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. Enroll Info: So st
Requisites: None
Course Designation: Workplace - Workplace Experience Course
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2019

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. Enroll Info: None
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: MATH 217, 221, or 275 or concurrent registration
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: None
Requisites: STAT 311, STAT 324, or STAT/MATH 431 or concurrent enrollment
Repeatable for Credit: No
Last Taught: Spring 2019

I SY E 320 — SIMULATION AND PROBABILISTIC MODELING
3 credits.
Analysis of stochastic systems using both analytic methods and computer simulation. Empirical and theoretical models of arrival and service processes. State spaces and state transition probabilities. Simulation of queueing and manufacturing systems. Continuous time Markov analysis of manufacturing systems. Enroll Info: STAT 311 or equiv, STAT 312 or con reg, MATH 320 or MATH 340
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

I SY E 321 — SIMULATION MODELING LABORATORY
1 credit.
Computer exercises involving generation and analysis of random variables, spreadsheet models of queueing systems, use of simulation software packages. Project. Enroll Info: Con reg in IE 320 or cons inst
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: MATH 222, MATH 320 or MATH 340
Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

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 (ISyE 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. Enroll Info: Concurrent registration in ISyE 349 and acceptance into the ISyE undergraduate or graduate program is required. Non- ISyE students may be allowed to enroll based on space availability and consent of the instructor, on a first-come basis
Requisites: None
Repeatable for Credit: No
Last Taught: Summer 2019
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. Enroll Info: Introduction to probability or statistics (Statistics 224, 309, 311, 371, PSYCH 210, Psych 280, SOC/CIE SOC 360, GEN BUS 303, or comparable course) or concurrent registration. Concurrent registration in ISYE 348 is required for ISYE majors.

Requisites: None
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
Last Taught: Summer 2019

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. Enroll Info: None

Requisites: Junior standing, declared in Industrial Engineering program, (COMP SCI 200, 300, 301 or 302), STAT 311, and I SYE 315
Repeatable for Credit: No
Last Taught: Summer 2019

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

Undergraduate honors research projects supervised by faculty members. Not available for graduate credit. Enroll Info: Admission to IE Undergraduate Honors in Research Program

Requisites: Consent of instructor
Course Designation: Honors - Honors Only Courses (H)
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2013

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 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. Enroll Info: None

Requisites: STAT 311, STAT/MATH 309, or STAT/MATH 431
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: None

Requisites: I SYE 315
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: I SYE 320, I SYE 349

Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: None

Requisites: (MATH 320, 340, 341, or 375) or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program

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
Last Taught: Fall 2018

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. Enroll Info: 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)

Requisites: None
Repeatable for Credit: No
Last Taught: Spring 2019
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. Enroll Info: Statistics 311, MATH/STAT 431, or consent of instructor
Requisites: None
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. Enroll Info: Ind Engr 320, 321, 349; EPD 397; or cons inst
Requisites: None
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. Enroll Info: Admission to IE undergraduate Honors in Research Program
Requisites: Consent of instructor
Course Designation: Honors - Honors Only Courses (H)
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2007

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. Enroll Info: IE 315, 323, 349 or cons inst
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

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. Enroll Info: Stat 224
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Summer 2019

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. Enroll Info: Ind Engr 313, Ind Engr 323, STAT 311
Requisites: None
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. Enroll Info: EPD 397 Sr or Grad st, or cons inst
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

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. Enroll Info: STAT 224, 311, 324, 371, STAT/MATH 309 or STAT/MATH 431
Requisites: STAT 224, 311, 324, 371, STAT/MATH 309 or STAT/MATH 431
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Summer 2019

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. Enroll Info: None
Requisites: STAT 311 and I SY E 323
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019
I SY E/COMP SCI/DS 518 — WEARABLE TECHNOLOGY
3 credits.

