I E-INDUSTRIAL ENGINEERING (I E)

I E 110. Industrial Engineering Orientation
1 Credit
Introduction to Industrial Engineering Department, Facility Research and Resources. Overview of where industrial engineering fits into larger view of all of engineering. Introduction to university resources for industrial engineering students. Restricted to majors.

I E 151. Computational Methods in Industrial Engineering
3 Credits
History, social implications, and application of computers and an introduction to computer programming, word processing, and database management systems. Satisfies General Education computer science requirement. 
Prerequisite: MATH 121G.

I E 152. Introduction to Industrial Engineering
2 Credits
Historical development of industrial engineering, present practice and trends.
Prerequisite: MATH 120.

I E 200. Special Problems-Sophomore
1-3 Credits
Directed individual projects. May be repeated for a total of 3 credits.
Prerequisite: consent of faculty member.

I E 217. Manufacturing Processes
2 Credits
Manufacturing methods and industrial processes which include casting, forming and machining. Crosslisted with: E T 217
Prerequisite(s): MATH 121G.
Corequisite(s): I E 217L.

I E 217 L. Manufacturing Processes Laboratory
1 Credit
Laboratory associated with I E 217.

I E 300. Special Problems-Junior
1-3 Credits
Directed individual projects. May be repeated for a total of 3 credits.
Prerequisite: consent of faculty member.

I E 311. Engineering Data Analysis
3 Credits
Methodology and techniques associated with identifying and analyzing industrial data. May be repeated up to 3 credits. C- or better in I E 151, C S 110, or equivalent.
Prerequisite(s): C- or better in MATH 192G.

I E 316. Methods Engineering
3 Credits (2+3P)
Methods analysis and design. Work measurement techniques. Job evaluation and wage incentive methods.
Prerequisite: I E 311.

I E 330. Environmental Management Seminar I
1 Credit
Survey of practical and new developments in hazardous and radioactive waste management provided through a series of guest lectures and reports of ongoing research. Restricted to: Main campus only. Crosslisted with: C E 330, CH E 330, E E 330, E S 330, E T 330, M E 330 and WERC 330

I E 351. Applied Problem Solving in Industrial Engineering
3 Credits
Application of computational techniques to engineering problems including the use of commercial programs in statistics and applied mathematics. Restricted to majors.
Corequisite: I E 311.

I E 365. Quality Control
3 Credits
Statistical analysis of quality in manufacturing. Acceptance sampling and control charts.
Prerequisite: I E 311 or equivalent.

I E 375. Manufacturing Processes II
3 Credits
Review of basic manufacturing processes. Advanced topics in casting, forming, machining and joining; major process parameters; economics of processes.
Prerequisite: I E 217 or E T 217.

I E 381. Technology Ventures
3 Credits
This course looks at how new technology ventures are formed at the individual entrepreneur and corporate levels. It covers the development of science and engineering based ventures from ideas through creating customer value. This is the first course in the Entrepreneurship Minor. The roles of science and engineering specialists in the creation of customer value are defined in preparation for development of technology-based enterprises.

I E 382. Business for the Practicing Engineer
3 Credits
Business tools and skills, including technology commercialization, patent applications, preparing a technology-oriented business plan, reading and constructing financial documents, modeling and understanding markets, e-commerce, QFD, concurrent engineering, engineer's role in the global economy, and engineer's impact on product design and cost.
Prerequisite: engineering major, junior level or above.

I E 400. Undergraduate Research
1-3 Credits
May be repeated for a maximum of 6 credits.
Prerequisite: consent of faculty member.

I E 411. Occupational Safety
3 Credits
Practical methods to improve safety in the workplace. Topics include OSHA and other regulations, hazard recognition, assessment and control, industry standards, risk assessment and safety management. Material is applicable to a variety of workplace settings. This course is intended for College of Engineering students who have completed their lower-division requirements in mathematics, engineering, technology, and basic science. Same as I E 561 with differential assignments. Prerequisite: Junior standing

I E 413. Engineering Operations Research I
3 Credits
Deterministic operations research modeling including linear and integer programming.
Prerequisite: MATH 192G.

I E 423. Engineering Operations Research II
3 Credits
Probabilistic operations research modeling, including queuing systems and their optimization; Markov chains.
Prerequisite: I E 311.
I E 424. Manufacturing Systems
3 Credits
Organization and functions of manufacturing planning and control systems including forecasting, MRP, capacity planning, JIT systems, scheduling, and inventory control.
Prerequisite: I E 311.

I E 451. Engineering Economy
3 Credits
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 Credits
Theories of leadership and motivation. Motivational programs for complex organizations. Relationships between organizational power, authority, and management styles. Same as MGT 453.
Prerequisite: MGT 309 or consent of instructor.

I E 460. Evaluation of Engineering Data
3 Credits
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 Credits
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 Credits
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. Same as I E 424 with differentiated assignments.
Prerequisite: I E 311 or equivalent.

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

I E 480. Senior Design
3 Credits (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 Credits
May be repeated for a maximum of 9 credits.
Prerequisite: consent of the head of the department.

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

I E 522. Queuing Systems
3 Credits
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 Credits
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 Credits
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 Credits
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 Credit
Same as C E 530, I E 530, CH E 530.

3 Credits
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 Credits
Linear programming problem formulation, simplex algorithm, theory of linear programming, duality, revised simplex algorithm, and sensitivity analysis.

I E 534. Nonlinear Programming
3 Credits
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 Credits
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 Credits
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 Credits
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 Credits
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 561. Advanced Safety Engineering
3 Credits
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 Credits
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 Credits
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.

I E 571. Advanced Quality Control
3 Credits
Advanced topics in quality control and design of experiments for improvement of quality.
Prerequisite: I E 311 or equivalent.

I E 575. Advanced Manufacturing Processes
3 Credits
Covers major process parameters in casting, forming, machining, and joining. Process economics and selection of processes design and interactions.
Prerequisite: graduate standing.

I E 590. Selected Topics
1-3 Credits
May be repeated for a maximum of 9 credits.
Prerequisite: consent of the head of the department.

I E 598. Special Research Programs
1-3 Credits
Individual analytical or experimental investigations. May be repeated for a maximum total of 6 credits.
Prerequisite: consent of instructor.

I E 599. Master's Thesis
15 Credits
Thesis.

I E 610. Topics in Operations Research
3 Credits
Selected topics of current interest, to be designated by subtitle. May be repeated for a maximum of 6 credits.

I E 620. Topics in Computer Modeling
3 Credits
Selected topics of current interest, to be designated by subtitle. May be repeated for a maximum of 6 credits.

I E 630. Topics in Engineering Management
3 Credits
Selected topics of current interest, to be designated by subtitle. May be repeated for a maximum of 6 credits.

I E 690. Selected Topics
1-15 Credits
May be repeated.
Prerequisite: consent of department head.

I E 700. Doctoral Dissertation
15 Credits
Dissertation.