

INDUSTRIAL AND SYSTEMS ENGR (ISEN)

ISEN 1560 Principles of Industrial & Systems Engineering 3 s.h.
An introduction to creative thought processes and analytical tools that are used to develop human usable systems within industrial engineering.
Prereq.: ENGR 1550.

ISEN 2610 Engineering Statistics 3 s.h.
Applications of data collection and analysis techniques to engineering problems. Techniques for data structuring, data modeling, parameter estimation, and design of experiments utilizing engineering data.
Prereq.: MATH 1571 or MATH 1571H or MATH 1585H, ENGR 1550 or ENGR 1550H.

ISEN 2616 Systems Analysis and Design 3 s.h.
Analysis and design of systems. Decomposition of large systems into subsystems. Analysis, modeling, and design of subsystems. Integration of subsystems.
Prereq.: MATH 1571 or MATH 1571H or MATH 1585H.
Coreq.: ENGR 1560 or ENGR 1560H.

ISEN 2620 IE Applied Statistics 3 s.h.
The course is an introduction to the basic concepts and methods of applied statistics.
The course is an introduction to the basic concepts and methods of applied statistics. **Prereq.:** ISEN 2610.

ISEN 2624 Engineering Economy 3 s.h.
The analysis and evaluation of factors that affect the economic success of engineering projects. Topics include interest, depreciation, cost classification, comparison of alternatives, make-buy decisions, replacement models and after-tax analysis.
Prereq.: MATH 1571 or MATH 1571H or MATH 1585H.
Coreq.: ENGR 1560 or ENGR 1560H.

ISEN 3720 Statistical Quality Control 3 s.h.
Concepts of data-based quality control techniques. Intermediate design of experiments as an off-line quality control technique using ANOVA techniques. Process control chart construction and applications as on-line quality control techniques. Basics of acceptance sampling systems and standards.
Prereq.: ISEN 2610 or equivalent.

ISEN 3723 Manufacturing Processes 3 s.h.
Introduction to properties and uses of engineering materials. Introduction to mechanical testing methods, metrology, tolerances, testing and inspection; semi-finished product manufacturing; macro-processing (forming, casting, powder metallurgy, metal working, composite fabrication); joining; nontraditional manufacturing processes; and surface processing.
Prereq.: MATH 1572, MECH 1560.

ISEN 3723L Manufacturing Processes Lab 1 s.h.
This lab is an introduction to a variety of manufacturing processes. This course divided into formative, subtractive, and additive manufacturing concepts and practices through a series of introductory tutorial labs and a term-long design and fabrication project. Processes covered include CAD design, metallurgy, metrology, 3D printing, casting, forming, welding, and inspection. A selection of additional processes will be available should students upon availability. These include investment casting, injection molding, and destructive and non-destructive tests.
Prereq.: MECH 1560.
Prereq. or Coreq.: ISEN 3723 or MFG 3723.

ISEN 3727 Simulation of Industrial Engineering Systems 3 s.h.
Techniques for the digital simulation of industrial engineering systems which can be represented via discrete event models. The generation of random variables, shaping of probability distributions, model structuring, model verification, and the simulation of inventory, queuing, and quality control systems in a high-level structured programming language. A special-purpose simulation language for expanding the class of problems which can be economically modeled.
Prereq.: ISEN 2610, ISEN 2616.

ISEN 3730 Materials Handling and Facilities Planning 3 s.h.
The course focuses on operational facility planning through comprehensive layout design. Considerations include product flow, space and activity relationships, workforce requirements, and material handling. Topics include flow analysis, facility location, group technology and layout, just-in-time, material handling equipment such as AGV, motion and time studies, and work sampling.
Prereq.: ISEN 2616.

ISEN 3736 Methods Engineering 2 s.h.
Techniques for analysis of task performance, the use of process charts, and various methods of work simplification, human-machine relation analysis. Theory and practice of time study and other methods of measuring and establishing performance level and productivity.
Prereq.: ISEN 3710 or equivalent.

ISEN 3736L Methods Engineering Laboratory 1 s.h.
Practice in analyzing and recording tasks. Determination of time standards and productivity requirements. Analysis and evaluation of actual plant operations. Taken concurrently with ISEN 3736. Three hours laboratory per week.

ISEN 3740 Prod Planning and Supply Chain 3 s.h.
This course introduces the issues underlying the design and operation of traditional and current supply chains, focusing on the logistics of the material and information movement inside manufacturing and service networks.
Prereq.: ISEN 2610 and ISEN 3730.
Prereq. or Coreq.: ISEN 2616.

ISEN 3745 Accounting for Engineers 3 s.h.
Review of labor and material costing systems. Introduction to cost accounting systems. Practice in development of forecasting and estimating systems. Process, operation and product costing systems. Elements of financial accounting systems that affect engineering decisions.
Prereq.: ISEN 3724 or equivalent.

