

Industrial and Systems Engineering and Engineering Management

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Industrial and Systems Engineering

Industrial & Systems Engineering is a branch of engineering dealing with the optimization of complex processes or systems. It is concerned with the development, improvement, implementation and evaluation of integrated systems of people, money, knowledge, information, equipment, energy, materials, analysis and synthesis, as well as the mathematical, physical, and social sciences together with the principles and methods of engineering design to specify, predict, and evaluate the results to be obtained from such systems or processes. Its underlying concepts overlap considerably with certain business-oriented disciplines such as operations management.

Depending on the sub-specialties involved, industrial engineering may also be known as, or overlap with, operations management, management science, operations research, systems engineering, manufacturing engineering, ergonomics or human factors engineering, safety engineering, or others, depending on the viewpoint or motives of the user. For example, in health care, the engineers known as health management engineers or health systems engineers are, in essence, industrial engineers by another name.

The Industrial and Systems Engineering Department offers the following degree program:

- Industrial and Systems Engineering, BSISE (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/industrial-systems-engineering-and-engineering-management/bsise-systems-track/#requirementstext>)

Students may earn the BSISE degree with one of two tracks: Industrial Engineering and Systems Engineering.

Mission

To provide integrated, applications-oriented education and research programs in the areas of industrial engineering, systems engineering, and engineering management to support the needs of students and organizations in the Huntsville area and beyond.

ISE Program Educational Objectives

To realize the mission of the department, the following educational objectives have been adopted for the undergraduate program. These objectives cover the fundamentals of both engineering and the humanities that characterize a university education, plus the specialized knowledge of industrial and systems engineering needed for a successful career in industry, the government, or academia.

- Graduates will have utilized a foundation in the knowledge and skills of industrial and systems engineering to improve lives and advance professionally in positions of increasing responsibility within their chosen field.
- Graduates will have become effective collaborators and innovators, leading or participating in efforts to address social, technical, and business challenges.
- Graduates will have engaged in lifelong learning and professional development through self-study, continuing education, or graduate and professional studies.

Major in Industrial and Systems Engineering

- BSISE, Industrial Engineering Track (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/industrial-systems-engineering-and-engineering-management/bsise-industrial-track/>)
- BSISE, Systems Engineering Track (<http://catalog.uah.edu/undergrad/colleges-departments/engineering/industrial-systems-engineering-and-engineering-management/bsise-systems-track/>)

ISE 224 - INTRO INDUSTRIAL & SYSTEMS

Semester Hours: 3

Overview of industrial engineering concepts. Includes history and development of classical industrial engineering; documentation and computational methods; basic work methods and measurement; manufacturing systems; and economic decision analysis. Prerequisites: EGR 101.

ISE 299 - ISE MENTORING I

Semester Hours: 0

Yearly mentoring and advising from engineering faculty and staff. Prerequisite w/ concurrency: ISE 224.

ISE 321 - ENGINEERING ECONOMY

Semester Hours: 3

Economic evaluation of engineering alternatives. Interest, time-value of investments, depreciation and income taxes, break-even cost analysis. Sophomore standing.

ISE 324 - WORK DESIGN

Semester Hours: 3

Principles of methods analysis and ergonomics to fit a task and workstation to the human operator including work measurement and tools, work sampling, job analysis, anthropometric data, and workplace design. Laboratory exercises focus on the implementation of lean principles. (Same as PY 324) Prerequisites: ISE 390 or PY 300.

ISE 327 - MANAGEMENT SYSTEMS ANALYSIS

Semester Hours: 3

Formal organization structures and functions. Analysis of organization planning leading toward the accomplishment of goals. Techniques for making decisions within formal organizations, together with ethical constraints. Emphasis on technical writing. Prerequisite: ISE 390.

ISE 328 - INTRO SYSTEMS ENGINEERING

Semester Hours: 3

Development of a systems framework for the design and realization of systems, with emphasis on the conception, design and management of systems in complex environments. Topics include systems concepts, requirements, architecture, evaluation, integration, trades, and object oriented methods and concepts.

ISE 340 - OPERATIONS RESEARCH

Semester Hours: 3

Fundamental methods, models and computational techniques of operations research. Linear programming including transportation, assignment of simplex algorithms. Queuing theory. Prerequisites: ISE 390 and MA 244.

ISE 390 - PROB & ENGR STATISTICS I

Semester Hours: 3

Engineering uses of probability, discrete and continuous probability distributions including the binomial, Poisson, hypergeometric, normal, uniform, lognormal, and exponential distributions. Statistical sampling, distributions of means, variances, and proportions. Hypothesis testing and confidence intervals. Prerequisite: MA 201.

ISE 391 - PROB/ENGR STAT II

Semester Hours: 3

Continuation of ISE 390 with regression analysis, analytics of variance, and nonparametric statistics. Introduction to design of engineering experiments, and computer-based solution of large-scale problems. Prerequisite: ISE 390.

