

# INDUSTRIAL & SYSTEMS ENGINEERING

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## Courses

### ISE 300. Probability & Statistics for Engineers. 3 Hours

Conceptual and hands-on development of probability and statistics with software exercises. Probability problems, random variables, moments, distributions, data description and analysis, estimation (bootstrap), hypothesis testing, regression, analysis of variance, and non-parametrics. Prerequisite(s): MTH 218.

### ISE 346. Six Sigma Yellow Belt. 1.5 Hour

Six Sigma Yellow Belt.

### ISE 401. Global Regulatory and Legal Framework of Quality in Industry and Business. 3 Hours

This course is geared to students interested in broadening their understanding of the legal and regulatory framework established to ensure quality in the development of products in science and technology. This course will provide an overview of regulations for the pharmaceutical, medical device, biotech, animal health, and consumer goods industries. Students will be introduced to fundamental concepts in the regulations related to clinical trial development, management, ethics, data integrity, data security, privacy, change control and validation.

### ISE 402. Product Development and Validation in Life Sciences. 3 Hours

This course will give students an understanding of the processes used in the pharmaceutical, medical device, and pharmaceutical industries for the development of new products. Students will learn the scientific principles used in such developments that ensure that products meet quality standards. This course, the second in a series of courses which will better prepare students for employment in the quality health science areas. Instructors will explore how rigorous human factor engineering studies and clinical trials provide essential inputs into the product development process. The students will be introduced to concepts such as gap analysis, risk assessment, master plan, process characterization, installation qualification, operational qualification, measurement system analysis, repeatability and reproducibility (data collection / analysis), performance qualification/validation. In a world of innovative technology, it is critical that the students gain an understanding of computer system and software validation to ensure the quality of data generation, data storage, and digital processes used in manufacturing and products with digital components using technical and practical aspects expected in the regulated life science industries. Prerequisites: MED 401 or IET 401 or ISE 401.

### ISE 403. Risk and Failure Analysis in Quality Science. 3 Hours

This course will dive into the nuances of the life science industries related to the specific regulations that apply to consumer health products. Importantly, it is desired that students take this course while on internship at a life science company such that they can experience a failure while learning all that is required for acceptable resolution. Through the use of historical risk analysis techniques, such as FMEA, Fault Tree, and 5 Why's, students will be able to analyze a holistic set of data (in-production, across product lines, across equipment, human variability, on-market, on-stability, validation studies, change control, etc.) that will lead to scientifically justified investigations supported by evidence, and the identification of effective corrective and preventative actions (CAPA). Prerequisites: MED 401 or IET 401 or ISE 401.

### ISE 404. Engineering Concepts for Non-Engineers. 3 Hours

This is an introductory course in the mathematics, methods, and models used in engineering. As such, it provides the non-engineering student with a foundation to successfully complete graduate engineering courses required in the study of Human Factors Engineering (HFE). This is a prerequisite course for non-engineers pursuing the graduate certificate in human factors engineering and lacking the necessary skills in mathematics and statistics.

### ISE 408. Lean Management and Six Sigma. 3 Hours

This course reviews the tools used to improve business performance, such as increasing process efficiency and reducing variation and waste. The course is designed around the rigorous approach known as DMAIC and covers a wide variety of problem-solving strategies based on statistics, optimization, and project management. The course elegantly integrates Six Sigma methodologies with lean enterprise principles, such as Kaizen, poka-yoke, and pull-push systems. The topics covered in this course are used both in manufacturing and service industry including hospitals, banks, and retailers. At the end of this course, students will be equipped to help organizations achieve their operational excellence. Prerequisite(s): Junior or senior status.

### ISE 411. Problem Solving & Decision Making. 3 Hours

Study of the fundamentals of problems solving and decision making in strategic management. Provides a structured approach to solving problem in a business environment. Learn how to identify the problem, determine the causes of the problem, and develop an action plan to solve the problem. Apply the methods through case studies and team exercises.

### ISE 415. Global Supply Chain Management. 3 Hours

This course is intended to educate students on the fundamental roles played by supply chain management in the Global economy. Students will gain knowledge on the management of local and global supply chain functions and their impact on industries, customers, and suppliers. Students will learn to optimize supply chain resources to reduce cost and improve revenue. Students will learn to utilize data and contemporary tools to make informed decisions in a global supply chain environment.

