

Graduate Course Descriptions

IND E 508 Stochastic Processes in Engineering (3)

Non-measure theoretic introduction to stochastic processes. Topics include Poisson processes, renewal processes, Markov and semi-Markov processes, Brownian motion, and martingales, with applications to problems in queuing, supply chain management, signal processing, control, and communications. Prerequisite: E E 505. Offered: jointly with E E 508; W.

IND E 512 Introduction to Optimization Models (3)

Presents optimization models that are used in applications such as industrial engineering, production, transportation, financial investment, healthcare systems, and environmental ecology. Problems span a variety of continuous and integer optimization models, with discussion of multi-objectives and incorporating randomness into optimization models.

IND E 513 Linear Optimization Models in Engineering (3)

Advanced formulation techniques to expand applications of linear programming to large-scale models. Appreciation of role of optimization models in engineering applications through introduction of techniques such as decomposition. Individual engineering projects. Prerequisite: IND E 410 and MATH 308 or permission of instructor.

IND E 515 Fundamentals of Optimization (5)

Maximization and minimization of functions of finitely many variables subject to constraints. Basic problem types and examples of applications; linear, convex, smooth, and nonsmooth programming. Optimality conditions. Saddlepoints and dual problems. Penalties, decomposition. Overview of computational approaches. Prerequisite: linear algebra and advanced calculus. Offered: jointly with AMATH 515/MATH 515.

IND E 516 Applications of Optimization in Engineering Design (3)

Discussion of issues arising in applications of optimization to engineering design. Emphasis on formulating problems and selecting appropriate solution techniques. Random search methods for problems otherwise computationally intractable. Individual projects in engineering optimal design. Prerequisite: AMATH 515/MATH 515/IND E 515 and MATH 328 or permission of instructor. Instructors: Zabinsky

IND E 519 Healthcare Modeling and Decision Making (3)

Applications of operations research in healthcare. Introduction to a variety of modeling techniques including decision analysis, cost-effectiveness analysis, Markov models, Markov decision processes, dynamic programming, simulation, queuing, scheduling, machine learning and their applications in healthcare management and medical decision making.

IND E 521 Quality Control in Manufacturing (3)

Design of quality control systems in manufacturing. Use of advanced statistical process controls, sampling inspection techniques, process capability, and other statistical tools. Also includes vendor sourcing and control tools, methods for establishing specifications and tolerances, quality function deployment, and other quality control techniques.

IND E 524 Robust Design and Quality Engineering (3)

Introduction to robust design and quality engineering. Applications of design of experiments for product and process design optimization. Experimental design using orthogonal arrays and linear graphs. System models using Chebyshev's orthogonal polynomials. Robustness in design and quality improvement for complex systems including Taguchi methods for quality engineering. Prerequisite: IND E 316 or equivalent. Instructors: Kapur

IND E 526 Reliability in Product Design and Testing (3)

Product assurance including reliability and quality engineering. Reliability design, measurement, and optimization. Advanced topics in probabilistic design. Design of reliability test plans and analysis of test data. Design of reliability programs and their management.

IND E 535 Engineering Simulation (3)

Advanced applications of discrete event, continuous, and combined discrete-continuous simulation modeling, detailed examination of fundamental computer programming concepts underlying the design and development of simulation languages, variance reduction techniques, and output analysis for various engineering, service systems, and manufacturing applications. Prerequisite: IND E 424 or equivalent.

IND E 537 Introduction to Manufacturing Systems (3)

Description of manufacturing systems. Includes discussion of current trends in manufacturing, especially lean principles. Introduces process flow analysis, manufacturing organizations including job-shop, assembly lines, and group technology, manufacturing inventory philosophies (just-in-time, MRP, OPT), work environment, and work simplification. Offered: jointly with ENV H 537; A.

IND E 543 Virtual Interface Technology (3)

Explores advanced concepts and technologies for interfacing humans to complex machines, with focus on virtual interfaces. Interface design principles reviewed from psychological and technological perspectives. Hardware, software, and mindware aspects of virtual interfaces investigated. Applications postulated and designed. Prerequisite: graduate standing in College of Engineering or permission of instructor. Instructors: Furness

IND E 544 Virtual World Development (3)

Software implementation, physiological and cognitive constraints, and the mathematics and philosophy of inclusion. Development of software tools, editing and interaction techniques, disposition of virtual world entities, nature of space, situated knowledge, divergent models for multiple participants, experiential mathematics, cyberspace. Cultural, legal, moral, ethical issues. Prerequisite: IND E 543 or permission of instructor. Instructors: Furness

IND E 545 User-Centered Design (4)

Explores the user-centered design paradigm from a broad perspective, emphasizing how user research and prototype assessment can be integrated into different phases of the design process. Students learn to think like a user-centered designer and carry out activities that are key to user-centered design. Offered: jointly with HCDE 518; W.

IND E 546 Analytical Methods in Transportation I (3)

Application of analytical and statistical methods to issues in transportation and driving. Analysis of probability distributions that describe variables. Development of statistical models for predicting transportation phenomena. Elementary sampling theory hypothesis testing, regression analysis, time series analysis, applied to transportation data. Prerequisite: either IND E 315, MATH 390/STAT 390, or equivalent. Instructors: Boyle Offered: jointly with CEE 584; W.

