## Engineering Management and Systems Engineering

**Web Site:** [https://www.odu.edu/emse](https://www.odu.edu/emse)

### Engineering Management and Systems Engineering

Andres Sousa-Poza, Chair

### Minor in Engineering Management

**Opportunities for Employment and Graduate Studies**

According to a recent Income and Salary Survey by the National Society of Professional Engineers, the median annual income of engineers having executive/administrative job functions is approximately $20,000 higher than those having technical functions. This program provides undergraduate students with a set of courses that provides some of the basic management concepts useful to those aspiring to an executive/administrative position in technology-based, project-oriented organizations. Upon graduation, this knowledge will help individuals qualify for project management positions or for entrepreneurial activities. Students interested in obtaining a strong preparation in engineering management should consider this minor.

### Points of Interest

The minor in engineering management is intended for students with majors in engineering, engineering technology, computer science, physics, chemistry, mathematics, ocean, earth and atmospheric sciences, or biology. Students with majors in other disciplines may also pursue this minor, and they are encouraged to talk with their advisors to determine its appropriateness to their educational objectives. The minor develops the skills in team building, interpersonal communications, decision making, ethics and leadership, project management, risk analysis, and quality assurance that employers are increasingly looking for in both engineers and scientists, as well as in other employees in ‘high tech’ organizations. The minor also satisfies the University’s General Education upper-division requirement.

### Requirements

Applicants for the minor in engineering management must be juniors or seniors with a declared major and a minimum GPA of 2.00. The courses can also be taken by graduate students or other graduates. The minor requires completion of 12 credit hours of course work with a minimum grade point average of 2.00 in all courses specified as a requirement for the minor exclusive of lower-level courses and prerequisite courses. A minimum of six hours in upper-level courses in the minor requirement must be taken through courses offered by Old Dominion University.

### Curriculum

The course work for the minor in engineering management involves extensive writing assignments, oral presentations, and group projects, and is designed to develop the skills needed for rapid advancement in either industrial or government organizations. Twelve credit hours of course work is required to meet the requirements for the minor in engineering management. Students are required to complete three core engineering management classes and one engineering management elective. Core engineering management classes include: ENMA 301, ENMA 302, ENMA 401, ENMA 421, or ENMA 424. Any ENMA 300- or 400-level class is acceptable as an elective for the minor, with the exception of internship or co-op courses. Students who intend to complete a master’s in engineering management or in systems engineering should take ENMA 420 as part of their minor requirements as it is a prerequisite to the graduate programs.

For additional information about the undergraduate minor in engineering management, contact:

Chair  
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### ENGINEERING MANAGEMENT Courses

**ENMA 301. Introduction to Engineering Management. 3 Credits.**

An introduction to principles of management and organizational behavior as they apply to the engineering profession. Special emphasis on team building, quality leadership and planning, handling personnel issues, and marketing technology. Group exercises, case studies, and extensive writing and speaking assignments. Prerequisites: Junior standing.

**ENMA 302. Engineering Economics. 3 Credits.**

Introduction to cost estimation, accounting and financial metrics. Valuation techniques, time value of money, and cash flow analysis. Economic analysis of engineering alternatives including depreciation effects, income taxes, inflation, engineering management capital budgeting of projects, portfolio and public sector projects. Prerequisite: Junior standing.

**ENMA 401. Project Management. 3 Credits.**

Foundations, principles, methods, and tools for effective design and management of projects in technology-based organizations. Project organization, life cycle, planning, scheduling, implementation, control, and evaluation. Special emphasis on project leadership, problem solving in team-based projects, project failure analysis, and advanced methods. Use of case studies and applications to reinforce course concepts. Students design and plan a project from concept through completion including proposal and post-project analysis. Prerequisites: Junior standing.

**ENMA 410/510. Agile Project Management. 3 Credits.**

This course focuses the management of projects using an agile approach to respond to the continuous changes that affect project capabilities and performance. Although any project can be manage using agile project management, projects with high degree of uncertainty obtain the most benefits from this approach (e.g., R&D projects). The course covers Scrum and expands it by articulating the human and business factors that make successful agile project management. Case studies and/or short-projects are required. Prerequisites: ENMA 401 or equivalent.

**ENMA 415/515. Introduction to Systems Engineering. 3 Credits.**

Introduces the principles, concepts and process of systems engineering. Examination of problem formulation, analysis, and interpretation as they apply to the study of complex systems. Emphasizes the design nature of systems engineering problem solving, and includes case studies stressing realistic problems. Development of system requirements, system objectives, and the evaluation of system alternatives. Prerequisites: Junior standing.

**ENMA 420. Statistical Concepts in Engineering Management. 3 Credits.**

Introduction to concepts and techniques in probability and statistics, including descriptive and inferential statistics. Topics include fundamentals of probability, distributions, estimation, hypothesis testing, regression, process control, and reliability. Applications include engineering design and analysis, manufacturing, decision aids, and quality management problems. Prerequisites: MATH 211 or equivalent.

**ENMA 421. Decision Techniques in Engineering. 3 Credits.**

A systematic approach to the formulation of problems, the generation and evaluation of alternatives, and the selection and implementation of courses of action applied to engineering design, manufacturing, and management decisions. Topics include: goals and objectives; variables and relations; constraints and feasibility; uncertainty and risk; models and optimization; data and information; analysis and simulation. Case studies requiring oral presentations and written reports are used to emphasize concepts and systems analysis. Prerequisites: Junior standing.
ENMA 424. Risk Analysis in Engineering Management. 3 Credits.
The systematic approach to analysis of risk as applied to engineering
management with emphasis on cyber systems. The objectives of this course
are (1) to gain an appreciation of the strategic importance of risk analysis
and its relationship to other enterprise and engineering functions and (2) to
develop a working knowledge of the concepts and methods in risk analysis
as they may apply to cyber systems. Prerequisites: Junior standing.

ENMA 480. Ethics and Philosophy in Engineering Applications. 3
Credits.
This course is designed to expose prospective engineering managers
the theories and practices that are inherent in the ethical environment of
modern organizations. Topics include definitions of ethical behavior and
leadership, the history of ethical thought, moral decision-making, and
the importance of values such as honesty, integrity, and trustworthiness.
A full exploration of ethical autonomy, collaboration, communication
and moral imagination will be conducted. A variety of methods will be
used to facilitate learning, including a textbook, movie and videos, case
studies, experiential activities and writing assignments. The successful
student should gain a full appreciation for the value and practices of ethical
leadership. Prerequisites: Junior standing.

ENMA 495/595. Topics in Engineering Management. 1-6 Credits.
Special topics with emphasis placed on the recent developments in
engineering management. Prerequisites: permission of the instructor.