

INDUSTRIAL/SYSTEMS ENGINEERING (ISYE)

ISYE 220 | ENGINEERING ECONOMICS

Units: 3 Repeatability: No

Prerequisites: ISYE 330 (Can be taken Concurrently)

Principles of financial analysis appropriate for evaluating the economic impact of engineering projects. Three hours lecture weekly.

ISYE 294 | SPECIAL TOPICS IN INDUSTRIAL AND SYSTEMS ENGINEERING

Units: 1-4 Repeatability: Yes (Can be repeated for Credit)

Special topics seminar in areas of special interest to Industrial & Systems Engineering. May be repeated for credit with a different topic. Upper division standing in the ISYE major.

ISYE 299 | INDEPENDENT STUDY

Units: 1-3 Repeatability: Yes (Can be repeated for Credit)

Individual project in creative design and synthesis under the general supervision of a participating professor. Project proposal must be submitted and approved prior to enrollment. May be repeated for credit.

ISYE 305 | INDUSTRIAL AND SYSTEMS ENGINEERING PROFESSIONAL PRACTICE

Units: 3 Repeatability: No

Core Attributes: Advanced writing competency, Oral communication competency

Prerequisites: (FYW 150 or CORE 2CFYW) and ISYE 310 (Can be taken Concurrently)

An introduction to professional skills needed for success in industry including written communication, oral communication, teamwork, leadership skills, and career management. Topics and projects include iterative writing process, literature reviews, technical reports, peer review techniques, self-awareness, emotional intelligence, personal branding, and global/intercultural awareness. Three hours lecture weekly.

ISYE 310 | WORK ANALYSIS AND DESIGN

Units: 4 Repeatability: No

Prerequisites: ISYE 330 (Can be taken Concurrently)

Introduction to the fundamental methods for analyzing and designing procedures to perform operations in the workplace. Includes time and motion study, methods improvement and workplace design. Three hours lecture and one three-hour laboratory weekly. Junior standing in engineering. Fall semester.

ISYE 320 | INTRODUCTION TO SYSTEMS ENGINEERING

Units: 3 Repeatability: No

Prerequisites: ISYE 220 with a minimum grade of C- and ISYE 330 with a minimum grade of C- and ISYE 305

This course introduces the theory and methods used to design and analyze systems. System life-cycle principle and different stages of the system development process are examined, practiced and applied to create integrated solutions to an engineering problem.

ISYE 330 | ENGINEERING PROBABILITY AND STATISTICS

Units: 3 Repeatability: No

Core Attributes: Quantitative reasoning comp

Prerequisites: MATH 151

Introduction to probability and applied statistics within an engineering context. Topics include probability, discrete and continuous probability distributions, and statistical tests and confidence intervals for one and two samples. Three hours lecture weekly. Fall and Spring semesters.

ISYE 335 | SIX SIGMA - PROCESS IMPROVEMENT METHODS

Units: 4 Repeatability: No

Prerequisites: ISYE 310 and ISYE 330 with a minimum grade of C-

Application of statistics to improving quality and productivity. Introduction to Six Sigma quality methodology and the DMAIC (define, measure, analyze, improve, and control) problem-solving strategy for continuous quality improvement. Three hours lecture and one three-hour laboratory weekly. Spring semester.

ISYE 340 | OPERATIONS RESEARCH I

Units: 3 Repeatability: No

Prerequisites: (MATH 310 or MATH 320)

Deterministic models and methods in operations research. Simplex method, sensitivity analysis, integer programming and network algorithms. Emphasis on modeling and interpreting solutions to problems encountered by industrial and systems engineers. Three hours lecture weekly.

ISYE 350 | MANUFACTURING PROCESSES

Units: 3 Repeatability: No

Prerequisites: (MENG 311 or ENGR 311) and MENG 210

Corequisites: ISYE 350L

Description, classification and analysis of manufacturing processes used in the transformation of different raw materials (e.g. metals, polymers, composites, etc.) into consumer or capital goods. Topics include: analysis of variables that affect process operations, performance, quality, cost, sustainability and the design of process plans.

