ENGINEERING MANAGEMENT

Courses

ENM 500. Probability & Statistics for Engineers. 3 Hours
This is an introductory course in the concepts and applications of probability and statistics. Emphasis is on applications and examples that an engineer or analyst would encounter in practice. Probability is presented as the fundamental tool for modeling uncertainty as well as the logical connection between a population of data and its samples. Descriptive statistics are introduced to describe and characterize data. Inferential statistics provide the means of generalizing to a population from a sample, thus enabling solutions and conclusions that otherwise would not be obtained. Modern software provides the leverage to tackle problems of realistic size and complexity. The concepts and methods covered have direct application to forecasting, queuing, inventory, production, scheduling, equipment replacement, reliability, availability, quality control, experimental design, robust engineering, six sigma, and more. Prerequisite(s): An undergraduate course sequence in calculus.

ENM 501. Applied Engineering Statistics. 3 Hours
Concepts and applications of advanced probability modeling and statistical techniques used in the study and solution of operations research/management science problems. The focus of this course is on the application of probability and statistics in the formulation and solution of models found in OR studies and in engineering design studies. This course builds upon the foundation established in the ENM 500 course. Prerequisite(s): ENM 500 or equivalent.

ENM 503. Engineering Analysis - Methods & Models. 3 Hours
Mathematical methods and models used in the study and solution of decision problems found in engineering and operations research/management science. The methods and models presented build on the student’s mathematical foundation and are motivated by their use in solving real-world problems. This is not a concept-theory course but rather a course designed to enhance the modeling and analysis skills of the student. Prerequisite(s): An undergraduate course sequence in calculus.

ENM 505. Management of Engineering Systems. 3 Hours
This course addresses systems engineering concepts and processes, explaining activities and tools for developing system solutions to meet customer needs. Using the Systems Engineering Body of Knowledge as a foundation, topics such as systems thinking, requirements analysis, testing, and life-cycle sustainment are discussed along with technical management topics such as configuration and interface management, risk management and decision analysis, and systems engineering. The interdisciplinary and cross-functional nature of systems engineering is also emphasized.

ENM 515. Human Factors Engineering. 3 Hours
Treatment of theory, data, and methods that can be applied to improve the interface between humans and the systems and products that they use. Human capabilities and limitations are studied to support the design of systems and products for safe and efficient use by the human operator.

ENM 517. Legal Aspects of Engineering. 3 Hours
An introductory course to provide the engineer with some insight into the areas of law that will impact an engineer’s professional practice. Special emphasis is given to the area of Contract Law due to the important and pervasive interaction that it has with engineering design and project work. Systems of law, legal reasoning, and the court systems are introduced. Product liability and business relationships are discussed. Courtroom experience is achieved through interaction with the UD Law School and local judges with participation in mock trials.

ENM 530. Engineering Economy. 3 Hours
This is an introductory course in the concept of time value of money and financial management for engineering managers. The course includes learning curves, cost estimating, managerial accounting, balance sheet and income statement, financial ratios, investment alternatives, depreciation, inflation, capital budgeting and other related topics.

ENM 534. Decision Analysis. 3 Hours
Introduction to decision analysis with applications. Topics explored include structuring decisions under uncertainty, influence diagrams, decision trees, risk analysis, sensitivity analysis, value of information, utility theory, and practical decision making. Prerequisite(s): ENM 500 or equivalent.

ENM 539. Project Management. 3 Hours
This course addresses the concepts, techniques and procedures used to manage engineering programs and projects using an integrated approach for planning, execution, and control. It includes an introduction to the systems approach to project management; project screening and selection; multiple-criteria methods for evaluation; work breakdown structures (WBS) and organization; configuration selection, management and control; project scheduling; project budgets; and resource management. A key goal is to provide the student with sufficient knowledge and tools to confidently manage a project or contribute effectively as a project team member.

