INDUSTRIAL AND SYSTEMS ENGINEERING (I SY E)

I SY E 1 — COOPERATIVE EDUCATION PROGRAM
1 credit.
Work experience which combines classroom theory with practical knowledge of operations to provide students with a background upon which to base a professional career in industry.
Requisites: So st
Course Designation: Workplace - Workplace Experience Course
Repeatable for Credit: Yes, unlimited number of completions

I SY E 191 — THE PRACTICE OF INDUSTRIAL ENGINEERING
1 credit.
An introduction to industrial engineering subject matter areas, problem types, and design/analysis approaches, techniques, and methodologies. Special emphasis on formulation and design alternatives for problem solving. Not open to students with advance standing in I.E.
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2011

I SY E 313 — ENGINEERING ECONOMIC ANALYSIS
3 credits.
Financial accounting principles and cost systems, interpretation and use of accounting reports and supplemental information for engineering economic analyses, consideration of cost-volume-profit analyses, use of discounted cash flow techniques, flexible budgeting, transfer pricing, and capital budgeting.
Requisites: MATH 217, 221, or 275 or concurrent registration
Repeatable for Credit: No

I SY E 315 — PRODUCTION PLANNING AND CONTROL
3 credits.
Techniques and applications of control concepts in the design of inventory, production, quality, and project-planning systems; use of the computer as a component in such systems.
Requisites: STAT 311, STAT 324, or MATH/STAT/MATH 431 or concurrent enrollment
Repeatable for Credit: No

I SY E 320 — SIMULATION AND PROBABILISTIC MODELING
3 credits.
Requisites: STAT 311 or equiv, STAT 312 or con reg, MATH 320 or MATH 340
Repeatable for Credit: No

I SY E 321 — SIMULATION MODELING LABORATORY
1 credit.
Computer exercises involving generation and analysis of random variables, spreadsheet models of queuing systems, use of simulation software packages. Project.
Requisites: Con reg in IE 320 or cons inst
Repeatable for Credit: No

I SY E 323 — OPERATIONS RESEARCH-DETERMINISTIC MODELING
3 credits.
Basic techniques for modeling and optimizing deterministic systems with emphasis on linear programming. Computer solution of optimization problems. Applications to production, logistics, and service systems.
Requisites: MATH 222, MATH 320 or MATH 340
Repeatable for Credit: No

I SY E 348 — INTRODUCTION TO HUMAN FACTORS ENGINEERING LABORATORY
1 credit.
This course provides students with hands on experience applying concepts discussed in the course Introduction to Human Factors Engineering (ISeE 349). The students complete a small three-part design project. In addition, students learn how to measure light, sound, anthropometric, and psychophysiological data, and then apply these measurements to product and workplace design challenges. Non-ISeE students may be allowed to enroll based on space availability and consent of the instructor, on a first-come basis
Requisites: Concurrent registration in ISeE 349 and acceptance into the ISeE undergraduate or graduate program is required.
Repeatable for Credit: No

I SY E/PSYCH 349 — INTRODUCTION TO HUMAN FACTORS
3 credits.
This course conveys the importance of considering human capabilities and limits in system design and operation. This includes understanding human characteristics from the cognitive, physical, and psychosocial perspectives. Implications of these characteristics are explored through understanding the needs of people, designing to support these needs, and evaluating systems to ensure they serve the intended purpose. Case studies are used to identify the human role in accidents and to identify design improvements. Application domains include consumer product design, human-computer interaction, workplace safety, and complex systems such as healthcare delivery. Concurrent registration in ISeE 348 is required for ISeE majors.
Requisites: Introduction to probability or statistics (Statistics 224, 309, 311, 371, PSYCH 210, Psych 280, SOC/C&E SOC 360, Gen Bus 303, or comparable course) or concurrent registration.
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
I SY E 350 — JUNIOR DESIGN LABORATORY
3 credits.

This course introduces industrial engineering students to the tools needed for advanced design courses through experiential learning and hands-on opportunities to conduct experiments, take relevant measurements, analyze real-world data, design systems, and to make and test prototypes of their designs.

**Requisites:** Junior standing, declared in Industrial Engineering program, (COMP SCI 200, 300, 301 or 302), STAT 311, and I SY E 315

**Repeatable for Credit:** No

I SY E 389 — HONORS IN RESEARCH
1-3 credits.

