### INEG 34403. 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: Fall and Spring)

### INEG 344H3. Honors 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: Fall and Spring)

This course is equivalent to INEG 34403.

### INEG 35103. Manufacturing Processes. 3 Hours.

This course focuses on the manufacturing processes that impart geometry and properties to engineering materials including casting, metalworking, machining, joining, heat treatment, and polymer processes. Process selection and analysis, design-for-manufacturing principles, cost estimation, and selection of process parameters are covered. Lab component covers communication of manufacturing specifications via engineering drawings. Prerequisite: MEEG 23003. Corequisite: Lab component. (Typically offered: Spring)

**INEG 35303. Transportation Logistics. 3 Hours.**

This course introduces students to transportation and logistics systems, including the components of logistics system and their interactions. There is emphasis on quantitative models and techniques for the optimization and analysis of transportation and logistics systems. Topics covered include: an overview of logistics systems and modes of transportation; facility location analysis and network design; network flow and transportation modeling; and vehicle routing. Prerequisite: INEG 26103. Pre- or corequisite: INEG 22203 or DASC 12004. (Typically offered: Fall and Spring)

**INEG 35403. Facility Logistics. 3 Hours.**

The design and analysis of efficient logistics systems at the facility level, with an emphasis on distribution facilities. Unit load, break bulk, crossdock and order fulfillment centers and their component systems and software. Automated and manual systems. Prerequisite: INEG 24103. Pre- or corequisite: INEG 26103. (Typically offered: Fall and Spring)

**INEG 35503. Production Planning and Control. 3 Hours.**

Strategy and competition, forecasting, aggregate planning, inventory control subject to known demand, inventory control subject to uncertain demand, supply chain management, push and pull production control systems, and operations scheduling. Prerequisite: INEG 23104 or STAT 30043. Pre- or corequisite: INEG 26103. (Typically offered: Fall and Spring)

**INEG 36204. Simulation. 4 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. Corequisite: Drill component. Prerequisite: (INEG 22203 or DASC 12004), INEG 23104 and INEG 23203. Pre- or Corequisite: INEG 24103. (Typically offered: Fall and Spring)

**INEG 362H4. Honors Simulation. 4 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. Corequisite: Drill component. Prerequisite: (INEG 22203 or DASC 12004), INEG 23104, INEG 23203 and honors standing. Pre- or corequisite: INEG 24103. (Typically offered: Fall and Spring)  
This course is equivalent to INEG 36204.

**INEG 37104. Work Methods and Ergonomics. 4 Hours.**

Ways of designing jobs, machines, operations and work environments so they are compatible with human capacities and limitations. Work methods topics include methods analysis, time studies, work sampling and learning curves. Cognitive and physical capabilities and limitations of humans are addressed through the study of human information processing, motor control theory, anthropometry, biomechanics, work physiology and manual material handling. Design of controls and displays, hand tools and workstations, along with work related musculoskeletal disorders. Laboratory required. Corequisite: Lab component. Prerequisite: INEG 23104. (Typically offered: Fall and Spring)

**INEG 381H2. Honors Industrial Engineering Research Experience I. 2 Hours.**

Introduction to the research of the faculty of the Department of Industrial Engineering for the purpose of matching students with an undergraduate research advisor. Development of skills in using electronic resources to conduct background research on individuals and topics in the engineering academic community. Development of scientific presentation skills. Prerequisite: Instructor permission and honors standing. (Typically offered: Spring)

**INEG 38303. 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, implementing database applications. Pre- or corequisite: INEG 22203. (Typically offered: Fall and Spring)

**INEG 400HV. Honors Thesis. 1-3 Hour.**

For Honors College students majoring in Industrial Engineering only. Prerequisite: Honors college students only and instructor consent. (Typically offered: Fall, Spring and Summer)

**INEG 4100V. Special Topics in Industrial Engineering. 1-4 Hour.**

Consideration of current industrial engineering topics not covered in other courses. Prerequisite: Senior standing. (Typically offered: Irregular) May be repeated for up to 4 hours of degree credit.