ENM 541. Production Engineering. 3 Hours
Study of the integration of man, machine, and material in producing a marketable product. The use of engineering techniques to design, develop, and implement the production system are covered. Topics include break-even analysis, learning curve theory, forecasting, resource balancing, inventory and production control, facility layout and location, job sequencing and scheduling, and assembly line balancing. Modern production techniques such as just-in-time (JIT), MRP systems flexible manufacturing, and computer-integrated manufacturing are discussed. Prerequisite(s): MSC 521 or permission of instructor.

ENM 560. Quality Assurance. 3 Hours
Introduction to the fundamental concepts and methods of modern approaches to quality assurance, with emphasis on statistical methods for process control, process capability analysis, and sampling inspection. The course introduces relevant methods of experimental design and current issues in quality improvement. Prerequisite(s): ENM 500 or equivalent.

ENM 561. Design & Analysis of Experiments. 3 Hours
This course introduces advanced topics in experimental design and analysis, including full and fractional factorial designs, response surface analysis, multiple and partial regression, and correlation. Prerequisite(s): ENM 500 or equivalent.

ENM 562. Robust Engineering. 3 Hours
Robust engineering methods lead to products and processes that function well in spite of variable customer environments and usage patterns, internal deterioration and ageing of components, and unit-to-unit variation in subassemblies. The key concept is using experimental design to neutralize these sources of performance variability. This course presents the still vital Taguchi methods that pioneered the methodology as well as modern work to improve on and expand Taguchi’s principals. Prerequisite(s): ENM 500 or equivalent.
ENM 563. Advanced Engineering Design. 3 Hours
This graduate-level course seeks to develop in students the ability to integrate dynamic mechanisms (i.e., heat transfer, fluid dynamics, electrical responses, etc.) into system modeling and analyses with uncertainty supporting the verification and validation of systems. Additionally, statistically-based analysis, design, and optimization will be addressed through open-ended problems with explicit considerations of system-level impacts, engineering tradeoffs, and system integration. A course project is required that must demonstrate application of the statistically-based design process. Prerequisite(s): ENM 561 or equivalent; Instructor permission.

ENM 565. Reliability Engineering I. 3 Hours
An introduction to reliability engineering concepts and methodology. The reliability, maintainability, and availability of components and multi-component systems are analyzed. Topics include exponential, Weibull, lognormal and normal failure laws, static reliability, hazard rate functions, state dependent failure rate models, redundancy, censoring, empirical models, curve fitting to failure data, and reliability growth testing. Prerequisite(s): ENM 500 or equivalent.

ENM 566. Reliability Engineering II. 3 Hours
Continuation of ENM 565 with emphasis on the design of systems to meet specified reliability, availability, and maintainability requirements. Prerequisite(s): ENM 565 or equivalent.

ENM 582. Engineering Organizational Development. 3 Hours
This course addresses individual, group behavior, and organizational design examined within the structure of technical operations, including the systems engineering environment. The objectives are to provide the participants with an understanding of behavioral science and design principles, their effect on organizational performance, and how one applies this science in the management of technical personnel and projects, especially in the systems engineering environment.

ENM 585. Engineering Organizational Systems. 3 Hours
Introduction to organizational theory and practice with emphasis on the design of organizational structures for the effective integration of production, research and development, and engineering activities. Special topics include high performing systems, the technical ad-hoc committee, matrix organization, and project management and other current issues.

ENM 587. Leading in Technical Environments. 3 Hours
Understanding and utilizing the keys to leading in technical organizations represents a distinct advantage to individuals and the institutions they serve. Students will be exposed to the underpinning of leadership in engineering environments including tenets, theories, debates, strategies, and innovative techniques. Opportunities to interact with technical leaders from government and industry will be provided. Practical application skills will be developed.

ENM 590. Case Studies in Engineering Management. 3 Hours
This capstone course emphasizes the completion of an engineering management project or study under the direction of a faculty advisor. A well-written report is required. Prerequisite(s): Completion of the engineering management core courses or equivalent.

ENM 595. Special Problems in Engineering Management. 1-3 Hours
This course covers special assignments in engineering management as arranged and approved by the advisor and the program director.