ISYE 350L | MANUFACTURING PROCESSES LABORATORY

Units: 1 Repeatability: No

Corequisites: ISYE 350

Applications of theoretical concepts learned in the Manufacturing Processes lecture class to design products, develop computer codes for machining, and produce parts out of various starting materials such as metals and plastics while considering quality, cost and sustainability implications. Manufacturing methods include, but not limited to: computer numerical control (CNC) machining, computer-aided manufacturing (CAM), welding, plastics forming, and design for manufacturing and assembly.

ISYE 380 | SUSTAINABILITY AND ENGINEERING

Units: 3 Repeatability: No

The course provides an interdisciplinary overview of the engineering roles and opportunities to improve the sustainability of engineering products, processes and systems. Topics include carbon footprint, life cycle assessment, design for sustainability, wastes and recycling, energy and water.

ISYE 385 | TECHNOLOGY, ENVIRONMENT AND SOCIETY

Units: 3 Repeatability: No

Prerequisites: ISYE 380 (Can be taken Concurrently) or ISYE 330

An interdisciplinary course that evaluates options for improving energy and resource productivity from the perspective of technology, economics, natural ecosystems, and public policy. Course covers methods for analyzing the environmental impacts of industrial and consumer activities. Topics include industrial ecosystems, life cycle assessments, and policy options for environmental sustainability. Analysis of the balance between resource availability and demand, and the relationship between energy use and technology will be explored. Prior completion of ISYE 380 recommended.

ISYE 391W | INDUSTRIAL AND SYSTEMS ENGINEERING PROFESSIONAL PRACTICE**Units: 3 Repeatability: No****Core Attributes: Advanced writing competency, Oral communication competency**

Prerequisites: ISYE 310 (Can be taken Concurrently)

Development of skills and knowledge needed to successfully manage projects in ISyE. Topics include project management, teamwork, the role of ISyE in an organization, career planning, formal memo writing, oral and written reports incorporating peer review, iterative drafting techniques, and formal final multimedia presentation incorporating peer review. Three hours lecture weekly.

ISYE 410 | HUMAN FACTORS**Units: 3 Repeatability: No**

Prerequisites: ISYE 330

An introduction to the field of ergonomics/human factors engineering. Principles of workplace and environmental design to conform to the physical and mental abilities and limitations of people are presented.

ISYE 420 | SIMULATION OF PRODUCTION AND SERVICE SYSTEMS**Units: 4 Repeatability: No**

Prerequisites: (ENGR 121 or COMP 110) and ISYE 440

Modeling and analysis of systems using computer-based discrete event simulation. Principles of modeling, validation, and output analysis are developed using high-level simulation languages. Three hours lecture and one three-hour laboratory weekly. Fall semester.

ISYE 430 | DESIGN AND ANALYSIS OF ENGINEERING EXPERIMENTS**Units: 3 Repeatability: No**

Prerequisites: ISYE 335

Systematic application of statistical techniques to the design and analysis of engineering experiments. Application of experimental design to develop models and improve quality and performance of products, processes, and services. Topics will include analysis of variance, single factor experiments, factorial and fractional factorial experimental designs, screening designs, optimality designs, and response surface designs. Fall semester.

ISYE 440 | OPERATIONS RESEARCH II**Units: 3 Repeatability: No**

Prerequisites: ISYE 330 with a minimum grade of C- and ISYE 340

Methods for developing and analyzing stochastic operations research models. Topics include Poisson processes, Markov processes, queuing, and decision theory. Three hours lecture weekly. Spring semester.

ISYE 450 | MANUFACTURING SYSTEMS**Units: 3 Repeatability: No**

Prerequisites: ISYE 350 and (ENGR 121 or COMP 110 or COMP 150)

Introduction to principles of manufacturing automation and analysis of automated systems. Topics include process and machine control, control systems, programmable logic controllers, robotics, computer vision and material handling systems. Two hours lecture and one two-hour laboratory weekly. Fall semester.