Undergraduate honors research projects supervised by faculty members. Not available for graduate credit.

**Requisites:** Admission to IE Undergraduate Honors in Research Program

**Course Designation:** Honors - Honors Only Courses (H)

**Repeatable for Credit:** Yes, unlimited number of completions

I SY E 412 — FUNDAMENTALS OF INDUSTRIAL DATA ANALYTICS
3 credits.

This course will provide students with understanding of the fundamentals of using industrial data analytics techniques to transform from data-rich into decision-smart. It focuses on training students with the ability of formulating and solving real industrial problems with the appropriate modeling strategies and analytics principles for better decision making.

**Requisites:** STAT 311, MATH/STAT/MATH 309, or MATH/STAT/MATH 431

**Repeatable for Credit:** No

I SY E 415 — INTRODUCTION TO MANUFACTURING SYSTEMS, DESIGN AND ANALYSIS
3 credits.

Introduction to the technologies, processes and systems of modern discrete part manufacturing. Emphasis on development of an understanding of the behavior of integrated systems.

**Requisites:** I SY E 315

**Repeatable for Credit:** No

I SY E 417 — HEALTH SYSTEMS ENGINEERING
3 credits.

Introduction to the application of industrial engineering methods to the analysis and improvement of health care delivery. Exploration of common problems of decision making and control in health care. Examination of social, regulatory and economic factors unique to health care.

**Requisites:** ISyE 320, ISyE 349

**Repeatable for Credit:** No

I SY E/COMP SCI/MATH 425 — INTRODUCTION TO COMBINATORIAL OPTIMIZATION
3 credits.

Focuses on optimization problems over discrete structures, such as shortest paths, spanning trees, flows, matchings, and the traveling salesman problem. We will investigate structural properties of these problems, and we will study both exact methods for their solution, and approximation algorithms.

**Requisites:** (MATH 320, 340, 341, or 375) or graduate or professional standing

**Course Designation:** Breadth - Physical Sci. Counts toward the Natural Sci req

**Level - Intermediate**

**L&S Credit:** Counts as Liberal Arts and Science credit in L&S

**Repeatable for Credit:** No

I SY E 450 — SENIOR DESIGN PROJECT
3 credits.

This course will provide students a team-based project experience to address a real-world design challenge posed by an external organization. Student teams will work in close collaboration with the project client to design a new system or process, or redesign an existing one, by integrating and applying appropriate ISyE knowledge, methodologies and tools for problem definition and analysis; idea generation; solution development, evaluation and justification; and implementation planning and impact assessment.

**Requisites:** Senior standing in ISyE, and ISyE 313, ISyE 323, ISyE 349, ISyE 350, and either ISyE 415 or ISyE 417 (or concurrent registration in one of them), and EPD 397 (or concurrent registration in EPD 397)

**Repeatable for Credit:** No

I SY E/CIV ENGR/N E 460 — UNCERTAINTY ANALYSIS FOR ENGINEERS
3 credits.

This course introduces undergraduates to approaches for quantifying uncertainty in engineering analyses. Both analytical and computational methods are demonstrated.

**Requisites:** Statistics 311, MATH/STAT 431, or consent of instructor

**Repeatable for Credit:** No

I SY E 476 — INDUSTRIAL ENGINEERING PROJECTS
3 credits.

Complete design of an industrial engineering system in a real world setting, e.g., manufacturing, hospital, communications, food processing, distribution, transportation, etc.

**Requisites:** Ind Engr 320, 321, 349; EPD 397; or cons inst

**Repeatable for Credit:** No

**Last Taught:** Spring 2015

I SY E 489 — HONORS IN RESEARCH
1-3 credits.

Undergraduate honors research projects supervised by faculty members. Not available for graduate credit.

**Requisites:** Admission to IE undergraduate Honors in Research Program

**Course Designation:** Honors - Honors Only Courses (H)

**Repeatable for Credit:** Yes, unlimited number of completions
I SY E/M E 510 — FACILITIES PLANNING
3 credits.

Introduction to plant location theory and analysis of models of plant location; models for determining plant size and time phasing; line balancing models; techniques for investigating conveyor and other material handling problems; and models of plant layout.

