### EIND - Industrial Engineering

**EIND 101. Introduction to Industrial & Management Systems Engineering.** 1 Credit. (1 Lec) F

PREREQUISITE: Must be taken the first year enrolled in IE program. Overview of the industrial engineering profession. Lectures will concentrate on tools and methods of industrial and management system engineering, and their application in manufacturing and service industries.

**EIND 142. Introduction to Systems Engineering.** 2 Credits. (1 Lec, 1 Lab) S

Introduce students to the methods used by industrial engineers to improve efficiency and safety of human-based systems. Labs will include hands-on activities and plant tours. Contemporary industrial engineering topics will be introduced, such as designing for the environment and sustainability.

**EIND 290R. Undergraduate Research.** 1-6 Credits. (1-6 Ind; max unlimited) F,S

Directed undergraduate research which may culminate in a written work or other creative project. Course will address responsible conduct of research. May be repeated.

**EIND 291. Special Topics.** 1-4 Credits. (1 Lec; 12 cr max) On Demand

PREREQUISITE: None required but some may be determined necessary by each offering department. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

**EIND 300. Engineering Management & Ethics.** 3 Credits. (3 Lec) F

PREREQUISITE: WRIT 101W, COMX 111US, and Junior standing. Introduction to management and organizational theory with applications to the engineering profession. Design of contemporary organizational systems and influence on effective organizational behavior. Social responsibility and ethical decision making for managers and engineers. Cases used to illustrate contemporary problems and environments.

**EIND 313. Work Design and Analysis.** 3 Credits. (2 Lec, 1 Lab) S

PREREQUISITE: WRIT 101W, EIND 142 for IE majors. Covers design and analysis methods for occupational tasks to improve productivity, workplace health, and safety. Topic areas include fundamental aspects of work standards development, ergonomics, and industrial safety. The labs demonstrate examples of applications of these topic areas.

**EIND 354. Engineering Probability and Statistics I.** 3 Credits. (3 Lec) F

PREREQUISITE: M 172, Junior standing, or consent of instructor. Understanding the statistical nature of engineering processes. Emphasis on proper data collection and classification, characteristics of variables and their distributions, joint probability distributions, and establishing hypotheses and statistical significance over engineering design specifications.

**EIND 364. Principles of Operations Research I.** 3 Credits. (3 Lec) F

PREREQUISITE: M 221. Formulation of models and optimization techniques to facilitate engineering management decisions. Resource allocation, transportation and multiple goals via networks, linear, and integer programming with primal-dual emphasis.

**EIND 371. Introduction to Computer Integrated Manufacturing.** 3 Credits. (2 Lec, 1 Lab) F

PREREQUISITE: ETME 215 or consent of instructor. Introduces core concepts of computer-controlled manufacturing systems and their applications. Topics include fundamentals of automation, programmable logic controllers, numerical control, industrial robotics, material handling and storage, and flexible manufacturing systems. Laboratories require students to apply course concepts in solving simulated industrial problems, and implement hardware-software solutions to meet state objectives.

**EIND 373. Production Inventory Cost Analysis.** 3 Credits. (3 Lec) S

PREREQUISITE: M 161, M 165, or M 171. Industrial cost systems, accounting processes, and cost estimation; cost analysis of manufacturing processes, economic decision making and uses of cost information in making product design and product line decisions.

**EIND 410. Interaction Design.** 2 Credits. (2 Lec) S

PREREQUISITE: EIND 313 or EGEN 310 (or equivalent) for Engineering majors. This course demonstrates the processes of integrating the psychology of the user into the design process as well as conducting usability testing to evaluate the design success. It emphasizes the need to understand the needs, capabilities, and emotions of the user to produce usable and desirable designs.

**EIND 411. Interaction Design Project.** 1 Credit. (1 Rect) S

COREQUISITE: EIND 410. Applications of interaction design methods discussed in EIND 410 to an actual product or service concept (prototype), based on student project teams guided by faculty.

**EIND 413. Ergonomics & Human Factors Engineering.** 3 Credits. (3 Lec) S

PREREQUISITE: Junior standing; EIND 313 for IMSE majors, or consent of instructor. Applications of ergonomics and human factors engineering. Topics include principles of anthropometrics, biomechanics, bioinstrumentation, physiology, design error, design for special populations (e.g., those with disabilities), mental stress/ workload, and risk assessment methods for work applied to common problems faced by engineers. Emphasis on design and analysis of occupational systems and consumer products which best “fit” job tasks or user requirements to human capabilities.

**EIND 422. Introduction to Simulation.** 3 Credits. (3 Lec) F

PREREQUISITE: CSCI 111 or equivalent, and EIND 354 or equivalent. Discrete simulation modeling methodology; random number generation, sampling, output analysis, validation, and verification; application to varied systems design and analysis problems. Cross-listed with CSCI 477.