ISYE 460 | OPERATIONS AND SUPPLY CHAIN MANAGEMENT**Units: 3**

Prerequisites: ISYE 220 and ISYE 340

Concepts in planning, controlling, and managing the operations function of manufacturing and service firms. Topics include operations strategy, forecasting, capacity, production planning and control, and trends in operations and supply chain management. Emphasis on the development and use of mathematical models and algorithms used to analyze and improve the use of material, labor and information in various processes. Three hours lecture weekly. Spring semester.

ISYE 470 | FACILITIES PLANNING**Units: 3 Repeatability: No**

Prerequisites: ISYE 310 and ISYE 340

Analysis and design of production and service facilities. Analytical and computer-based techniques to assist with strategic planning, process design, material handling and flow, layout and facility location. Three hours lecture weekly. Fall semester.

ISYE 480 | DATA SCIENCE AND ANALYTICS**Units: 3 Repeatability: No**

Prerequisites: ISYE 330 and (ENGR 121 or COMP 110)

Course explores different types of statistical methods for analyzing data. The course begins with a focus on measurement, inferential statistics, and causal inference. Then different techniques are applied for analyzing and viewing data with a strong focus on applying this knowledge to real-world data problems. Topics in quantitative techniques include descriptive and inferential statistics, regression, classification, clustering, and machine learning (ML) algorithms. Three hours of lecture weekly.

ISYE 491 | ISYE SENIOR DESIGN PREPARATION**Units: 1 Repeatability: No**

Corequisites: ISYE 420, ISYE 430, ISYE 470

In this course, students will complete preliminary work to prepare for ISYE 492 Senior Design Project. This includes project sponsor onboarding logistics/paperwork and drafting preliminary project charter including problem statement and Gantt chart.

ISYE 492 | INDUSTRIAL AND SYSTEMS ENGINEERING DESIGN PROJECT**Units: 3 Repeatability: No****Core Attributes: Advanced Integration**

Prerequisites: ISYE 220 and ISYE 310 and ISYE 320 and ISYE 335 and ISYE 470 and ISYE 491 and (ISYE 350 or ISYE 420) and (ISYE 350 (Can be taken Concurrently) and ISYE 440 (Can be taken Concurrently))

This is the industrial and systems engineering capstone senior design course in which students work in teams in collaboration with a faculty mentor and project sponsor on an open-ended design project. Students will apply various principles of industrial and systems engineering, knowledge and skills acquired throughout the curriculum to develop a sustainable and implementable solution to a real-world problem while considering design constraints. Written and oral reports, design reviews, final project report and presentation are expected as part of students' deliverables in this course.

ISYE 494 | SPECIAL TOPICS IN INDUSTRIAL AND SYSTEMS ENGINEERING**Units: 0.5-4 Repeatability: Yes (Can be repeated for Credit)**

Special topics seminar in areas of special interest to Industrial & Systems Engineering. May be repeated for credit with a different topic. Upper division standing in the ISYE major.

ISYE 496 | ISYE UNDERGRADUATE RESEARCH**Units: 1-3 Repeatability: Yes (Can be repeated for Credit)**

A faculty-directed research project supervised by a faculty mentor in the Industrial and Systems Engineering department. Project deliverables could include (but are not limited to) literature research, project planning, experimental designs and execution, data collection/analysis, hypothesis testing, model validation, and report writing. Course may be taken pass/fail or for letter grade, 1 – 3 semester units, and may be repeated for credits with a maximum of 3 units counted towards ISyE program elective requirement (with letter grade only). Requires departmental approval of Undergraduate Research form prior to registration.

ISYE 498 | INTERNSHIP/CO-OP EXPERIENCE**Units: 1-3 Repeatability: Yes (Can be repeated for Credit)**

Directed upper division level internship/ co-operative experience in engineering research, design, development, manufacturing, or the engineering activity.

Written report required. Credit not applicable to minimum program graduation requirement. Placement contingent upon approval of participating organization. May be repeated for credit.

ISYE 499 | INDEPENDENT STUDY**Units: 1-3 Repeatability: Yes (Can be repeated for Credit)**

Individual project in creative design and synthesis under the general supervision of a participating professor. Project proposal must be submitted and approved prior to enrollment. May be repeated for credit.