Introduces students to the design and implementation of wearable computing systems. Designed for students with a background in textiles and apparel design, computer science, engineering or media arts. By the completion of this course, students will have fundamental knowledge of electronic circuits, programming, and "maker skills." Enroll Info: None

Requisites: Sophomore standing
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
Last Taught: Spring 2019

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. Enroll Info: Sr or Grad st, or cons inst

Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

I SY E/COMP SCI/E CE 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. Enroll Info: None

Requisites: (COMP SCI 200, 300, 301, 302, or 310) and (MATH 320, 340, 341, or 375) or graduate/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
Last Taught: Summer 2019

I SY E/COMP SCI/MATH/STAT 525 — LINEAR OPTIMIZATION
3 credits.

Introduces optimization problems whose constraints are expressed by linear inequalities. Develops geometric and algebraic insights into the structure of the problem, with an emphasis on formal proofs. Presents the theory behind the simplex method, the main algorithm used to solve linear optimization problems. Explores duality theory and theorems of the alternatives. Enroll Info: None

Requisites: MATH 320, 340, 341, 375, or 443 or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
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
Last Taught: Spring 2019

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


Requisites: STAT/COMP SCI/I SY E/MATH 525 and (COMP SCI 200, 300, 301, 302, or 310) or graduate/professional standing
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: 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. Enroll Info: IE 349 or equiv

Requisites: None
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: Fall 2018

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

Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019
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. Enroll Info: None

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

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 2018

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. Enroll Info: None

Requisites: Consent of instructor

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

Last Taught: Spring 2019

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. Enroll Info: ISYE 349, or Biomed Engr 315, or Grad standing

Requisites: None

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

Repeatable for Credit: No

Last Taught: Spring 2019

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. Enroll Info: Stat 224

Requisites: None

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

Repeatable for Credit: No

Last Taught: Spring 2018

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. Enroll Info: One intro crse in statistical methods, or cons inst

Requisites: None

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

Repeatable for Credit: No

Last Taught: Summer 2019

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. Enroll Info: None

Requisites: OTM 410 or I SY E 323

Repeatable for Credit: No

Last Taught: Spring 2011

I SY E 601 — SPECIAL TOPICS IN INDUSTRIAL ENGINEERING

1-3 credits.

In various areas. Sample topics: "Simulation" and "Systems Design". Enroll Info: Junior standing and consent of instructor

Requisites: None

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2019

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. Enroll Info: None

Requisites: None

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

Repeatable for Credit: Yes, unlimited number of completions

Last Taught: Spring 2012

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 CAM integration. Course provides experience with CAM software and NC machines. Enroll Info: Ind Engr 315 or cons inst

Requisites: None

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

Repeatable for Credit: No

Last Taught: Fall 2018
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. Enroll Info: None
Requisites: Declared in Doctor of Pharmacy program with third year standing
Repeatable for Credit: No
Last Taught: Fall 2018

I SY E 610 — DESIGN OF PROGRAM EVALUATION SYSTEMS
3 credits.
Design of systems for evaluating the effectiveness (efficiency, benefits, costs, resource utilization, contribution) of socio-technical systems. Measurement, analysis and interpretation of results including implications for engineering research. Extensive case studies. Enroll Info: Sr or Grad st in ind engr or cons inst
Requisites: None
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. Enroll Info: MATH 320 STAT 311, Sr or Grad st, or cons inst
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

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. Enroll Info: IE 315, 320, 321, 323, STAT 311, 312
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

I SY E/B MI 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. Enroll Info: None
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 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. Enroll Info: None
Requisites: COMP SCI 302 and STAT 312
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

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. Enroll Info: STAT 311, MATH 320 or MATH 340
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

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. Enroll Info: None
Requisites: (STAT/MATH 431, 309, STAT 311 or MATH 531) and (MATH 320, 340, 341, 375, 421 or 531) or graduate/professional standing or member of the Pre-Masters Mathematics (Visiting International) Program
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
Last Taught: Summer 2019
I SY E/MATH/OTM 633 — QUEUING THEORY AND STOCHASTIC MODELING
3 credits.
Reliability theory; coherent systems and reliability bounds. Markovian queues and Jackson networks. Steady-state behavior of general service time queues. Priority queues. Approximation methods and algorithms for complex queues. Simulation. Dynamic programming; applications to inventory and queueing. Enroll Info: None
Requisites: STAT/I SY E/MATH/OTM 632
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
Last Taught: Spring 2010