**EIND 425. Technology Entrepreneurship.** 3 Credits. (3 Lec) F

PREREQUISITE: Junior standing. Introduction to principles of entrepreneurship and starting a business. Students learn how to formulate, plan, and implement a new venture, emphasizing the unique intellectual property, funding and marketing/selling concerns of technology startups. Includes extensive use of technology examples and case studies.

**EIND 434. Project and Engineering Management.** 3 Credits. (3 Lec) F,S

PREREQUISITE: Junior standing. Fundamental principles of planning, estimating, budgeting, scheduling, implementing, evaluation, and controlling engineering and research projects. Common engineering management concerns such as labor scheduling, human resources management, and related governmental compliance also explored.

**EIND 442. FaceandMat Hndlg Sys Dsgn.** 3 Credits. (3 Lec) F

PREREQUISITE: IMSE seniors in their last full academic year, EIND 313, EMEC 103, ETME 215. COREQUISITE: EIND 300. Senior capstone course. The first course in the senior capstone sequence. Principles and techniques for planning and designing production facilities and material handling systems. Process and product analysis requirements, layout and support facilities. Computer-aided analysis and design.

**EIND 454. Eng Probability and Stats II.** 3 Credits. (3 Lec) S

On Demand

PREREQUISITE: EIND 354 or consent of instructor. Statistical analysis for managerial decision-making as applied to engineering problems. Single and multiple factor ANOVA, randomized complete, full-blown and fractional designs with blocking and confounding, Introductions to nested and split-plot designs, multiple regression and response surface designs.

**EIND 455. DOE for Engineers.** 3 Credits. (3 Lec) S

PREREQUISITE: EIND 354 or consent of instructor. Statistical analysis for managerial decision-making as applied to engineering problems. Single and multi-factor ANOVA, randomized complete, full-blown and fractional designs with blocking and confounding, Introductions to nested and split-plot designs, multiple regression and response surface designs.

**EIND 457. Regres & Multivar Analysis.** 3 Credits. (3 Lec) S

On Demand

PREREQUISITE: EIND 354 or consent of instructor. Advanced topics in statistical analysis for engineers. Topics include regression techniques: ANOVA, simple linear regression, multiple linear regression, and variable selection procedures; and multivariate analysis techniques: principal components, factor analysis, canonical correlation analysis, and clustering methods. Statistical analysis for managerial decision-making as applied to engineering problems.

**EIND 458. Production & Engineering Mgmt.** 3 Credits. (3 Lec) S

COREQUISITE: EIND 464 or consent of instructor. Design and management of efficient production/delivery systems for goods and services, emphasizing quantitative analysis and systems approaches. Topics include forecasting, inventory management, production planning, scheduling, material planning, and lean manufacturing systems.

**EIND 464. Prin of Operations Research II.** 3 Credits. (3 Lec) S

PREREQUISITE: EIND 354 and EIND 364. Advanced formulation of models, optimization techniques and application to engineering design and operations management decision making. Nonlinear and integer programming algorithms. Stochastic models including advanced queueing and general markov processes.

**EIND 468. Managerial Forecasting & Decision Analysis.** 3 Credits. (3 Lec) F

PREREQUISITE: EIND 354. Time series analysis through classical approaches; auto-regression, smoothing models, and advanced time series models. Technical applications emphasized. Includes investigations into final and dependent data. Approaches designed for managers to test real applications for making decisions.
EIND 477. Quality Assurance. 3 Credits. (3 Lec) S
PREREQUISITE: EIND 354 or EGEN 350 or consent of instructor. Statistical and non-statistical aspects of quality assurance assessment. Includes classical SPC and process improvement via control charts. Also includes product and process design through planned experimentation and simple experimental designs (ANOVA). Limited use of case studies. A design project or course capstone paper demonstrating significant elements of the course is required.

EIND 490R. Undergrad Research. 1-6 Credits. (1 Ind; 12 cr max) F,S,Su
PREREQUISITE: Junior standing, consent of instructor, and approval of department head or director. Directed research and study on an individual basis.

EIND 499R. Indus Engin Design Capstone. 3 Credits. (1 Lec; 1 Lab, 1 Rct) S
PREREQUISITE: EGEN 310, EGEN 325, EIND 434 and EIND 442.
COREQUISITE: EIND 458. Senior capstone course. Second course in senior capstone sequence. A comprehensive open-ended team design project emphasizing the application of industrial engineering tools and knowledge to create engineered solutions for real business needs or opportunities. Oral and written communication and project management emphasized.

EIND 506. Healthcare Delivery Systems. 3 Credits. (3 Lec) S, even years
PREREQUISITE: ENSG 500 or EIND 458 or consent of instructor. This interdisciplinary course targets nursing students pursuing certification as a Clinical Nurse Leader and Industrial Engineering students who intend to work in the healthcare sector. Students will learn strategies for analyzing and improving processes, coordinating interdisciplinary healthcare teams, enhancing healthcare quality management, and reducing health risk through medical error elimination. This course is cross-listed with NRSG 608.