ISEN 4810 Special Topics 3 s.h.
Special topics and new developments in Industrial Engineering. Subject matter, credit hours, and special prerequisites to be announced in advance of each offering.
Prereq.: senior standing in Industrial Engineering or consent of instructor.

ISEN 4810A ST Adv Manufacturing Process 3 s.h.
Special topics and new developments in Industrial Engineering. Subject matter, credit hours, and special prerequisites to be announced in advance of each offering. 3 s.h. . .
Prereq.: senior standing in Industrial Engineering or consent of instructor.

ISEN 4821 Capstone Design 1 3 s.h.
The application of engineering techniques to the analysis, design, layout, and justification of manufacturing and service facilities. Subjects covered include, equipment selection, process flow, and material flow. The system design involves field investigation, acquisition and analysis of data, use of computer-aided facilities planning and design software, preparation of drawings, and writing a final report.
Prereq.: ISEN 3723, ISEN 3720, ISEN 3727, and DATX 5801.
Coreq.: ISEN 5801.
Gen Ed: Capstone.

ISEN 4822 Capstone Design 2 3 s.h.

This course will focus on project management and completing the two-semester design project with industry. Project analyses will be highlighted by both written and oral communication of design outcomes.

Prereq.: ISEN 4821 (C or better).

Gen Ed: Capstone.

ISEN 5801 Operations Research 1 3 s.h.

Formulation and solution of engineering problems using linear programming. Model formulation, the primal, dual, and transportation simplex methods, duality theory, and sensitivity analysis.

Prereq.: MATH 2673.

ISEN 5811L Manufacturing Practices I Laboratory 1 s.h.

Experimental analysis of manufacturing processes. Process control and data acquisition. Experimental design applied to processes including polymer processes, casting, machining, and joining. Three hours laboratory.

Prereq. or Coreq.: ISEN 3723.

ISEN 5812L Manufacturing Practices 2 Laboratory 1 s.h.

Experimental analysis of advanced manufacturing techniques. Advanced sensing and controlling technologies. Real-time monitoring, metrology, and data acquisition. Numerically controlled (NC) machines and programming. Net-shape and additive manufacturing.

Prereq. or Coreq.: ISEN 5823.

ISEN 5820 Advanced Quality for Engineers 3 s.h.

Applications and practices of quality control in industry. Engineering and administrative aspects of quality control programs, process control, and acceptance sampling. Application of quantitative methods to the design and evaluation of engineered products, processes, and systems.

Prereq.: ISEN 3720.

ISEN 5823 Automation 3 s.h.

Principles and applications of sensing, actuation and control. Emphasis on hydraulic and pneumatic systems. Industrial process controllers, sensors and machine vision. Design and cost considerations for industrial automation applications.

Prereq.: MECH 2641, ECEN 2614 or consent of instructor.

ISEN 5825 Advanced Engineering Economy 3 s.h.

An extension of the topics in engineering economy. Analysis of rationale and norm of decision making, risk and uncertainty models, utility theory, measurement of productivity, and advanced project comparison methods.

Prereq.: ISEN 2624.

ISEN 5830 Human Factors Engineering 3 s.h.

Various aspects of human factors in the design of human-machine systems and environments. Study of human sensory, perceptual, mental, psychomotor, and other characteristics; techniques of measuring human capabilities, limitations, safety, comfort, and productivity.

Prereq.: MATH 2673.

ISEN 5850 Operations Research 2 3 s.h.

Formulation and solution of industrial engineering problems using operational research models. Topics include queuing models and the specialization of linear models to equipment replacement, project planning, assignment, and transshipment problems.

Prereq.: ISEN 5801.

ISEN 5880 Management of Technology 3 s.h.

The course discusses major topics in management of technology and innovations. Dynamics of technology innovation, sources of technology innovations, corporate technology strategy, collaboration and intellectual property, structures and process for innovations, idea generation, commercialization of technology and innovations, and market entry.

Prereq.: Senior standing or consent of instructor.

ISEN 5881 Competitive Manufacturing Management 3 s.h.

Basic principles of manufacturing competitiveness. The role of engineers in promoting competitiveness. Discussion of new technologies used in modern manufacturing management including, continuous improvement, waste elimination, JIT, lean production systems, setup time reduction, equipment maintenance/improvement, total quality management, and supply chain management.

Prereq.: ISEN 3723 or consent of instructor.

ISEN 6901 Optimization Techniques 3 s.h.

A study of the theory of optimization and its application to problems from several engineering disciplines. The principles will be applied to constrained and unconstrained engineering problems. Algorithms will be developed for solving optimization problems, which can be formulated as linear, nonlinear, integer, or dynamic programming models.

ISEN 6902 Digital Simulation 3 s.h.

A study of simulation methods using digital computers, random number generation, Monte Carlo techniques, queuing models, and analysis of simulation output. The student will be provided the opportunity to simulate moderately complex systems on digital computers. Primary emphasis will be on models of technical, scientific, and economic systems.

ISEN 6905 Applied Statistics for Design, Quality, and Productivity 3 s.h.