Requisites: IE 315, 323, 349 or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2017

I SY E/M E 512 — INSPECTION, QUALITY CONTROL AND RELIABILITY
3 credits.

Inspection data for quality control; sampling plans for acceptance inspection; charts for process control. Introduction to reliability models and acceptance testing.

Requisites: Stat 224
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/M E 513 — ANALYSIS OF CAPITAL INVESTMENTS
3 credits.

A second course in quantitative methods for analyzing capital investments in technological environments, both public and private. Replacement models; comparison of alternative investment models; risk analysis; case studies.

Requisites: Ind Engr 313, Ind Engr 323, STAT 311
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2012

I SY E 515 — ENGINEERING MANAGEMENT OF CONTINUOUS PROCESS IMPROVEMENT
3 credits.

This course addresses the role of the industrial engineer as a "manager" of continuous improvement in design and production processes. It provides modern tools and techniques for planning and managing team projects, integrating the concepts of total quality, data based decision making, and resource management.

Requisites: EPD 397 Sr or Grad st, or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E 516 — INTRODUCTION TO DECISION ANALYSIS
3 credits.

Overview of modeling techniques and methods used in decision analysis, including multiattribute utility models, decision trees, and Bayesian models. Psychological components of decision making are discussed. Elicitation techniques for model building are emphasized. Practical applications through real world model building are described and conducted.

Requisites: STAT 224, 311, 324, 371, MATH/STAT/MATH 309 or MATH/STAT/MATH 431
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E 517 — DECISION MAKING IN HEALTH CARE
3 credits.

Introduction to the use of decision sciences in health-care. Conceptual understanding of medical decision making and its tools including decision trees, sensitivity analysis, Markov (decision) processes, and Monte Carlo simulations with examples from the current medical literature.

Requisites: STAT 311 and I SY E 323
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E 520 — QUALITY ASSURANCE SYSTEMS
3 credits.

Introduces engineers to applications of total quality concepts and tools to develop, implement, and maintain an effective quality assurance system in a manufacturing or service organization. Emphasis is on documentation development, team-based improvement strategies, and international quality standards.

Requisites: Sr or Grad st, or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/COMP SCI/E C E 524 — INTRODUCTION TO OPTIMIZATION
3 credits.

Introduction to mathematical optimization from a modeling and solution perspective. Formulation of applications as discrete and continuous optimization problems and equilibrium models. Survey and appropriate usage of basic algorithms, data and software tools, including modeling languages and subroutine libraries.

Requisites: (COMP SCI 200, 300, 301, 302, or 310) and (MATH 320, 340, 341, or 375) or graduate or professional standing
Course Designation: Breadth - Natural Science
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
I SY E/COMP SCI/MATH/STAT 525 — LINEAR PROGRAMMING METHODS
3 credits.

Real linear algebra over polyhedral cones; theorems of the alternative for matrices. Formulation of linear programs. Duality theory and solvability. The simplex method and related methods for efficient computer solution. Perturbation and sensitivity analysis. Applications and extensions, such as game theory, linear economic models, and quadratic programming.

Requisites: (MATH 320, 340, 341, 375, or 443) or graduate or professional standing

Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

I SY E/COMP SCI 526 — ADVANCED LINEAR PROGRAMMING
3-4 credits.


Requisites: COMP SCI/ISYE/MATH/STAT/COMP SCI/I SY E/MATH 525 and (COMP SCI 200, 300, 301, 302, or 310) or graduate or professional standing

Course Designation: L&S Credit - Counts as Liberal Arts and Science credit in L&S

Repeatable for Credit: No

Last Taught: Fall 2015

I SY E/PSYCH 549 — HUMAN FACTORS ENGINEERING
3 credits.

Analysis and design of man-machine systems using human performance models and data. Emphasis on systems involving communication and control. Projects using digital and analog computer simulation techniques for system design.

Requisites: IE 349 or equiv

Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

I SY E 552 — HUMAN FACTORS ENGINEERING DESIGN AND EVALUATION
3 credits.


Requisites: Ind Engr 349 EPD 397, or cons inst

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

Last Taught: Fall 2016

I SY E 555 — HUMAN PERFORMANCE AND ACCIDENT CAUSATION
3 credits.

