Doctor of Engineering in Systems Engineering (Online)

Introduction

The School of Engineering and Applied Science Online Programs offers the Doctor of Engineering (D.Eng.) degree in Systems Engineering. Classes are held on Saturdays, starting in January 2025 with a target graduation date of December 2026. Applicants should typically hold a master's degree in engineering, applied science, mathematics, computer science, information technology, or related fields from an accredited institution.

The Doctor of Engineering in Engineering Management

The D.Eng. (SE) addresses the widespread need for practitioners who can apply knowledge from the program of study in a business or technical environment. Unlike a Doctor of Philosophy degree student, whose fundamental research leads to foundational work that is published in archival professional journals and contributes to the basic understanding of the field, the D.Eng. student engages a practical problem and takes a new approach to its resolution, applying advanced systems engineering theories and practices to research and recommend a useful solution. The D.Eng. empowers the student – who is likely already a practicing engineer –to create advanced, hands-on treatments of complex systems engineering problems.

Curriculum

The curriculum comprises 48 credit hours divided into a classroom phase of 8 graduate-level, 3 credit hour courses, and a research phase during which the student writes and defends a praxis paper. The research phase requires a minimum of 24 credit hours.

Proposed Courses

EMSE 6807: Advanced Systems Engineering

EMSE 6767: Applied Data Analytics

EMSE 6817: Model-Based Systems Engineering

EMSE 8030: Risk Management

EMSE 6848: Systems of Systems

EMSE 6850: Quantitative Models in Systems Engineering

EMSE 8099: Survey of Research Formulation for Engineering Management

EMSE 8100: The Praxis Proposal

……

EMSE 8199: Praxis Research (24 credits minimum)

Classroom Phase Schedule

Course sessions last 10 weeks. Classes meet Saturday mornings from 9:00 am-12:10 pm and afternoons from 1:00-4:10 pm (all times Eastern). This program is taught in an accelerated, cohort format in which students take all courses in lockstep. Classes cannot be taken out of sequence, attendance at all class meetings is expected, and students must remain continuously enrolled; i.e., leaves of absence are permitted only in medical or family emergency, or in case of deployment to active military duty.

Session	# Courses	#Credit Hours	Tentative Dates
Spring-1 2025	2	6	January 4—March 8, 2025
Spring-1 2025	2	6	March 22—May 31, 2025
Summer 2025	2	6	June 14—August 23, 2025
Fall-1 2025	2	6	September 6—November 8, 2025

No classes on Memorial Day and Fourth of July

Research Phase Schedule (Min. 24 Credit Hours)

In order to proceed to the research phase, students must earn a grade point average of at least 3.2 in the 8 classroom courses, and no grade below B-. Upon successful completion of the classroom phase, students are registered for a minimum of 24 credit hours (ch) of EMSE 8199 Praxis Research: 3 ch in Fall 2025 (Session 2), 9 ch in Spring 2026, 3 ch in Summer 2026, and 9 ch in Fall 2026. Throughout the research phase, the student develops the praxis under the guidance of a designated faculty advisor. Faculty research advisors meet individually with students every two weeks.

Selected Research Areas for Praxis

Sample Praxis Research Areas

- Systems of Systems Architectures using System Modeling Language
- Advanced Decision Support Systems for Complex Healthcare Management
- Cyber-Physical Systems Optimization for Smart Grid Technologies
- Resilient Supply Chain Networks Design under Uncertainty
- Human-Centered Design for Autonomous Systems
- Design and Integration of Sustainable Energy Systems

Cost

All classes meet live online through synchronous distance learning technologies. Classes are recorded for future viewing. Tuition is billed at $1,650 per credit hour for the 2024-2025 year. Required digital textbooks and software are provided at no additional cost. A non-refundable tuition deposit of $995, which is applied to tuition in the first semester, is required when the student accepts admission.

Course Descriptions

See also http://bulletin.gwu.edu/courses

EMSE 6767 Applied Data Analytics: Applied and practical data analytics. High-level theory, with primary focus on practical application of a broad set of statistical techniques needed to support an empirical foundation for systems engineering and engineering management. A variety of practical visualization and statistical analysis techniques. Leveraging Minitab and Excel to examine raw data to arrive at insightful conclusions. (3 credit hours)

EMSE 6807 Advanced Systems Engineering: Analysis of advanced systems engineering topics; system lifecycle models, INCOSE Vision 2025, requirements types and processes, architectural design processes and frameworks, DoDAF artifacts, enterprise architecture and enterprise systems engineering, complex adaptive systems (CAS), modeling languages and SysML, and Model Based Systems Engineering (MBSE). Applications of systems engineering tools and techniques. (3 credit hours)

EMSE 6817 Model-Based Systems Engineering: Model-based systems engineering (MBSE) and its derivative, evidence-based systems engineering (EBSE), are techniques with strong potential for improving the technical integrity of complex systems. The foundation of these model- and research-based techniques for system definition and analysis as applied to life-cycle SE. Practical applications. (3 credit hours)

EMSE 6848 Systems of Systems: Complex systems engineering in terms of systems of systems (SoS); theoretical and practical instances of SoS; application of life cycle systems engineering processes; various types of SoS and the challenges to be faced to ensure their acquisition and technical integrity. (3 credit hours)

EMSE 6850 Quantitative Models in Systems Engineering: Quantitative modeling techniques and their application to decision making in systems engineering. Linear, integer, and nonlinear optimization models. Stochastic models: inventory control, queuing systems, and regression analysis. Elements of Monte Carlo and discrete event system simulation. (3 credit hours)

EMSE 8030 Risk Management: Risk management process; individual and collaborative responsibilities of program and engineering managers; practical applications of risk-based planning and risk management tools essential to success of any program; communicating the process and its value in avoiding catastrophic outcomes. Case studies. (3 credit hours)

EMSE 8099 Quantitative Methods in Engineering Management: Survey of quantitative research methods including overviews of mathematical programing, forecasting, simulation, and decision theory. (3 credit hours)

EMSE 8100 The Praxis Proposal: Overview of research methods. Aims and purpose of the praxis. Development of praxis research strategies, formulation and defense of a praxis proposal. Praxis proposal defense must be passed before the student is admitted to degree candidacy to undertake praxis work. Restricted to students who have completed all required coursework for the D.Eng. in the field of engineering management degree. (3 credit hours)

EMSE 8199 Praxis Research: Independent applied research in engineering management culminating in the final praxis report and final examination for the degree of Doctor of Engineering. May be repeated for credit. Restricted to students in the D.Eng. in the field of engineering management program. (24 credit hours)