

SIE 250 -- Introduction to Systems and Industrial Engineering (3 units)

Description: System modeling the elementary constructs and principles of system models including discrete-time, discrete-state system theory; finite state machines; modeling components, coupling, modes, and homomorphisms system design; requirements, life-cycle, performance measures and cost measures, tradeoffs, alternative design concepts, testing plan, and documentation. Applications and case studies from engineering. Prerequisite(s): ENGR 102, MATH 129. Usually offered: Fall.

SIE 265 -- Engineering Management I (3 units)

Description: Fundamentals of economic analysis and the time value of money for engineers. Construction of financial models in EXCEL including Income, Cash Flow, and Balance Sheet. Estimation of required capital and project acceptance criteria. Prerequisite(s): MATH 129, ENGR 102. Identical to: ENGR 265. Usually offered: Fall, Spring.

SIE 270 -- Mathematical Foundations of Systems and Industrial Engineering (3 units)

Description: Basics of data structures, transformations, computer methods, their implementation in MATLAB, and their applications in solving engineering problems. Prerequisite(s): ECE 175, MATH 129, PHYS 141. Usually offered: Spring, Summer

SIE 277 -- Object-Oriented Modeling and Design (3 units)

Description: Modeling and design of complex systems using all views of the Unified Modeling Language (UML). Most effort will be in the problem domain (defining the problem). Some effort will be in the solution domain (producing hardware or software). Prerequisite(s): C SC 110 or ECE 175. Usually offered: Fall.

SIE 295S -- Systems and Industrial Engineering Sophomore Colloquium (1 unit)

Description: A colloquium designed to help students understand what SIE's do. Students will interact with speakers and take tours to local companies. The course helps students select course options within the SIE programs and helps focus on possible SIE applications areas. Usually offered: Spring.

Note: Upper division courses, SIE 3xx and SIE 4xx, require Advanced Standing for registration. Students must contact the department to apply for advanced standing.

SIE 305 -- Introduction to Engineering Probability and Statistics (3 units)

Description: Axioms of probability, discrete and continuous distributions, sampling distributions. Engineering applications of statistical estimation, hypothesis testing, confidence intervals. Prerequisite(s): MATH 129. Usually offered: Fall, Spring, Summer.

SIE 321 -- Probabilistic Models in Operations Research (3 units)

Description: Probability, Markov chains, Poisson processes, queuing models, reliability models. Prerequisite(s): SIE 305. Usually offered: Spring.

SIE 330R -- Engineering Experiment Design (3 units)

Description: Design and analysis of observational and factorial experiments employing numerical and graphical methods. Topics include control charts, probability plots, multiple regression analysis, confidence and prediction intervals and significance tests. Prerequisite(s): SIE 305. Usually offered: Spring.

SIE 340 -- Deterministic Operations Research (3 units)

Description: Linear programming models, solution techniques, sensitivity analysis and duality. Prerequisite(s): SIE 270. Usually offered: Fall, Summer

SIE 367 -- Engineering Management II (3 units)

Description: Strategic, tactical and operational planning; innovation and technological cycles; the elements of entrepreneurship, and human relations topics for technical managers. Prerequisite(s): SIE 265. Usually offered: Spring.

SIE 370 -- Embedded Computer Systems (4 units)

Description: Boolean algebra, combinational and sequential logic circuits, finite state machines, simple computer architecture, assembly language programming, and real-time computer control. The computer is used as an example of systems engineering design; it is analyzed as a system, not as a collection of components. Typical structure: 3 hours lecture, 3 hours laboratory. Usually offered: Spring

SIE 377 -- Software for Engineers (3 units)

Description: Programming in C. Modular program design and verification, pointers and structures, data structures and algorithms including: lists, trees, graphs, searching and sorting. Prerequisite(s): ECE 175. Usually offered: Fall.

SIE 383 -- Integrated Manufacturing Systems (3 units)

Description: Introduction to the integrated manufacturing enterprise and automation. Topics include computer-aided design, process planning, computer numerical control machining, machine vision, application of robots and automation. Typical structure: 2 hours lecture, 2 hours laboratory. Usually offered: Spring.

SIE 406 -- Quality Engineering (3 units)

Description: Quality, improvement and control methods with applications in design, development, manufacturing, delivery and service. Topics include modern quality management philosophies, engineering/statistical methods (including process control, control charts, process capability studies, loss functions, experimentation for improvement) and TQM topics (customer driven quality, teaming, Malcolm Baldrige and ISO 9000). Prerequisite(s): SIE 305. May be convened with: SIE 506. Usually offered: Spring.