A systems view of accident causation, with emphasis on the human performance limitations important in industrial and other accidents. Models of causation, data collection systems, economic evaluation, and safety programs. Small group projects.

Requisites: IE 349 or PSYCH 225 or equivalent an intro stats crse or consent of instructor for Grad students

Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

I SY E 556 — OCCUPATIONAL SAFETY AND HEALTH ENGINEERING
3 credits.

Introduction to the principles of safety and health hazards in the industrial environment. This course provides engineers with the fundamentals of measurement, evaluation, regulation, and control of hazardous conditions, toxic substances, physical agents, and dangerous processes in industrial operations.

Requisites: IE 349 or Grad st or cons inst

Repeatable for Credit: No

I SY E/COMP SCI/M E 558 — INTRODUCTION TO COMPUTATIONAL GEOMETRY
3 credits.

Introduction to fundamental geometric computations and algorithms, and their use for solving engineering and scientific problems. Computer representations of simple geometric objects and paradigms for algorithm design. Applications from areas of engineering analysis, design and manufacturing, biology, statistics, and other sciences.

Requisites: (COMP SCI 367 or 400) and MATH 234 or graduate or professional standing

Course Designation: L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No

I SY E/MED PHYS 559 — PATIENT SAFETY AND ERROR REDUCTION IN HEALTHCARE
2 credits.

Techniques for evaluating and reducing risks in medical procedures, including probabilistic risk assessment methods, failure mode and effects analysis, human factors analysis, and quality management. Discussions of patient safety standards, recommendations from agencies, and continual quality improvement.

Requisites: Jr st or cons inst

Course Designation: Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement

Repeatable for Credit: No
Industrial and Systems Engineering (I SY E)

I SY E/B M E 564 — OCCUPATIONAL ERGONOMICS AND BIOMECHANICS
3 credits.

Introduces engineers how to design manufacturing and industrial operations in which people play a significant role, so that human capabilities are maximized, physical stress is minimized, and workload is optimized. Examples and topics emphasize industrial applications.

Requisites: ISYE 349, or Biomed Engr 315, or Grad standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/N E 574 — METHODS FOR PROBABILISTIC RISK ANALYSIS OF NUCLEAR POWER PLANTS
3 credits.

Methods for risk and reliability analysis of engineered systems, particularly as applied in the nuclear power industry. Fault trees and event trees, Bayesian data analysis, probabilistic risk management. Some familiarity with nuclear plant safety systems is helpful, but not required.

Requisites: Stat 224
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E 575 — INTRODUCTION TO QUALITY ENGINEERING
3 credits.

Introduction to statistically based quality improvement methods useful in industrial settings; observational methods and design of experiments; experimentation to discover influential factors and to analyze sources of variation; robust products. There will be a one hour discussion section each week.

Requisites: One intro crse in statistical methods, or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/OTM 578 — FACILITIES LOCATION MODELS
3 credits.

The theory and methods of facility location. Plant and warehouse siting, plant layout problems and location of service facilities such as hospitals and fire stations. Cases of actual applications.

Requisites: OIM 410 or Ind Engr 323, or equivalent
Repeatable for Credit: No

I SY E 601 — SPECIAL TOPICS IN INDUSTRIAL ENGINEERING
1-3 credits.

In various areas. Sample topics: "Simulation" and "Systems Design".

Requisites: Junior standing and consent of instructor
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2018

I SY E 602 — SPECIAL TOPICS IN HUMAN FACTORS
3 credits.

Various special topics in human factors engineering. Course topic may vary from semester to semester. Different versions of this course may be offered in same semester.

Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2010

I SY E 605 — COMPUTER INTEGRATED MANUFACTURING
3 credits.

An introduction to computer-integrated design and manufacturing with a focus on manufacturing process planning. Emphasis on concurrent engineering principles, manufacturing process engineering, computer-aided process planning, NC programming, and CAD/CAM integration.

Course provides experience with CAD/CAM software and NC machines.

Requisites: Ind Engr 315 or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2016

I SY E/PHARMACY 608 — SAFETY AND QUALITY IN THE MEDICATION USE SYSTEM
3 credits.

Addresses the problems of medication errors and quality in health care, problem resolutions, methods of assessment, and intervention implementation and quality management.

