Industrial & Systems Engineering

Department Chair
Truc T. Ngo, PhD, Chair

Faculty
Bradley Chase, PhD, MPH
Odesma Dalrymple, PhD
Jae D. Kim, PhD
Leonard A. Perry, PhD
Rick T. Olson, PhD
Chell A. Roberts, PhD

Industrial & Systems Engineering (ISyE) applies basic engineering skills from mathematics and the physical sciences, specialized analysis techniques and an understanding of how people interact with machines and each other to design and evaluate the performance of systems in industry and in the service sector. Examples of the types of systems that may be analyzed by ISyEs include health care delivery systems, product distribution systems and manufacturing systems. The factor that most distinguishes ISyE from other engineering disciplines is the attention devoted to human involvement in the systems being analyzed.

Educational Objectives

The ISyE program seeks to develop graduates who:

- Have established careers in Industrial & Systems Engineering in industry, service, consulting or government organizations
- Design, develop, implement and improve integrated industrial and service systems to achieve organizational goals
- Collaborate with others as members or leaders of engineering or multidisciplinary teams
- Continue to develop skills in engineering, business, management or other Industrial & Systems Engineering related fields.

To achieve these objectives, the ISyE program has been designed to ensure that graduates have achieved the following outcomes, including the ability to:

- Identify, formulate and solve complex engineering problems by applying principles of engineering, science and mathematics
- Apply engineering design to produce solutions that meet specified needs with consideration of public health, safety and welfare, as well as global, cultural, social, environmental and economic factors
- Communicate effectively with a range of audiences
- Recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental and societal contexts
- Function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks and meet objectives
- Develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
- Acquire and apply new knowledge as needed, using appropriate learning strategies.

Coursework in the ISyE program emphasizes the process of developing analytical models for systems and using computer-based techniques to explore ways in which the systems can be made to function more efficiently. The upper-division ISyE courses emphasize the general principles of designing and evaluating systems and the application of these principles to many different types of systems.

The ISyE major student is expected to be involved in professional aspects of the field. Since the engineering profession places a high value on professional society involvement, students enrolled in the Industrial & Systems Engineering major are expected to be active student members of the Institute of Industrial and Systems Engineers (IISE).

Industrial & Systems Engineering Advisory Board

The Industrial & Systems Engineering Advisory Board (ISyEAB) was organized in Summer 2001 to represent the interests of the Industrial & Systems Engineering industry and alumni to the industrial and systems engineering program. The board, composed of representatives from companies such as Northrop Grumman, Thermo Fisher Scientific, Sharp Healthcare, Scripps Health, BAE Systems, SPAWAR Systems Center, and the Kiran Group, serves to expand the level and role of industry affiliates in the continued development of the program and in the promotion of cooperative programs and relations with industry and the San Diego community.

The ISYE Major

Preparation for the Major

Preparation for the major requirements are the completion of the following courses with a grade point average of 2.0 or better.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 150</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 151</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 310</td>
<td>Applied Mathematics for Science and Engineering I</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Math Elective 1</td>
<td>3-4</td>
</tr>
<tr>
<td>PHYS 270</td>
<td>Introduction to Mechanics &amp; Mechanics Lab</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 271</td>
<td>Introduction to Electricity and Magnetism Lab</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 151 &amp; 151L</td>
<td>General Chemistry I and General Chemistry I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>Total Mathematics and Science Units</td>
<td></td>
<td>26-27</td>
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Engineering Core:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGR 101</td>
<td>Introduction to Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 102</td>
<td>Introduction to Electromechanical System Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 103</td>
<td>User-Centered Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 121</td>
<td>Engineering Programming</td>
<td>3</td>
</tr>
<tr>
<td>or COMP 110</td>
<td>Computational Problem Solving</td>
<td></td>
</tr>
<tr>
<td>MENG 210</td>
<td>Statics</td>
<td>3</td>
</tr>
<tr>
<td>Engineering Elective 2</td>
<td></td>
<td>3-4</td>
</tr>
<tr>
<td>Total Engineering Core Units</td>
<td></td>
<td>18-19</td>
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</table>

Engineering Professional Practice Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISYE 305</td>
<td>Industrial and Systems Engineering Professional Practice</td>
<td>3</td>
</tr>
</tbody>
</table>
PHIL 342  Engineering Ethics  
Total Preparation for Major Units  

1  MATH 250, MATH 222, MATH 262 or another mathematics class approved by ISyE chair.
2  ELEC 201, MENG 260 or another engineering course approved by ISyE chair.
3  The following courses are also acceptable: PHIL 332 (Business Ethics), PHIL 338 (Environmental Ethics), PHIL 345 (Computer Ethics)