SIE 408 -- Reliability Engineering (3 units)

Description: This is a three-credit course configured for well-qualified seniors, graduate students, and engineering professionals and practitioners. It is concerned with determining the probability that a component or system, whether simple or complex, will function as intended. The scope of this course includes: (1) Root cause analysis of critical failures, (2) reliability models of components and systems, (3) development of statistical methods for estimating the reliability of a product, (4) use of software tools to perform model development and analysis, and (5) methodologies to influence system designs. Prerequisite: SIE 305. Usually offered: Fall.

SIE 410A -- Human Factors and Ergonomics in Design (3 units)

Description: Consideration of human characteristics in the requirements for design of systems, organizations, facilities and products to enable human-centered design which considers human abilities, limitations and acceptance. Co-requisite or Prerequisite: SIE 305. Usually offered: Fall.

SIE 411 -- Human Machine Interaction (3 units)

Description: Basic concepts, methods, principles and skills in designing and evaluating various human-machine interfaces. Machine here is generally defined as any physical systems that can be operated by human operators. By taking this course, students can not only use several effective methods to design and prototype human-machine interfaces based on the needs and characteristics of users (e.g., PPT method, Visual Basic Applications user interface programming skills; simple Web design techniques etc.), but also apply both quantitative and qualitative evaluation methods to optimize the human performance, mental workload and aesthetics. To broaden students' view in HMI, relative new topics in HMI are also introduced in this course. Prerequisite: ECE 175 or CSC 110, SIE 305. Usually offered: Fall.

SIE 414 – Law for Engineers and Scientists (3 units)

Description: Topics covered in this course include patents, trade secrets, trademarks, copyrights, product liability contracts, business entities, employment relations and other legal matters important to engineers and scientists. Usually offered: Spring.

SIE 415 – Technical Sales and Marketing (3 units)

Description: Principles of the engineering sales process in technology-oriented enterprises; selling strategy, needs analysis, proposals, technical communications, electronic media, time management and ethics; practical application of concepts through study of real-world examples. Usually offered: Fall, Spring.

SIE 422 -- Engineering Decision Making Under Uncertainty (3 units)

Description: Application of principles of probability and statistics to the design and control of engineering systems in a random or uncertain environment. Emphasis is placed on Bayesian decision analysis. Prerequisite(s): SIE 305. May be convened with: SIE 522. Usually offered: Fall.

SIE 430 -- Engineering Statistics (3 units)

Description: Statistical methodology of estimation, testing hypotheses, goodness-of-fit, nonparametric methods and decision theory as it relates to engineering practice. Significant emphasis on the underlying statistical modeling and assumptions. Prerequisite(s): SIE 305. May be convened with: SIE 530. Usually offered: Fall.

SIE 431 -- Simulation Modeling and Analysis (3 units)

Description: Discrete event simulation, model development, statistical design and analysis of simulation experiments, variance reduction, random variate generation, Monte Carlo simulation. Prerequisite(s): SIE 305. May be convened with: SIE 531. Usually offered: Fall, Spring.

SIE 440 -- Survey of Optimization Methods (3 units)

Description: Survey of methods including network flows, integer programming, nonlinear programming, and dynamic programming. Model development and solution algorithms are covered. Prerequisite(s): SIE 340. May be convened with: SIE 540. Usually offered: Spring.

SIE 454A -- The Systems Engineering Process (3 units)

Description: Process and tools for systems engineering of large-scale, complex systems: requirements, performance measures, concept exploration, multi-criteria tradeoff studies, life cycle models, system modeling, etc. May be convened with: SIE 554A. Usually offered: Fall.

SIE 455 – Sensor Systems Engineering (3 units)

Description: The primary purpose of this course is to provide students with a system level understanding of sensor development. The student will see the development of remote sensing techniques beginning with high level requirements through concept of operations, architecture development, subsystem modeling and culminating in integration, validation and verification. The student will be exposed to key design parameters for radar and Electro Optical sensing systems that drive both system cost and performance. Advanced multi-sensor systems and adaptive signal processing will also be discussed. Prerequisite(s): SIE 305. Usually offered: Spring.

SIE 457 – Project Management (3 units)

Description: Foundations, principles, methods and tools for effective design and management of projects in technology-based organizations. This course focuses on the scope, time, cost, performance and quality concerns of engineering projects characterized by risk and uncertainty. Initiating, planning, executing, monitoring, controlling and closing process are addressed. Students design and complete a project from concept through completion. Project Management software is utilized. Usually offered: Fall.