Requisites: Declared in Doctor of Pharmacy program with third year standing
Repeatable for Credit: No

I SY E 610 — DESIGN OF PROGRAM EVALUATION SYSTEMS
3 credits.


Requisites: Sr or Grad st in ind engr or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2010

I SY E 612 — INFORMATION SENSING AND ANALYSIS FOR MANUFACTURING PROCESSES
3 credits.

Focuses on the sensing and multivariate data modeling and analysis techniques for monitoring, diagnosis, and quality improvement of manufacturing processes. The techniques introduced can find wide applications in health care, financial engineering, service industry applications, human factors, etc.

Requisites: MATH 320 STAT 311, Sr or Grad st, or cons inst
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
I SY E 615 — PRODUCTION SYSTEMS CONTROL
3 credits.

An intermediate to advanced course stressing the application of recent operations research techniques to production planning, scheduling and inventory control.
Requisites: IE 315, 320, 321, 323, STAT 311, 312
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/B M I/L I S 617 — HEALTH INFORMATION SYSTEMS
3 credits.

Provides grounding in core concepts of health information systems. Major applications include clinical information systems, language and standards, decision support, image technology and digital libraries. Evaluation of IE tools and perspectives designed to improve the quality, efficiency and effectiveness of health information.
Requisites: I SY E 417
Course Designation: Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2016

I SY E/OTM 620 — SIMULATION MODELING AND ANALYSIS
3 credits.

Introduction to simulation modeling and analysis techniques with application to production, logistics, service, and other systems. Emphasis on model building, application of basic statistical data analysis, and the use of simulation for design, evaluation, and improvement of such systems. Introduction to available software. Case studies.
Requisites: COMP SCI 302 and STAT 312
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E 624 — STOCHASTIC MODELING TECHNIQUES
3 credits.

Techniques for modeling systems in which uncertainty is an essential factor. Emphasizes why, how and when techniques can or cannot be applied, rather than their mathematical derivation. Case studies and/or examples from such areas as logistics, production, and service industries.
Requisites: STAT 311, MATH 320 or MATH 340
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2017

I SY E/MATH/OTM/STAT 632 — INTRODUCTION TO STOCHASTIC PROCESSES
3 credits.

Topics include discrete-time Markov chains, Poisson point processes, continuous-time Markov chains, and renewal processes. Applications to queueing, branching, and other models in science, engineering and business.
Requisites: MATH 531 or (MATH/STAT/MATH 431, MATH/STAT/MATH 309 or STAT 311) and (MATH 320, 340, 341, 375, or 421) or graduate standing
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/MATH/OTM 633 — QUEUING THEORY AND STOCHASTIC MODELING
3 credits.

Requisites: Math, Ind Engr 632 or cons inst
Course Designation: Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/COMP SCI 635 — TOOLS AND ENVIRONMENTS FOR OPTIMIZATION
3 credits.