**INEG 410HV. Honors Special Topics in Industrial Engineering. 1-3 Hour.**

Consideration of current industrial engineering topics not covered in other courses. Prerequisite: Senior standing. (Typically offered: Irregular) May be repeated for up to 3 hours of degree credit.

This course is equivalent to INEG 4100V.

**INEG 4110V. Individual Study in Industrial Engineering. 1-3 Hour.**

Individual study and research on a topic mutually agreeable to the student and a faculty member. Prerequisite: Instructor consent. (Typically offered: Fall, Spring and Summer)

**INEG 411HV. Honors Individual Study in Industrial Engineering. 1-3 Hour.**

Individual study and research on a topic mutually agreeable to the student and a faculty member. Prerequisite: Instructor consent and honors candidacy. (Typically offered: Fall, Spring and Summer)

This course is equivalent to INEG 4110V.

**INEG 41203. Global Engineering and Innovation. 3 Hours.**

This course provides engineering students a global perspective for design and innovation. Students explore various design thinking tools and techniques. Students apply engineering design and innovation techniques to create solutions that meet specified markets with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental and economic factors. Students also have the opportunity to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which considers the impact of the engineering solution in the global, economic, environmental, and social contexts. Prerequisite: Senior standing or instructor consent. (Typically offered: Irregular)

**INEG 41403. Data Mining. 3 Hours.**

The course focuses on the principles, theory, design, and implementation of data mining algorithms for large-scale data. Topics include foundations of data mining; preprocessing; mining frequent patterns, associations and correlations; supervised learning including decision tree induction, naïve Bayesian classification, support vector machine, logistic regression, Bayesian network, and K-nearest neighbor learning; unsupervised learning including K-means clustering, hierarchical clustering, density-based clustering, and grid-based clustering; outlier analysis; graph mining; scalable and distributed data mining. Prerequisite: (INEG 23303 and INEG 22203) or (CSCE 20104 and INEG 33103) or (INEG 23104 and INEG 22203) or INEG 33303. (Typically offered: Fall)

**INEG 41603. 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. Prerequisite: INEG 23303 or INEG 23104 or INEG 33303. (Typically offered: Spring)

**INEG 42503. 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 42503 and INEG 52503/OMGT 52503. Prerequisite: Senior standing. (Typically offered: Fall)

**INEG 425H3. Honors 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 42503 and INEG 52503/OMGT 52503. Prerequisite: Honors standing and instructor consent. (Typically offered: Fall)

This course is equivalent to INEG 42503.

**INEG 43203. Quality Engineering and Management. 3 Hours.**

Provides the student with complete coverage of the functional area of "Quality Assurance" ranging from the need for such a function, how it works, techniques utilized, and managerial approaches for insuring its effectiveness. Prerequisite: INEG 23303 or INEG 23104 or INEG 33103. (Typically offered: Irregular)

**INEG 44203. 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. Prerequisite: (INEG 23303 or INEG 23104 or INEG 33103) and INEG 24103. (Typically offered: Irregular)

**INEG 442H3. Honors 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. Prerequisite: INEG 23104 and INEG 24103. (Typically offered: Irregular)

This course is equivalent to INEG 44203.

**INEG 44303. 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. Prerequisite: INEG 24103. (Typically offered: Fall)

**INEG 443H3. Honors 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. Prerequisite: INEG 24103. (Typically offered: Fall)

This course is equivalent to INEG 44303.

**INEG 44503. Productivity Improvement. 3 Hours.**

Analysis of common productivity problems. Development of skills required to diagnose problems; measure productivity; develop improvement strategies; and provide for the implementation and maintenance of productivity measurement and improvement systems. Prerequisite: Senior standing. (Typically offered: Irregular)

**INEG 46803. Decision Support in Industrial Engineering. 3 Hours.**

Reinforcing important computer programming methods using industrial engineering-based applications. Students will utilize Microsoft Excel and Visual Basic for Applications to develop custom solutions to challenging industrial engineering problems. Emphasis on computational proficiency and computing productivity in a spreadsheet-based setting. Prerequisite: (INEG 22104 or DASC 12004) and INEG 23104. (Typically offered: Fall)