EIND 509. Systems Simulation. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: CSCI 111, EIND 354, EIND 422, or consent of instructor. Systems exhibiting randomness are modeled and statistically analyzed using a state-of-the-art simulation language. Graphical model animation, and advanced output analysis are emphasized. Applications include improvement of existing and design of new production and service systems.

EIND 510. Usability Engineering. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: EIND 410 or EGEN 310R or consent of instructor. Usability engineering is an iterative design process that applies human-centered design principles integrated with user participation (usability testing) to produce usable, desirable, and sustainable products, services and systems. This project-based course will use a seminar format with industry guest speakers from various disciplines.

EIND 511. Advanced Human Factors. 3 Credits. (3 Lec) S, even years
PREREQUISITE: Basic knowledge of statistics (t-tests, ANOVA, regression, design of experiments) or consent of instructor. Advanced research methods applied to areas where ergonomics and human factors is playing a key role in increasing effectiveness, efficiency and safety of human-based systems. Example application areas include: (1) transportation systems; (2) health care systems; and (3) occupational work.

EIND 513. Human Factors in the Safety of Complex Systems. 3 Credits. (3 Lec) F, even years
PREREQUISITE: EIND 313 or EIND 413 (or equivalent); or consent of instructor. Advanced topics in human factors engineering applied to the understanding of human error in the failure of safety-critical systems. Emphasis is on understanding the system and human basis of failure in order to design systems with greater resilience. Basic and applied issues of human cognition, emotion, culture, and skill in relation to human error and system safety are explored through seminars, laboratory demonstrations and case studies.

EIND 514. Occupational Biomechanics. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: Basic knowledge of statistics (t-tests, ANOVA, regression, design of experiments); EIND 413 or consent of instructor. Topics relate to occupational biomechanics and bioinstrumentation application, focused on designing for the health and safety at work. Topics include the skeletal system, physiology, fatigue assessment, stress response, psychometrics, biomechanics, work design assessments and implementation of ergonomics programs.

EIND 525. Multi-Attribute Analysis. 3 Credits. (3 Lec) F, even years
PREREQUISITE: EIND 364. Theory, methods and applications pertinent to decision making with multiple attributes and/or multiple objectives. Special emphasis is given to multi-attribute utility theory, goal programming, and multiple criteria optimization decision-making in modern manufacturing and service systems and in design decision-making to support competitive priorities of an enterprise.

EIND 554. DOE for Engineers. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: EIND 354 or consent of instructor. Statistical analysis for managerial decision-making applied to engineering problems. Single and multi-factor ANOVA, randomized complete and fractional factorial designs with blocking and confounding. Introductions to nested and split-plot designs, multiple regression and response surface designs.

EIND 557. Regression & Multivar Analysis. 3 Credits. (3 Lec) S, even years
PREREQUISITE: EIND 354 or consent of instructor Advanced topics in applied statistics for engineers. Topics include regression techniques: ANOVA, simple linear regression, multiple linear regression, and variable selection procedures; and multivariate analysis techniques: principal components, factor analysis, canonical correlation analysis, and clustering methods. Statistical analysis for managerial decision-making as applied to engineering problems.

EIND 558. Manage Forecast & Dec Analysis. 3 Credits. (3 Lec) F, odd years
PREREQUISITE: EIND 354 or EIND 457. Time series analysis through classical approaches including regression, smoothing models, and advanced time series models. Technical applications emphasized in concepts, tools, and methods. Includes investigations into financial and dependent data. Approaches designed for managers to test real applications for making decisions.

EIND 574. Management Engineering Systems. 3 Credits. (3 Lec) S, odd years
PREREQUISITE: EIND 300 or consent of instructor. Students will explore various facets of designing effective organizational and management systems. Topics will include: classical and open system organization theory, socio-technical systems theory, congruence, technology and innovation management, knowledge management, and continuous improvement in organizations. Students will complete an independent research project in addition to course readings and in-class discussion.

EIND 575. Research or Prof Paper/Project. 1-4 Credits. (1-4 Ind) F,S,Su
PREREQUISITE: Master's standing; consent of instructor.

EIND 589. Graduate Consultation. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: Master’s standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis if on a thesis plan) but who need additional faculty or staff time or help.

EIND 590. Master's Thesis. 1-10 Credits. (1-10 Ind) F,S,Su
PREREQUISITE: Master's standing; consent of instructor.

EIND 591. Special Topics. 1-4 Credits. (1-4 cr.)
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one-time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number.

EIND 592. Independent Study. 1-3 Credits. (1-3 Ind) F,S,Su
PREREQUISITE: EIND 300 or consent of instructor. Directed research and study on an individual basis.

EIND 598. Internship. 1-12 Credits. (1-12 Ind) On Demand
PREREQUISITE: Graduate standing, consent of instructor, approval of department head or director. Directed research and study on an individual basis.

EIND 600. Doctoral Thesis. 1-10 Credits. (1-10 Ind) F,S,Su
PREREQUISITE: Doctoral standing; consent of instructor.