INDUSTRIAL ENGINEERING

I E 451. Engineering Economy 3 cr.
Discounted cash flows, economics of project, contract and specifications as related to engineering design. Same as CH E 451.

I E 453. Leadership and Motivation 3 cr.
Theories of leadership and motivation. Motivational programs for complex organizations. Relationships between organizational power, authority, and management styles. Prerequisite: MGT 309 or consent of instructor. Same as MGT 453.

I E 460. Evaluation of Engineering Data 3 cr.
Analysis of engineering systems possessing variability, employing regression, analysis of variance, distribution theory, and experimental design methods. Prerequisite: I E 311 or equivalent.

I E 466. Reliability 3 cr.
Application of statistical theory to engineering reliability estimation, reliability improvement, and the analysis of reliability test data. Prerequisite: I E 311 or equivalent.

I E 467. Discrete-Event Simulation Modeling 4 cr.
Basic modeling concepts, organizations of simulations, input data analysis, random variate generation, simulation design and analysis, model validation, output analysis, and management of simulations. Differentiated graduate assignments. Prerequisite: I E 311 or equivalent. Same as I E 567.

I E 468. Advanced Discrete-Event Simulation Applications 3 cr.
Semester long project involving development and application of advanced simulation skills. Prerequisite: I E 467. Same as I E 568.

I E 477. Ergonomics in Manufacturing Systems 3 cr.
Ergonomic analysis applied to manufacturing engineering environment. Covers: task analysis, workplace assessment and design, computer-integrated manufacturing, and legal/regulatory issues in manufacturing task and workplace design.

I E 478. Facilities Planning and Design 3 cr.
Plant location methods, total process analysis, process integration, materials handling analysis, and traditional and computerized plant layout methodologies. Prerequisite: I E 316. Corequisite: I E 424.

I E 479. Integrated Manufacturing 3 cr.
Automated process planning as a link between CAD and CAM. Emphasis on information flows and modeling concepts, design data analysis, feature recognition and generative planning. Prerequisite: knowledge of a programming language or consent of instructor. Same as I E 579.

I E 480. Senior Design 3 cr. (2+3P)
Multi-disciplinary team design project for external clients. Involves semester long activities including major design report and presentation. Prerequisites: senior standing, I E 467.

I E 490. Selected Topics 1-3 cr.
Prerequisite: consent of the head of the department. May be repeated for a maximum of 9 credits.

I E 505. Directed Readings 1-3 cr.
Prerequisite: consent of the head of the department. May be repeated for a maximum total of 6 credits.

I E 511. Survey of Industrial Engineering 3 cr.
A project-based course covering methods of engineering, plant layout, production and inventory control, and economic analysis.

I E 515. Stochastic Processes Modeling 3 cr.
Introduction to the use of stochastic processes in the modeling of physical and natural systems. Use of generating functions, conditional probability and expectation, Poisson processes, random walk models, Markov chains, branching processes, Markov processes, and queuing processes in an applied setting. Prerequisites: I E 311 or equivalent; and MATH 392 or equivalent.

I E 522. Queuing Systems 3 cr.
Elements and classification of queuing systems, single server models, multi-server models, cost analysis and applications. Prerequisite: I E 311 or equivalent.

I E 523. Advanced Engineering Economy 3 cr.
Theoretical basis for engineering economy methods, problems of cost estimation, replacement, nonmonetary factors, and feasibility studies. Same as C E 523.

I E 524. Advanced Production and Inventory Control 3 cr.
Organization and functions of manufacturing planning and control systems including forecasting, MRP, capacity planning, JIT systems, scheduling and inventory control. Same as I E 424 with differentiated assignments.

I E 525. Systems Synthesis and Design 3 cr.
Examination of the production management complex in terms of its components and the synthesis of these components into an effective operating unit. Development of input-output models representing the basis structure of all production activities.

I E 530. Environmental Management Seminar 1 cr.
Same as C E 530, E E 530, CH E 530.

I E 531. Fundamentals of Operations Research Techniques 3 cr.
Key concepts, terminology, paradigms, and methods of operations research: Linear programming including assignment and transportation algorithms; stochastic analysis, including inventory control and queuing systems; general approaches, including goal, integer, nonlinear and dynamic programming.

I E 533. Linear Programming 3 cr.
Linear programming problem formulation, simplex algorithm, theory of linear programming, duality, revised simplex algorithm, and sensitivity analysis.

I E 534. Nonlinear Programming 3 cr.
Theoretical and computational methods to solve optimization problems in engineering, statistics, economics, and operations research. Topics include convexity, optimality conditions, Newton's method, Lagrange multipliers, search algorithms for unconstrained and constrained problems, as well as barrier and penalty methods. Prerequisite: MATH 192G or equivalent

I E 535. Discrete Optimization 3 cr.
Combinatorial Optimization problems using both integer programming and graph theoretic approaches. Emphasis on modeling and computational algorithms.

I E 537. Large Scale Systems Engineering 3 cr.
Systems engineering approaches to large-scale complex technological and societal problems. Concepts of interaction and structural graphs, matrices, delta, and Gantt charts. The hall matrix approach, structural concepts, reachability matrices, and cross impact-analysis, modeling and decision making.

I E 539. Fundamentals of Transportation and Routing in Logistics 3 cr.
Introduction to the conceptual, methodological, and mathematical foundations of transportation and routing problems in logistics system. Emphasis on mathematical modeling and computational algorithms.

I E 545. Characterizing Time-Dependent Engineering Data 3 cr.
Theory and techniques employed in the characterization of stochastic processes commonly found in engineering applications. Distribution models include exponential, gamma, Weibull, and extreme value. Design and analysis of experiments involving complete and censored data and elevated stress. Analytical techniques include parametric, nonparametric, and graphical approaches with emphasis on modern computer tools. Exact and approximate maximum-likelihood techniques are stressed. Prerequisite: I E 311 or equivalent.

I E 550. Environmental Management Seminar II 1 cr.
Survey of practical and new developments in hazardous and radioactive waste management provided through a series of guest lectures and reports of ongoing research. Same as WERC 550.

I E 561. Advanced Safety Engineering 3 cr.
Regulation as well as qualitative, and quantitative methods to achieve and maintain safety in the workplace. Includes liability, worker s compensation, OSHA, hazard control, safety assessment, cost justification, and system analysis. Prerequisite: graduate status in engineering.

I E 563. Topics in Engineering Administration 3 cr.
Study of qualitative and quantitative aspects. Consideration given to philosophical, psychological, political and social implications of engineering administrative decisions.

I E 567. Design and Implementation of Discrete-Event Simulation 3 cr.
Basic modeling concepts, organizations of simulations, input data analysis, random variate generation, simulation design and analysis, model validation, output analysis, and management of simulations. Taught with I E 467 with differentiated assignments for graduate students.