Industrial & Systems Engineering Requirements
These courses include units in ISyE science and design. These classes are required by the major, with a grade of C- or better in ISYE 330:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENG 311</td>
<td>Materials Science and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>or ENGR 311</td>
<td>Engineering Materials Science</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 220</td>
<td>Engineering Economics</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 310</td>
<td>Work Analysis and Design</td>
<td>4</td>
</tr>
<tr>
<td>ISYE 320</td>
<td>Introduction to Systems Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 335</td>
<td>Six Sigma - Process Improvement Methods</td>
<td>4</td>
</tr>
<tr>
<td>ISYE 340</td>
<td>Operations Research I</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 350</td>
<td>Manufacturing Processes</td>
<td>4</td>
</tr>
<tr>
<td>&amp; 350L</td>
<td>Manufacturing Processes Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 420</td>
<td>Simulation of Production and Service Systems</td>
<td>4</td>
</tr>
<tr>
<td>ISYE 430</td>
<td>Design and Analysis of Engineering Experiments</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 440</td>
<td>Operations Research II</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 460</td>
<td>Operations and Supply Chain Management</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 470</td>
<td>Facilities Planning</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 492</td>
<td>Industrial and Systems Engineering Design Project</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 330</td>
<td>Engineering Probability and Statistics</td>
<td>3</td>
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<tr>
<td>ISYE Electives 4</td>
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<td>15</td>
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<tr>
<td>Total Units</td>
<td>61</td>
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4 Students must select 15 units of ISyE program electives. Nine units of these electives must be upper division within the school of engineering. Three of the remaining six units must be upper division. The currently approved upper division electives include ISYE 380, ISYE 385, ISYE 410, ISYE 450, ISYE 480, NABS 301, and ISYE 494 special topics courses. Consult with the ISyE chair for other approved electives.

Note: Most engineering, and many mathematics and science courses, required by the engineering program are offered only in the fall or spring semester, but not both. Consult individual course sections for semester offering pattern, or see an engineering advisor.

Additional Requirements
All industrial and systems engineering majors must satisfy the core curriculum specified by the university and the Connect Career Readiness Program (https://www.sandiego.edu/engineering/resources/careers/connect).

Concentration in Sustainability (12 units)
This Concentration in Sustainability allows ISyE majors to delve more into sustainable engineering concepts and practices to improve process and system designs/configurations. Upon completing the cluster of required courses, students will have a portfolio of projects, problem solving and hands-on practices demonstrating their competency in the subject matter. The Sustainability Concentration is intended to be an integral part of the existent ISyE BS/BA degree program. Students are required to complete a minimum of 12 course units with letter grades of C- or better. Students may use all 12 concentration units towards their ISyE program electives. Course requirements include the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>ISYE 380</td>
<td>Sustainability and Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ISYE 385</td>
<td>Technology, Environment and Society</td>
<td>3</td>
</tr>
<tr>
<td>Select two of the following courses:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EOSC/BIOL 112</td>
<td>Ecology and Environmental Biology</td>
<td>3-4</td>
</tr>
<tr>
<td>EOSC 305</td>
<td>Environmental Assessment Practices</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 355</td>
<td>Environmental Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>BSCM 305</td>
<td>Sustainable Global Supply Chain Management</td>
<td>3</td>
</tr>
<tr>
<td>ECON 308</td>
<td>Environmental and Natural Resource Economics</td>
<td>3</td>
</tr>
<tr>
<td>ETLW 302</td>
<td>Business and Society</td>
<td>3</td>
</tr>
<tr>
<td>ETLW 403</td>
<td>Environmental Management</td>
<td>3</td>
</tr>
<tr>
<td>MSRE 517</td>
<td>Sustainable Real Estate</td>
<td>3</td>
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</table>

Or another sustainability related course approved by ISyE department chair.