Formulation and modeling of applications from computer sciences, operations research, business, science and engineering involving optimization and equilibrium models. Survey and appropriate usage of software tools for solving such problems, including modeling language use, automatic differentiation, subroutine libraries and web-based optimization tools and environments.
Requisites: (MATH 320, 340, 341, or 375) and (COMP SCI 200, 202, 300, 301, or 302) or graduate or professional standing or declared in the Capstone Certificate in Computer Sciences for Professionals
Course Designation: Breadth - Physical Sci. Counts toward the Natural Sci req
Level - Intermediate
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2015
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>I SYE/M E 641</td>
<td>DESIGN AND ANALYSIS OF MANUFACTURING SYSTEMS</td>
<td>3 credits.</td>
<td>Covers a broad range of techniques and tools relevant to the design, analysis, development, implementation, operation and control of modern manufacturing systems. Case studies assignments using industry data will be used to elaborate the practical applications of the theoretical concepts. This course also serves as a capstone course for the MSMSE degree.</td>
</tr>
<tr>
<td>I SYE/M E 643</td>
<td>PERFORMANCE ANALYSIS OF MANUFACTURING SYSTEMS</td>
<td>3 credits.</td>
<td>This course examines the state of the art in the use of stochastic network theory to develop performance models of modern manufacturing systems.</td>
</tr>
<tr>
<td>I SYE 645</td>
<td>ENGINEERING MODELS FOR SUPPLY CHAINS</td>
<td>3 credits.</td>
<td>The course will provide an overview of engineering fundamentals behind supply chains. Topics covered will include modeling and design of multi-stage production distribution systems, multi-echelon inventory models, theory of supply chain contracts, value of flexibility and information sharing in supply chains.</td>
</tr>
<tr>
<td>I SYE/PSYCH 652</td>
<td>SOCIOTECHNICAL SYSTEMS</td>
<td>3 credits.</td>
<td>Sociotechnical systems theory with applications to the design of organizations and jobs. Open systems and organizational environments. Analysis of the technical and social systems and techniques for &quot;whole&quot; system consideration. Organizational design strategy. Field site analyses by student teams.</td>
</tr>
<tr>
<td>I SYE/PSYCH 653</td>
<td>ORGANIZATION AND JOB DESIGN</td>
<td>3 credits.</td>
<td>Design of productive organizations and people's roles within them. Issues including boundary location, organizational decision levels, autonomous work groups, implementation and diffusion. Roles of the union. Case studies.</td>
</tr>
<tr>
<td>I SYE/B M E 662</td>
<td>DESIGN AND HUMAN DISABILITY AND AGING</td>
<td>3 credits.</td>
<td>Design of products for persons with physical, sensory or cognitive impairments is covered as well as the design of standard mass market products. Interdisciplinary teams explore specific disabilities, then design a standard mass market product in competition with each other.</td>
</tr>
<tr>
<td>I SYE 699</td>
<td>ADVANCED INDEPENDENT STUDY</td>
<td>1-5 credits.</td>
<td>Under faculty supervision.</td>
</tr>
<tr>
<td>I SYE 702</td>
<td>GRADUATE COOPERATIVE EDUCATION PROGRAM</td>
<td>1-2 credits.</td>
<td>Work experience that combines classroom theory with practical knowledge of operations to provide students with a background on which to develop and enhance a professional career. The work experience is tailored for MS students from within the U.S. as well as eligible international students.</td>
</tr>
</tbody>
</table>
Implementation, oversight, and management of quality-oriented activities in health care settings. Overview of current and historical activities, approaches, and issues confronting health care related to quality assessment, assurance, and improvement.

**Requisites:** Major or minor in population health, or cons inst

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2016

Issues involved in decision-making regarding technological risks and risk management in areas such as nuclear power, hazardous waste disposal, and pollution control. Risk perception and cognitive biases; risk analysis and decision analysis; political issues in risk management; regulatory mechanisms; and risk communication. Selected case studies.

**Requisites:** STAT 311 or MATH/STAT 431 or SOC/C&E SOC 360, IE 516, Grad st; or cons inst

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Spring 2015

Stochastic programming is concerned with decision making in the presence of uncertainty, where the eventual outcome depends on a future random event. Topics include modeling uncertainty in optimization problems, risk measures, stochastic programming algorithms, approximation and sampling methods, and applications. Students are strongly encouraged to have knowledge of linear programming (e.g., CS/ISyE/MATH/COMP SCI/I SY E/STAT 525) and probability and statistics (e.g., MATH/STAT 431). Knowledge of integer optimization (CS/I SY E/MATH/COMP SCI/I SY E 728) is helpful, but not required.

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2016

Use, control and administration of centralized and distributed data bases. Topics include the definition, design, creation, revision, interrogation, update, security and integrity of data bases.

**Requisites:** Info Sys 371 or cons inst

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2017

General and special techniques of dynamic programming developed by means of examples. Shortest-path algorithms. Deterministic equipment replacement models. Resource allocation problem. Traveling-salesman problem. Analysis of inventory systems. General stochastic formulations. Markovian decision processes. Students are strongly encouraged to have knowledge of mathematical optimization (e.g., COMP SCI/I SY E/MATH/STAT 525, I SY E 623, COMP SCI/I SY E/MATH/STAT 726), knowledge of analysis (e.g., MATH/STAT 431 or 521) and programming ability (e.g., COMP SCI 200 or 301)

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2016

Theory and algorithms for nonlinear optimization, focusing on unconstrained optimization. Line-search and trust-region methods; quasi-Newton methods; conjugate-gradient and limited-memory methods for large-scale problems; derivative-free optimization; algorithms for least-squares problems and nonlinear equations; gradient projection algorithms for bound-constrained problems; and simple penalty methods for nonlinearly constrained optimization. Students are strongly encouraged to have knowledge of linear algebra (e.g. MATH 320, MATH 433) and familiarity with basic mathematical analysis.