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. Enroll Info: None
Requisites: (MATH 320, 340, 341, or 375) and (COMP SCI 200, 202, 300, 301, or 302) or graduate/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

I SY E/M E 641 — DESIGN AND ANALYSIS OF MANUFACTURING SYSTEMS
3 credits.
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. Enroll Info: Grads: MSE major or consent of instructor; Undergrads: IE 315 or 605, consent of instructor
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

I SY E/M E 643 — PERFORMANCE ANALYSIS OF MANUFACTURING SYSTEMS
3 credits.
This course examines the state of the art in the use of stochastic network theory to develop performance models of modern manufacturing systems. Enroll Info: ISyE 624 or ISyE 632, Comp Sci 302 or Comp Sci 367 or Graduate standing
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

I SY E 645 — ENGINEERING MODELS FOR SUPPLY CHAINS
3 credits.
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. Enroll Info: ISyE 323, ISyE 415
Requisites: None
Repeatable for Credit: No
Last Taught: Fall 2018

I SY E/PSYCH 652 — SOCIOTECHNICAL SYSTEMS
3 credits.
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 "whole" system consideration. Organizational design strategy. Field site analyses by student teams. Enroll Info: Grad st or IE 349
Requisites: None
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: Fall 2011

I SY E/PSYCH 653 — ORGANIZATION AND JOB DESIGN
3 credits.
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. Enroll Info: Grad st or IE 349
Requisites: None
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: Fall 2017
I SY E/B M E 662 — DESIGN AND HUMAN DISABILITY AND AGING
3 credits.
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. Enroll Info: Jr st or cons inst
Requisites: None
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2019

I SY E/INFO SYS/OTM 671 — E-BUSINESS: TECHNOLOGIES, STRATEGIES AND APPLICATIONS
3 credits.
Overview of core concepts of e-commerce and e-business technologies, strategies and applications. Covers business-to-consumer, business-to-business and intra-business models by using real-world examples and cases from various industries. Enroll Info: None
Requisites: Senior standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2014

I SY E 699 — ADVANCED INDEPENDENT STUDY
1-5 credits.
Under faculty supervision. Enroll Info: None
Requisites: Consent of instructor
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: Yes, unlimited number of completions
Last Taught: Summer 2019

I SY E 702 — GRADUATE COOPERATIVE EDUCATION PROGRAM
1-2 credits.
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. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2019

I SY E/POP HLTH 703 — QUALITY OF HEALTH CARE: EVALUATION AND ASSURANCE
1-3 credits.
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. Enroll Info: Major or minor in population health, or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

I SY E/C&E SOC/N E/SOC 708 — SOCIETAL RISK MANAGEMENT OF TECHNOLOGICAL HAZARDS
3 credits.
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. Enroll Info: STAT 311 or MATH/STAT 431 or SOC/C&E SOC 360, IE 516, Grad st; or cons inst
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2015

I SY E/COMP SCI 719 — STOCHASTIC PROGRAMMING
3 credits.
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., MATH/COMP SCI/I SY E/STAT 525) and probability and statistics (e.g., MATH/STAT 431). Knowledge of integer optimization (MATH/COMP SCI/I SY E 728) is helpful, but not required. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2018

I SY E/INFO SYS 722 — COMPUTER-BASED DATA MANAGEMENT
3 credits.
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. Enroll Info: None
Requisites: Graduate/professional standing and INFO SYS/COMP SCI 371
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Fall 2017
### Industrial and Systems Engineering (I SY E)