SIE 458 – Model Based Systems Engineering (3 units)

Description: An introduction to model-based systems engineering (MBSE), which is the formalized application of modeling to support system requirements, design, analysis, verification and validation activities beginning in the conceptual design phase and continuing throughout development and later life cycle phases. The course emphasizes practical use of the Systems

Modeling Language (SysML) and MBSE methods. Co-requisite or Prerequisite: SIE 454A. Usually offered: Fall.

SIE 462 -- Production Systems Analysis (3 units)

Description: Production systems, quantitative methods for forecasting, aggregate planning, inventory control, materials requirement planning, production scheduling, manpower planning and facility design. Prerequisite(s): SIE 305. SIE 340 or consent of advisor. Usually offered: Spring.

SIE 464 – Cost Estimation (3 units)

Description: Focuses on principles of cost estimation and measurement systems with specific emphasis on parametric models. Approaches from the fields of hardware, software and systems engineering are applied to a variety of contexts (risk assessment, judgment & decision making, performance measurement, process improvement, adoption of new tools in organizations, etc.). Material is divided into five major sections: cost estimation fundamentals, parametric model development and calibration, advanced engineering economic principles, measurement systems, and policy issues. Usually offered: Spring.

SIE 465 – Supply Chain Management (3 units)

Description: Fundamentals of Supply Chain Management including inventory/logistics planning and management, warehouse operations, procurement, sourcing, contracts and collaboration. Prerequisite: SIE 305 and SIE 340. May be convened with: SIE 565. Usually offered: Spring.

SIE 471 – Systems Cyber Security Engineering (3 units)

Description: The purpose of this course is to introduce selected topics, issues, problems, and techniques in the area of System Cyber Security Engineering (SCSE), early in the development of a large system. Students will explore various techniques for eliminating security vulnerabilities, defining security specifications / plans, and incorporating countermeasures in order to achieve overall system assurance. SCSE is an element of system engineering that applies scientific and engineering principles to identify, evaluate, and contain or eliminate system vulnerabilities to known or postulated security threats in the operational environment. Prerequisite: ECE 175 or CSC 110. Usually offered: Fall.

SIE 474 – Information Analytics and Decision-Making in Engineering (3 units)

Description: Recent advances in computational and information technology allow the collection and evaluation of vast volumes of data. This explosion in information has amplified the need to understand the value of information and how to use available information to make better decisions that in turn affect the environment. The course will cover information valuation, decision-making, and information economics in non-strategic and strategic settings. Prerequisite: SIE 305. Usually offered: Fall.

SIE 477 – Introduction to Biomedical Informatics (3 units)

Description: Driven by efforts to improve human health and healthcare systems, this course will cover relevant topics at the intersection of people, information, and technology. Specifically, we will survey the field of biomedical informatics that studies the effective uses of biomedical data, information, and knowledge from molecules and cellular processes to individuals and populations, for scientific inquiry, problem solving, and decision making. We will explore foundations and methods from both biomedical and computing perspectives, including hands-on experiences with systems, tools, and technologies in the healthcare system. Prerequisite: ECE 175 or CSC 110. Usually offered: Fall.

SIE 482 – Lean Engineering (3 units)

Description: Survey of lean and variability reduction principles as applied to manufacturing and non-manufacturing environments. Prerequisite(s): SIE 305. Usually offered: Spring.

SIE 483 -- Computer-Integrated Manufacturing (CIM) Systems (3 units)

Description: Modern manufacturing systems with emphasis on information requirements and data management. Includes CAD, CAM, CAPP, real-time scheduling, networking, and system justification. Prerequisite(s): SIE 383. May be convened with: SIE 583. Usually offered: Fall.

SIE 496 – Special Topics in Systems and Industrial Engineering (3 units)

Description: This course is designed to provide a flexible topics course across several domains in the field of Systems Engineering, Industrial Engineering, and Engineering Management. Students will develop and exchange scholarly information in a small group setting. Selected advanced topics in Systems and Industrial Engineering and Operations Research, such as 1) optimization, 2) stochastic systems, 3) systems engineering and design, 4) human cognition systems, and 5) informatics. Repeatability: Course may be repeated for a maximum of 9 units or 3 completions. Prerequisite: SIE 305. Usually offered: Fall, Spring, Summer