**INEG 481H1. Honors Industrial Engineering Research Experience II. 1 Hour.**

Development of an undergraduate research proposal with an emphasis on scientific writing skills. Development of skills in using electronic resources to conduct background research related to proposed research. Introduction to the peer review process and nationally competitive awards. Prerequisite: INEG 381H2 and honors standing. (Typically offered: Fall)

**INEG 49103. Industrial Engineering Capstone Experience I. 3 Hours.**

First semester of a two-semester, team-based project in support of a real-world industry partner organization. Learn about the industry partner organization and the relevant segment of that organization. Assess and evaluate the operations and performance of the system that needs to be improved, or detail the need for and the requirements of a new system. Communicate findings using reports and presentations. Prerequisite: INEG 20001, INEG 21003, INEG 33303, INEG 34403, INEG 35403 and INEG 36204. Pre- or corequisite: INEG 35303, INEG 35503, INEG 37104, INEG 38303 and INEG 44303. (Typically offered: Fall)

**INEG 49204. Industrial Engineering Capstone Experience II. 4 Hours.**

Second semester of a two-semester, team-based project in support of a real-world industry partner organization. Develop and assess recommendations for improving system performance, or develop the detailed design of a new system. Evaluate the potential impact of the project. Develop deliverables for the industry partner organization. Communicate findings using reports and presentations. Students must have successfully completed INEG 49103 in the immediate prior semester. Corequisite: Lab component. Prerequisite: INEG 35303, INEG 35503, INEG 37104, INEG 38303, INEG 44303 and INEG 49103. (Typically offered: Spring)

**INEG 5130V. Master's Research Project and Report. 1-6 Hour.**

Required course for students electing the report option. (Typically offered: Fall, Spring and Summer)

**INEG 5140V. 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 5150V. 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 51603. 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 4100V with the same title, and INEG 51603. (Typically offered: Spring)

**INEG 52503. 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 42503 and INEG 52503/OMGT 52503. (Typically offered: Fall)

This course is cross-listed with OMGT 52503.

**INEG 52603. 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 26004 and INEG 23303 is expected. (Typically offered: Fall)

**INEG 53103. 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 53203. 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 53303. 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 53903. 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 54203. 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 44203 and INEG 54203. (Typically offered: Irregular)

**INEG 54303. 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 54303.

**INEG 54403. 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, single 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 54403, OMGT 54403.

**INEG 54503. 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 44303 and INEG 54503. (Typically offered: Fall)

**INEG 55303. 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 56103. (Typically offered: Spring)

**INEG 55603. 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. Prerequisite: Graduate standing or instructor consent. (Typically offered: Fall)

**INEG 56103. 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 56203. 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 53103. (Typically offered: Irregular)

**INEG 56803. 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 56903. Heuristic Optimization. 3 Hours.**

Theory and applications of methodological approaches explicitly addressed to heuristic or approximate optimization of integer and combinatorial models. Prerequisite: INEG 56103. (Typically offered: Irregular)



**INEG 58003. 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 36204 and INEG 58003. Corequisite: Drill component. (Typically offered: Irregular)

**INEG 58103. 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 58203. 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 58303. 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 6000V. Master's Thesis. 1-9 Hour.**

Master's Thesis. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.

**INEG 61103. 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 56103. (Typically offered: Fall)

**INEG 6140V. 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 63103. 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 61103. (Typically offered: Fall)

**INEG 63203. 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 53103 and INEG 53203. (Typically offered: Spring)

**INEG 64403. 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 54403. (Typically offered: Spring)

**INEG 68203. 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 52603 or (INEG 53103 and INEG 53203)), and (INEG 58203 or INEG 36204 or INEG 58003). (Typically offered: Irregular)

**INEG 68403. 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 56103 or equivalent, computer programming proficiency, and exposure to proofs. (Typically offered: Irregular)

**INEG 7000V. Doctoral Dissertation. 1-18 Hour.**

Doctoral Dissertation. (Typically offered: Fall, Spring and Summer) May be repeated for degree credit.