### ISE 417. Legal Aspects of Engineering. 3 Hours

This is an introductory course which provides the engineer with insight into the areas of law that will impact an engineer's professional practice. Special emphasis is given to the study of intellectual property including patents, trademarks and copyrights. The course covers points to be considered in entering into contracts, legal options for setting up a business, and the engineer's legal exposure in the design of products, and legal responsibilities as an engineering employee or employer. Students will have the opportunity to participate in a mock trial through interaction with the law school and local judges.

### ISE 421. Introduction to Operations Research. 3 Hours

Introductory courses cover deterministic methods for optimization, with a focus on mathematical programming (linear, nonlinear, and integer programming) and network methods. Prerequisite(s): CPS 132; (ISE 300 or MTH 367).

### ISE 422. Topics in Operations Research. 3 Hours

This is an introductory course covering probabilistic methods for modeling and analyzing the performance of complex systems. Topics include Markov chains, queuing, forecasting, discrete event simulation, and inventory modeling. Prerequisite(s): CPS 132; ISE 300 or MTH 367.

**ISE 426. Systems Engineering Foundation. 3 Hours**

There is a need for engineering professionals to understand the benefits of following a sound systems engineering approach when designing and improving systems. This course addresses systems engineering concepts and processes, explaining activities and tools for developing system solutions to meet customer needs. Using the online Systems Engineering Body of Knowledge as the guiding topics such as systems thinking, concept of operations, requirements analysis, design, testing, and life-cycle sustainment are discussed. The design lifecycle models including the Vee model along with the different system types of product, service, enterprise, and system of system will be discussed. The interdisciplinary and cross-functional nature of systems engineering is also emphasized along with the systems engineering management planning. Prerequisites: Junior or Senior standing.

**ISE 430. Engineering Economy. 1-3 Hours**

Introduction to the models and methods of engineering economic decision analysis. Fundamental economic concepts, cost estimates, time value of money, comparison of alternatives, before- and after-tax analysis, decision making under risk and uncertainty, break-even analysis, and linear programming models. Prerequisite(s): MTH 218.

**ISE 435. Human Factors. 3 Hours**

Methods to improve the interface between the human and their environment. Human characteristics are studied to determine the best way to design the task, product, work station, or other environmental features to accommodate the human. Prerequisite(s): (Junior or senior status) or permission of instructor.

**ISE 438. Sustainable Manufacturing & Product Design. 3 Hours**

Design for the environment, sustainable manufacturing processes, and business practices to support these topics are developed. Prerequisite(s): Permission of instructor.

**ISE 441. Production Engineering. 3 Hours**

Analysis and design of systems of personnel and machines for production processes. Forecasting, scheduling, production and inventory control. Prerequisite(s): CPS 132; (ISE 300 or MTH 367).

**ISE 455. System Dynamics. 3 Hours**

Basic concepts of structure in dynamic systems; starting point for systems approach to dynamic systems in multidisciplinary courses in urban, ecological, corporate, or other social systems.

**ISE 460. Quality Assurance. 3 Hours**

Principles of statistical quality control. Application of attributes and variable acceptance sampling plans; control charts; design of quality control systems and procedures. Prerequisite(s): CPS 132; (ISE 300 or MTH 367).

**ISE 461. Design & Analysis of Experiments. 3 Hours**

Application of statistical methods to engineering experimentation; analysis of experimental response through statistical methods. Prerequisite(s): CPS 132; (ISE 300 or MTH 367).

**ISE 465. Reliability & Maintainability. 3 Hours**

Application of probability and statistical theory to engineering reliability design and analysis; reliability of components and assemblies; design of systems for reliability and maintainability. Prerequisite(s): CPS 132; (ISE 300 or MTH 367).

**ISE 483. Leadership and Engagement for Engineering Diversity. 3 Hours**

This course will provide students with an awareness of the barriers, biases and challenges to diversity in engineering, provide strategies that can be used to improve satisfaction in the engineering workplace and in academia; and provide principles and practices that can enhance the students' leadership skills for the engineering workplace. Prerequisites: Junior Status.

**ISE 487. Leading in Technical Environments. 3 Hours**

Understanding and utilizing the keys to leading in technical organizations represents a distinct advantage to individuals and the institutions they serve. Students will be exposed to the underpinning of leadership in engineering environments including tenets, theories, debates, strategies, and innovative techniques. Opportunities to interact with leaders from government and industry will be provided. Practical application skills will be developed.

**ISE 499. Special Problems in Systems. 1-6 Hours**

Particular assignments to be arranged and approved.