Review of probability and statistics, uncertainty and decision making, statistical inference, and analyzing sources of variation. Risk and reliability, risk assessment, robust and quality design, regression analysis, and analysis of variance. Design of experiments, single-factor and multifactor experiments, design of experiments for product characteristics, process characteristics, and process optimization. General statistical process control, special charts and sampling techniques for control, monitoring, and auditing quality. Economic issues in process/quality control.

Prereq.: ISEN 3710 Engineering Statistics or equivalent.

ISEN 6906 Supply Chain Engineering 3 s.h.

In an expanding global economy, efficient and responsive supply chains are critical to business success. This course explores key aspects of supply chain engineering with an emphasis on mathematical approaches to supply chain analysis. Topics include demand forecasting, inventory modeling and control, facility location, capacity planning, transportation, warehousing, scheduling, material requirements planning and procurement.

Prereq.: ISEN 3710/ISEN 6921 and consent of instructor.

ISEN 6908 Logistics Engineering and Mgt 3 s.h.

Study of logistics from a systems engineering perspective. Covers design of systems for supportability and serviceability, the production and effective distribution of systems for customer use, and the sustaining maintenance and support of systems throughout their period of utilization.

Prereq.: ISEN 3720, ISEN 5801 or consent of the instructor.

ISEN 6910 Design and Analysis Experiment 3 s.h.

For professionals from business and industry, and students. Specific topics will be announced each time the workshop is offered. Credit hours based on frequency and duration of workshop meetings.

ISEN 6912 Network Flows 3 s.h.

Flow problems on networks. Maximum flow minimum cut theorem. Labeling algorithms. Circulation and feasibility theorems. Sensitivity analysis. Incidence matrices. Shortest routes. Minimum cost flows, out-of-kilter algorithm. Critical path networks, project cost curves. Multi-commodity flow problem, billows. Matching problems in graph theory.

Prereq.: ISEN 5801 or MATH 3720.

ISEN 6920 Project Management 3 s.h.

Methods for planning, organizing, scheduling, supporting, and controlling projects. Network techniques, including CPM, PERT, and time-cost trade-off analysis. Techniques for the estimation of time, manpower, and other resource requirements of the projects, including economic and statistical analysis, forecasting, learning curves, and line balancing. Management of time and other resources involved. Case studies and utilization of computer resources for the analysis and presentation of projects.

Prereq.: graduate standing in STEM college.

ISEN 6921 Engineering Statistics 3 s.h.

Development and application of stochastic models of engineering systems. Elementary probability models applied to decision making under uncertainty. Development and use of theoretical probability distributions for describing stochastic systems. Models for point and confidence interval estimation and models for correlation analysis applied to engineering problems.

Prereq.: ISEN 3710 or equivalent.

ISEN 6930 Microcomputer Models for Deterministic Engineering Systems 3 s.h.

Microcomputer model development, implementation, evaluation, and application for deterministic engineering systems. Recognition of engineering systems amenable to analysis as deterministic microcomputer models. Determination of model structure, identification of model parameters, verification of model validity, exercising the model, and interpretation of results.

ISEN 6935 Decision Analysis for Engineering 3 s.h.

Review of probability and statistics, subjective probability, probability models, using data, Monte Carlo simulation, and value of information. Introduction to decision analysis, elements of decision problems, structuring decisions, making choices, creativity, and decision making. Risk attitudes, utility axioms, paradoxes, and conflicting objectives.

Prereq.: ISEN 3710 Engineering Statistics or equivalent, or permission of instructor.

ISEN 6939 Operations & Supply Chain Strategy 3 s.h.

This course explores manufacturing and service processes for transforming resources into technology-based products. It will cover strategies and processes for moving information and materials through the supply chain, strategies to support overall firm objectives, product development programs and capacity utilization requirements. The course will also explore manufacturing for flow design and facility layout; six sigma quality and statistical process control, lean supply chains, logistics, distribution and global sourcing; ERP, and inventory management.

Prereq.: ISEN 3710 or equivalent.

ISEN 6970 Advanced Manufacturing Processes 1 3 s.h.

Advanced manufacturing processes for metallic materials. Included are continuous casting, powder techniques, fluidized bed reactors, and directional solidification.

ISEN 6971 Advanced Manufacturing Processes 2 3 s.h.

Advanced manufacturing processes for nonmetallic materials. Included are sintering, slip casting, plastic forming techniques, and extrusion of nonplastic materials.

ISEN 6990 Special Topics 3 s.h.

Special topics in industrial/manufacturing systems engineering covering areas not otherwise available. Topics are selected by the faculty from fields of current research interest or special emphasis and may vary from semester to semester. May be repeated for a maximum of six semester hours.

ISEN 6992 Graduate Projects 3 s.h.

Analysis, design, research, or other independent investigation on projects selected with the advice and approval of the student's graduate committee.

Prereq.: Permission of instructor.

ISEN 6999 Thesis 1-6 s.h.

Hours arranged. May be repeated.