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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
<th>Description</th>
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| I SY E/COMP SCI 723 | **DYNAMIC PROGRAMMING AND ASSOCIATED TOPICS** 3 credits. |          | 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. Knapsack 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) Enroll Info: None | Requisites: Graduate/professional standing  
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement  
Repeatable for Credit: No                                                                                 | Last Taught: Spring 2018                                                                 |                                                  |
| I SY E/COMP SCI/MATH 726 | **NONLINEAR OPTIMIZATION I** 3 credits. |          | 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. Enroll Info: Students are strongly encouraged to have knowledge of linear algebra and familiarity with basic mathematical analysis.  
Requisites: Graduate/professional standing  
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement  
Repeatable for Credit: No                                                                                 | Last Taught: Fall 2018                                                                 |                                                  |
| I SY E/COMP SCI 727 | **CONVEX ANALYSIS** 3 credits. |          | 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). Enroll Info: None | Requisites: Graduate/professional standing  
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement  
Repeatable for Credit: No                                                                                 | Last Taught: Fall 2018                                                                 |                                                  |
| 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., MATH/COMP SCI/I SY E/STAT 525), including algorithms, duality and polyhedral theory. Enroll Info: None | Requisites: Graduate/professional standing  
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement  
Repeatable for Credit: No                                                                                 | Last Taught: Spring 2019                                                                 |                                                  |
| I SY E/M HR 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. Enroll Info: Knowledge of statistics strongly encouraged such as STAT 301.  
Requisites: Graduate/professional standing or member of Business Exchange program  
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement  
Repeatable for Credit: No                                                                                 | Last Taught: Spring 2019                                                                 |                                                  |
| I SY E/COMP SCI/MATH 730 | **NONLINEAR OPTIMIZATION II** 3 credits. |          | Theory and algorithms for nonlinearly constrained optimization. Relevant geometric concepts, including tangent and normal cones, theorems of the alternative, and separation results. Constraint qualifications.  
Geometric and algebraic expression of first-order optimality conditions. Second-order optimality conditions. Duality. Nonlinear programming algorithms: merit functions and filters; interior-point, augmented Lagrangian, and sequential quadratic programming algorithms. Enroll Info: None | Requisites: 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 2019                                                                 |                                                  |
| I SY E 790 | **Masters' Research and Thesis** 1-9 credits. |          | Enroll Info: None  
Requisites: Graduate/professional standing  
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement  
Repeatable for Credit: Yes, unlimited number of completions  
Last Taught: Spring 2019                                                                                 |                                                  |                                                  |
I SYE 816 — SPECIAL TOPICS IN SYSTEMS DESIGN
1-3 credits.

Subjects vary. Enroll Info: None
Requisites: Graduate/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 SYE 823 — SPECIAL TOPICS IN OPERATIONS RESEARCH
1-3 credits.

Subjects vary. Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

I SYE/PSYCH 854 — SPECIAL TOPICS IN ORGANIZATION DESIGN
1-3 credits.

Enroll Info: None
Requisites: Graduate/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 SYE/PSYCH 859 — SPECIAL TOPICS IN HUMAN FACTORS ENGINEERING
1-3 credits.

Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2019

I SYE/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. Enroll Info: None
Requisites: SOC/POP HLTH 797 and POP HLTH/B M I 552
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Spring 2018

I SYE 890 — PRE-DISSERATOR’S RESEARCH
1-9 credits.

Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Summer 2019

I SYE 961 — GRADUATE SEMINAR IN INDUSTRIAL ENGINEERING
1-3 credits.

Enroll Info: None
Requisites: Graduate/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 SYE 990 — RESEARCH AND THESIS
1-6 credits.

Enroll Info: None
Requisites: Graduate/professional standing
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: No
Last Taught: Summer 2019

I SYE 999 — ADVANCED INDEPENDENT STUDY
1-6 credits.

Under staff supervision. Enroll Info: None
Requisites: Declared in Industrial Engineering PhD
Course Designation: Grad 50% - Counts toward 50% graduate coursework requirement
Repeatable for Credit: Yes, unlimited number of completions
Last Taught: Spring 2018