ISE 399 - ISE MENTORING II

Semester Hours: 0

Yearly mentoring and advising from engineering faculty and staff. Prerequisites: ISE 299 and ISE 391.

ISE 402 - INDUSTRIAL & ORGANIZA PSY

Semester Hours: 3

Application of basic principles of learning, motivation, and perception to typical industrial and organizational problems. Senior standing. (Same as PY 402/502).

ISE 403 - HUMAN FACTORS PSYCHOLOGY

Semester Hours: 3

Study of human performance in human-technology-environment systems. Consideration of human capabilities and limitations as related to controls and displays, and the role of human cognition in decision-making and training effectiveness. Senior standing. (Same as PY 403/503).

ISE 421 - IMPROVING HEALTHCARE SYST

Semester Hours: 3

Overview of healthcare systems with emphasis on departments; functions and improving operational performance. Lean concepts and techniques are introduced as they specifically apply in a healthcare environment. Topics include workplace organization; patient and material flow; pull systems; value stream mapping; practical problem solving and root cause analysis. Multiple hands-on simulations and laboratory exercises are utilized to demonstrate the concepts.

ISE 422 - HEALTHCARE SYST ENGR

Semester Hours: 3

This course explores and introduces students to the systematic and quantitative analysis of healthcare systems. The purpose of this class is to increase the student's understanding of how to apply proven industrial and systems engineering methods to healthcare related problems. Potential topics include: healthcare, financing, health analytics, lean and six sigma as they relate to healthcare, reliability and patient safety, capacity management and healthcare logistics.

ISE 423 - INTR STATISTICAL QUALITY CONTR

Semester Hours: 3

Introduces statistical theory and techniques to control quality of manufacturing products. Provides a solid foundation in Statistical Quality Control. The Six Sigma methodology is also introduced in this course. Students can take the certification exam to earn Green Belt in Six Sigma. Prerequisite: ISE 391.

ISE 426 - DSGN & ANALY OF EXPERIM

Semester Hours: 3

Advanced topics in statistical experiments with emphasis on the design aspect. Factorial designs, including fractional replication and confounding. Includes computer laboratory exercises. (Same as ISE 526). Prerequisite: ISE 391.

ISE 428 - SYSTEMS ANALYSIS & DESIGN I

Semester Hours: 3

Philosophy and methods of industrial and non-industrial systems analysis and design. Methods of systems definition, analysis, simplification, evaluation, and optimization. Design project required. Ethics and technical writing are emphasized. Senior Standing. Prerequisites: ISE 124, ISE 321, ISE 340, ISE 391, and ISE 399 or EGR 399.

ISE 429 - SYS ANALYSIS/DESIGN II

Semester Hours: 3

Continuation of design project begun in ISE 428. Prerequisite: ISE 428.

ISE 430 - MANUF SYS & FACILITIES DESIGN

Semester Hours: 3

Modern manufacturing systems design with emphasis on facility location and plant layout. Includes classical systems, just-in-time systems, principles of integrated manufacturing systems design, and an analysis of process flow and productivity, and available space to determine facility layout. (Same as ISE 530) Prerequisites: ISE 324 or MAE 378.

ISE 433 - PROD & INVENTORY CONTROL SYS

Semester Hours: 3

Inventory models including classical optimal economic order quantity models, manufacturing resource planning systems, production scheduling, material requirements, and purchase order control. Emphasis on manufacturing system revisions, continuous process improvement, and implementation of lean principles. Prerequisite: ISE 390.

ISE 436 - INTRO TO ADDITIVE MFG

Semester Hours: 3

Overview course on additive manufacturing technologies, including 3D printing, prototyping, powder deposition, powder spraying, laminate materials manufacturing, ultrasonic consolidation, and other topics. Focus on design for manufacturing. Prerequisite: CE 211 or MAE 211.

ISE 437 - ELECTRONICS MANUF PROCESSES

Semester Hours: 3

Concepts, facilities, and technology utilized in the manufacture of electronic components and products. Includes printed wiring board fabrication and component mounting methods, automation, quality and reliability, product testing, and economic issues. Senior Standing. (Same as ISE 537).

ISE 439 - SELECTED TOPICS/ISE

Semester Hours: 1-3

ISE 447 - INTRO TO SYSTEMS SIMULATION

Semester Hours: 3

Philosophy and elements of digital, discrete-event simulation. Emphasis on modeling and analysis of stochastic systems, including probabilistic models, output analysis, and the use of simulation software. (Same as ISE 547) Prerequisites: CPE 112 and ISE 391.

ISE 480 - SYSTEMS ENGINEERING MODELING

Semester Hours: 3

The main goal of this course is to teach the student Model Based Systems Engineering (MBSE) fundamentals with application to real-world systems engineering problems. Students will learn (1) core systems engineering concepts and processes; (2) System Modeling Language (SysML) fundamentals and its use to develop and execute system models on a SysML based tool and (3) Architecture and physical model execution, simulation and integration.