Recommended Program of Study: Industrial & Systems Engineering

First Year
Semester I

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ENGR 101</td>
<td>Introduction to Engineering</td>
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<tr>
<td>MATH 150</td>
<td>Calculus I</td>
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<tr>
<td>CHEM 151 &amp; 151L</td>
<td>General Chemistry I</td>
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Or

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<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ENGR 121</td>
<td>Engineering Programming</td>
<td>3</td>
</tr>
<tr>
<td>or COMP 110</td>
<td>Computational Problem Solving</td>
<td>3</td>
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<tr>
<td>CC Electives</td>
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Semester II

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
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<tbody>
<tr>
<td>ENGR 103 or 102</td>
<td>User-Centered Design</td>
<td>3</td>
</tr>
<tr>
<td>ENGR 121 or COMP 110</td>
<td>Engineering Programming</td>
<td>3</td>
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Or

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 151 &amp; 151L</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 151</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 270 &amp; 270L</td>
<td>Introduction to Mechanics</td>
<td>4</td>
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<tr>
<td>CC Elective</td>
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Sophomore Year

Semester I

<table>
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<tr>
<th>Code</th>
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<tbody>
<tr>
<td>ENGR 103 or 102</td>
<td>User-Centered Design</td>
<td>3</td>
</tr>
<tr>
<td>MATH 310</td>
<td>Applied Mathematics for Science and Engineering I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 271 &amp; 271L</td>
<td>Introduction to Electricity and Magnetism</td>
<td>4</td>
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</table>
CC Electives

Semester II
ISYE 330 Engineering Probability and Statistics
MENG 210 Statics
Math Elective
Engineering Elective
CC Elective

Junior Year

Semester I
ISYE 220 Engineering Economics
ISYE 310 Work Analysis and Design
ISYE 340 Operations Research I
ISYE 305 Introduction to Systems Engineering
MENG 311 or ENGR 311 Materials Science and Engineering
ISYE 320 Introduction to Systems Engineering
ISYE 335 Six Sigma - Process Improvement Methods
ISYE 350 Manufacturing Processes
& 350L
ISYE 440 Operations Research II
ISyE Program Elective I

Senior Year

Semester I
ISYE 420 Simulation of Production and Service Systems
ISYE 430 Design and Analysis of Engineering Experiments
ISYE 470 Facilities Planning
ISyE Program Elective II
CC Elective

Semester II
ISYE 460 Operations and Supply Chain Management
ISYE 492 Industrial and Systems Engineering Design Project
ISyE Program Elective III
ISyE Program Elective IV
CC Elective

Senior Year 2

Semester I
CC Electives
ISyE Program Elective V

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
Units: 3 Repeatability: No
Core Attributes: Advanced writing competency, Oral communication competency
Prerequisites: FYW 150 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 330 and ISYE 305
Introduction to the theory and methods used to design and analyze systems. Principles of the system life-cycle including problem identification, description, modeling, solution and implementation. Three hours lecture weekly. Spring semester.

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
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)
Methods for developing and analyzing deterministic operations research models. Topics include linear programming, networks, and Integer programming. Three hours lecture weekly. Fall semester.
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
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.

ISYE 391 | INDUSTRIAL AND SYSTEMS ENGINEERING PROFESSIONAL PRACTICE
Units: 3 Repeatability: No
Core Attributes: Advanced writing competency, Oral communication competency
Prerequisites: FYW 150
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 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
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. Three hours lecture weekly. Spring semester.

ISYE 410L | HUMAN FACTORS LABORATORY
Units: 1
Corequisites: ISYE 410
Laboratory for ISYE 410. Three hour laboratory weekly. Spring semester.

ISYE 420 | SIMULATION OF PRODUCTION AND SERVICE SYSTEMS
Units: 4 Repeatability: No
Prerequisites: (ENGR 121 or COMP 150) 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
Prerequisites: ISYE 330 and ISYE 335
Systematic application of statistical techniques to the design and analysis of engineering experiments. Application of experimental design to the improvement of products, processes, and services. Topics will include analysis of variance, single factor experiments, factorial and fractional factorial experimental designs, robust design, and response surface methods. Three hours lecture weekly. Fall semester.

ISYE 440 | OPERATIONS RESEARCH II
Units: 3 Repeatability: No
Prerequisites: ISYE 330 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 492 | INDUSTRIAL AND SYSTEMS ENGINEERING DESIGN PROJECT
Units: 3 Repeatability: No
Core Attributes: Advanced Integration
Prerequisites: ISYE 310 and ISYE 320 and ISYE 335 and ISYE 350 and ISYE 420 and ISYE 470
Capstone Senior design project. Application of principles of Industrial & Systems Engineering from throughout the curriculum to a design project. Written and oral reports, design reviews, final project report and presentation. Spring semester.

ISYE 494 | 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 496 | UNDERGRADUATE RESEARCH
Units: 1-3 Repeatability: Yes (Can be repeated for Credit)
Faculty-directed undergraduate research in industrial and systems engineering. Problem proposal must be submitted and approved prior to enrollment. Written report required. Upper division standing in the ISYE major. Prior approval by the department chair is required. May be repeated for credit.

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.