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2017

Convex sets in finite-dimensional spaces: relative interiors, separation, set operations. Convex functions: conjugacy, subdifferentials and directional derivations, functional operations, Fenchel-Rockafellar duality. Applications to operations research and related areas. Students taking this course are strongly encouraged to have had a course in basic analysis (e.g. MATH 521) and a course in linear algebra (e.g., MATH 340).

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2017

Convex sets in finite-dimensional spaces: relative interiors, separation, set operations. Convex functions: conjugacy, subdifferentials and directional derivations, functional operations, Fenchel-Rockafellar duality. Applications to operations research and related areas. Students taking this course are strongly encouraged to have had a course in basic analysis (e.g. MATH 521) and a course in linear algebra (e.g., MATH 340).

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

**Last Taught:** Fall 2017
I SY E/COMP SCI/MATH 728 — INTEGER OPTIMIZATION
3 credits.

Introduces optimization problems over integers, and surveys the theory behind the algorithms used in state-of-the-art methods for solving such problems. Special attention is given to the polyhedral formulations of these problems, and to their algebraic and geometric properties. Applicability of Integer Optimization is highlighted with applications in combinatorial optimization. Key topics include: formulations, relaxations, polyhedral theory, cutting planes, decomposition, enumeration. Students are strongly encouraged to have knowledge of Linear Programming (e.g., COMP SCI/I SY E/MATH/COMP SCI/I SY E/STAT 525), including algorithms, duality and polyhedral theory.

Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/MHR 729 — BEHAVIORAL ANALYSIS OF MANAGEMENT DECISION MAKING
3 credits.

Examination of behavioral science literature dealing with the processes by which individuals, small groups and organizations make decisions. Understanding decision-making behavior in order to improve managerial performance; modeling decision-making processes for systems design and theory building purposes.

Requisites: Intro course in mgmt processes intermediate course in stat
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E/COMP SCI/MATH 730 — NONLINEAR OPTIMIZATION II
3 credits.


Requisites: COMP SCI/I SY E/MATH/STAT/COMP SCI/I SY E/MATH 726
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2017

I SY E 790 — MASTER'S RESEARCH AND THESIS
1-9 credits.

Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions

I SY E 816 — SPECIAL TOPICS IN SYSTEMS DESIGN
1-3 credits.

Subjects vary.
Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2014

I SY E 823 — SPECIAL TOPICS IN OPERATIONS RESEARCH
1-3 credits.

Subjects vary.
Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Fall 2017

I SY E/PsyCh 854 — SPECIAL TOPICS IN ORGANIZATION DESIGN
1-3 credits.

Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2015

I SY E/PsyCh 859 — SPECIAL TOPICS IN HUMAN FACTORS ENGINEERING
1-3 credits.

Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2018

I SY E/POP HLTH 875 — COST EFFECTIVENESS ANALYSIS IN HEALTH AND HEALTHCARE
3 credits.

Basic ideas and tools of cost effectiveness analysis as applied in evaluating medical technologies. Addresses special problems and methods in assessing diagnostic technologies, including ROC analysis, and in measuring health for technology assessment. Uses "classical" and current journal literature.

Requisites: POP HLTH/SOC/POP HLTH 797 and BMI/POP HLTH/BMI 552
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No

I SY E 890 — PRE-DISSERTATOR'S RESEARCH
1-9 credits.

Requisites: Graduate or professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
I SY E 961 — GRADUATE SEMINAR IN INDUSTRIAL ENGINEERING
1-3 credits.

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** Yes, unlimited number of completions

**Last Taught:** Spring 2011

I SY E 990 — RESEARCH AND THESIS
1-6 credits.

**Requisites:** Graduate or professional standing

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** No

I SY E 999 — ADVANCED INDEPENDENT STUDY
1-6 credits.

Under staff supervision.

**Requisites:** Consent of instructor

**Course Designation:** Grad 50% - Counts toward 50% graduate coursework requirement

**Repeatable for Credit:** Yes, unlimited number of completions