IND E 549 Human Factors in Engineering Design (3)

Engineering considerations of the abilities and limitations of the human aspect in the design of operational systems and components. Functional, psychological, physiological, and environmental considerations. Covers traditional human factors material with a project-based focus/emphasis. Offered: jointly with ENV H 549; Sp.

IND E 564 Recognition of Health and Safety Problems in Industry (2)

Develops skills in occupational health and safety hazard recognition in a variety of important Northwest industries. Focuses on process understanding and hazard recognition skills during walk-through inspections of several local facilities, stressing a multidisciplinary approach. Offered: jointly with ENV H 564; A.

IND E 566 Introduction to Ergonomics (3)

Basic principles of ergonomics in work environment applied to problems of worker and management. Topics include measurement of physical work capacity, problems of fatigue and heat stress, applied biomechanics, worker-machine

interactions and communication, design of displays and controls. Prerequisite: basic human physiology or permission of instructor. Offered: jointly with ENV H 566/NSG 508; W.

IND E 567 Applied Occupational Health and Safety (3)

Application of occupational safety and health principles. Student teams perform evaluations, assess production methods/processes and exposures, health and safety procedures and programs, and develop engineering and administrative controls. Students perform on a consulting project with a local company including budgeting, project reporting, and presentation. Offered: jointly with ENV H 559/NSG 505; Sp, even years.

IND E 569 Occupational Biomechanics (4)

Lectures and laboratories address human occupational biomechanical and physiological limits and measurement, analysis, and modeling techniques that are used by ergonomists for design of safe, healthful, and productive physical work. Prerequisite: ENV H 566 or permission of instructor. Offered: jointly with ENV H 569; Sp, even years.

IND E 570 Supply Chain Systems (3)

Develops concepts related to the design, evaluation, and performance of supply chain systems through an exploration of contemporary practice and research, focusing on current issues, analytical frameworks, and case studies. Prerequisite: IND E 315 or equivalent. Instructors: Beamon

IND E 575 Inventory Management (5)

Examines modeling and analysis of inventory flow in supply chains in order to improve service and decrease cost. Covers tools and methods for making long-term and short-term inventory related decisions for items with different demand and supply characteristics. Topics include forecasting, production planning, deterministic and stochastic inventory models, and supply management. Offered: jointly with SCTL 503; W.

IND E 576 Facility Design and Operations Management (5)

Introduces the fundamental principles, concepts, and procedures for designing and managing supply-chain networks of factories, suppliers, warehouses, and distribution centers. Students learn to use engineering systems design methodologies and software to construct appropriately detailed quantitative models, evaluate alternative supply network configurations, and assess the management of their operations. Offered: jointly with SCTL 504; Sp.

IND E 581 Navigating the Business Environment (3)

Covers the fundamentals of finance and accounting, marketing, strategy, and business communication as well as the skill of identifying and influencing the key decision maker. Offered: A.

IND E 582 Technical Leadership (3)

Includes how to motivate, reach consensus, work virtually, recruit, and work with engineers from different cultures. Offered: W.

IND E 583 Decision Analysis in Engineering (3)

Examines multi-criteria decision tools involving qualitative and quantitative methods. Covers decision trees, subjective probability, utility and value theories, goals and objectives, risk, optimization, and simulation. Includes case studies in decision and systems analysis. Offered: Sp.

IND E 584 Project Performance (3)

Examines the fundamentals of project performance and application of systems engineering theory, concepts, and tools and techniques to plan, manage, and accomplish organizational objectives in a project framework. Also considers the critical roles leadership and team development plays in successful completion of projects. Offered: S.

IND E 585 Systems Architecture and Model-Based Systems Engineering (3)

Introduction to systems architecture through development of system requirements, allocations of functionality and reintegration. Utilizes model systems engineering as a graphical, mathematical, and modeling tool for systems analysis. Offered: A.

IND E 586 Systems Engineering Risk: Assessment and Management (3)

Management of systems engineering risk ensures costs, schedule, and technical performance objectives are achieved. Covers analysis methods and stochastic modeling for assessing and making decisions about projects and financial and technical risks associated with complex systems engineering projects. Also covers balancing risks across the systems development like cycle.

IND E 591, 592, 593 Seminar (1,1,1) Credit/no credit only.

Topics of current interest in industrial engineering. Prerequisite: graduate standing in Industrial Engineering or permission of instructor.

IND E 595 Global Integrated Systems Engineering ([4/5]-, max. 9)

Covers systems engineering, project management, finance, economics, and a seminar on global technical topics. Offered: jointly with A A 595; AW.

IND E 596 Global Integrated Systems Engineering Project (3)

Project-based systems design course. Prerequisite: A A/INDE 595. Offered: jointly with A A 596; Sp.

IND E 599 Special Topics in Industrial Engineering (1-5, max. 9)

IND E 600 Independent Study or Research (1-10) Credit/no credit only.

IND E 700 Master's Thesis (1-10) Credit/no credit only.

IND E 800 Doctoral Dissertation (1-10) Credit/no credit only.