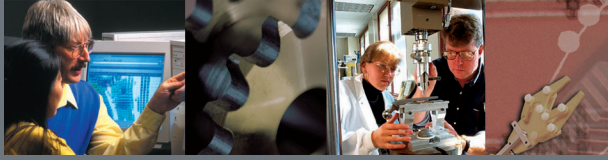


GRADUATE PROGRAMS *in* SYSTEMS ENGINEERING *at* UMBC



The **Systems Engineering (SE) Program** at UMBC is designed to teach practical systems engineering skills that can be immediately applied on-the-job to accelerate the professional development of systems engineers. Students learn how to develop operable systems that meet customer requirements while successfully navigating the complexities of the systems engineering life cycle.

Courses are taught by senior systems engineers from area companies and agencies. They bring extensive experience working on large scale systems for defense and intelligence applications, aeronautical communications and navigation and information processing.

Programs Offered

- Graduate Certificate in Systems Engineering
- Master of Science in Systems Engineering
- Systems Engineering Tracks in Other Engineering Majors:
 - M.S. Electrical Engineering
 - M.S. Computer Science
 - M.S. Engineering Management

GRADUATE CERTIFICATE IN SYSTEMS ENGINEERING 15 CREDITS

The five-course (15 credit) Graduate Certificate in Systems Engineering provides the core processes, techniques and tools required to manage complex systems. All certificate courses can be applied toward the Master of Science in Systems Engineering, Electrical Engineering, Computer Science or Engineering Management.

Required Courses

EENE 660: Systems Engineering Principles
EENE 661: Systems Architecture and Design
EENE 662: Systems Modeling, Simulation and Analysis
EENE 663: Systems Implementation, Integration and Test
EENE 670: Systems Engineering Project (Capstone Project)

MASTER OF SCIENCE IN SYSTEMS ENGINEERING 30 CREDITS

The Master of Science in Systems Engineering provides the knowledge and skills required of systems engineers to assume a leadership role in the management of complex systems. This 30-credit, non-thesis program consists of a broad core curriculum and a set of comprehensive electives. The core curriculum equips students with the processes, techniques and tools required to practice systems engineering. Students choose electives from an engineering specialization to meet specific learning needs.

Degree Requirements

*Required Core Courses**

15 credits

EENE 660: Systems Engineering Principles
EENE 661: Systems Architecture and Design
EENE 662: Systems Modeling, Simulation and Analysis
EENE 663: Systems Implementation, Integration and Test
EENE 670: Systems Engineering Project (Capstone Project)

* All five-core courses can be applied toward the Graduate Certificate in SE or Master of Science in Electrical Engineering, Computer Science or Engineering Management.

Electives

6 credits

Students choose two courses from a range of systems engineering and related courses.

Specialized Electives

9 credits

Students choose three courses from the following specializations:

- Engineering Management
- Electrical Engineering
- Computer Engineering
- Computer Science
- Mechanical Engineering

SYSTEMS ENGINEERING TRACKS IN OTHER ENGINEERING MAJORS

M.S. in Electrical Engineering **33 credits** *(For electrical engineers)*

This program trains engineers to design systems using the systems engineering approach within an electrical engineering context.

M.S. in Computer Science **33 credits** *(For professionals with a background in IT)*

This program trains engineers and IT professionals to apply the systems engineering approach to the architecture and design of IT systems.

M.S. in Engineering Management **30 credits** *(For current or prospective systems engineering majors)*

This program combines a practical business approach with a systems engineering concentration and emphasizes how to effectively manage people and complex projects.

CORE SE COURSE DESCRIPTIONS

ENEE 660: Systems Engineering Principles [3]

This course provides the foundational framework to understand the system engineering (SE) process, selection of specialized SE tools and the execution of SE under differing design or acquisition philosophies. The course addresses: (1) SE principles (2) SE processes and methodologies (3) integration of technical disciplines and (4) SE management.

ENEE 661: System Architecture and Design [3]

This course covers the development of a system architecture and hardware/software system design within the overall systems engineering (SE) process. Major topics include development of an operational concept, functional decomposition, requirements allocation and partitioning, interface definition, inclusion of integrity, reliability, and maintainability within the design concept, validation and verification, technical performance budgeting, quality function deployment techniques, and statistical and linear models.

ENEE 662: Modeling, Simulation, and Analysis [3]

This course addresses simulation architectures. Topics addressed include cost and risk analysis; experimental design; simulation control and interfaces; requirements and architecture definition; simulation design and implementation; verification, validation, and accreditation; estimating, planning, and controlling simulation efforts.

ENEE 663: System Implementation, Integration, and Test [3]

This course covers the translation of design specifications into product elements, integration of these elements into a system, and the verification that the resulting system performs as intended in its operational environment.

ENEE 670: Systems Engineering Project [3]

This capstone course is a group project in SE. Students apply the knowledge gained in previous SE courses to demonstrate a working level of SE. The project requires a sequence of tasks to achieve an end result that incorporates the use of multiple EE domains, disciplines and tools.

ENEE 671: Service Oriented Architecture [3]

This course examines the design consequences in following SOA architectural principles. The course emphasizes the practical implementation of useful enterprise-wide systems using SOA. Working in teams, students architect, design and implement a system project via simulation of performance and behavior. As result, students gain fundamental knowledge and hands-on experience to permit them to function as individual contributors and integration leads in the context of an industrial environment.

ENEE 672: Decision and Risk Analysis [3]

This course provides an overview of decision and risk analysis techniques. It focuses on how to make rational decisions in the presence of uncertainty and conflicting objectives. It covers modeling uncertainty, the principles of rational decision-making, representing and solving decision problems using influence diagrams and decision trees, sensitivity analysis, Bayesian decision analysis, deductive and inductive reasoning, objective and subjective probabilities, probability distributions, regression analysis, defining and calculating the value of information, modeling risk attitudes and utility functions. Concepts will be illustrated through case studies and practiced by students through homework.

ADMISSION REQUIREMENTS

For any of the Systems Engineering programs, the requirements are:

- B.S. degree in Engineering or Information Technology
- Minimum undergraduate G.P.A. of 3.0 on 4.0 scale. (Students with a G.P.A. less than 3.0 may be admitted to the M.S. program provisionally or to the Graduate Certificate program.)
- Graduate Record Examination (GRE) scores are required if not a graduate from an accredited U.S. university with a GPA of 2.9 or above.

FOR MORE DETAILS

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