Introduction
This School of Engineering and Applied Science Online Programs Office (SEAS-OP) weekend program leads to award of the Doctor of Engineering (D.Eng.) degree in Engineering Management. A group of about 25-30 students will begin study as D.ENG. COHORT 12 (DN12) August 2020 with a target graduation date of August 2022. Under the direction and supervision of Professor Shahram Sarkani, Ph.D., P.E., EMSE-OP Director, professionals who are employed full-time pursue study and research in an intense, focused environment alongside like-minded fellow students.

The Doctor of Engineering Management
The D.Eng. (EM) 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 engineering management theories and practices to recommend a useful solution. Research toward the D.Eng. is applied, rather than basic. The D.Eng. empowers the student – who is likely already to be a practicing engineer – to create advanced, hands-on treatments of complex engineering management problems.

Curriculum
The curriculum comprises 45 credit hours divided into a classroom phase of 10 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 15 credit hours.

Ten Proposed Courses
- EMSE 6045 International Technology Commercialization
- EMSE 6992-A Special Topic: Machine Learning
- EMSE 6115 Uncertainty Analysis for Engineers
- EMSE 6025 Entrepreneurship and Technology
- EMSE 6765 Data Analysis for Engineers and Scientists
- EMSE 8030 Risk Management Process for the Engineering Manager
- EMSE 8099 Survey of Research Formulation for Engineering Management
- EMSE 6710 Applied Optimization Modeling
- EMSE 8100 The Praxis Proposal
- EMSE 6992-B Special Topic: Lean Six Sigma for Engineering Manager

Course work culminates in the praxis proposal, a research report that proposes a practice-based solution – to a problem of the student’s own choosing – that could be used by practicing engineers.

Classroom Phase Schedule
Course sessions last 10 weeks. Classes meet Saturday mornings from 9:00 am-12:00 pm and afternoons from 1:00-4:00 pm (all times Eastern). This program is taught in an accelerated, cohort format in which students take all courses in lock step. 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.

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<tr>
<th>Session</th>
<th>#Courses</th>
<th>#Credit Hours</th>
<th>Tentative Dates</th>
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<tr>
<td>Fall-1 2020</td>
<td>2</td>
<td>6</td>
<td>August 8 –October 10, 2020</td>
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<td>Fall- 2 2020</td>
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<td>Spring-1 2021</td>
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<td>Spring-2 2021</td>
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<td>March 27 – May 29, 2021</td>
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<td>Summer 2021</td>
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<td>June 12 – August 21, 2021</td>
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* No classes the week of Independence Day, Thanksgiving, Winter Break
Research Phase (Min. 15 Credit Hours)
To be admitted to candidacy for the D.Eng. degree, the student must earn a grade point average of at least 3.2 in the 10 classroom courses, and no grade below B-. Upon successful completion of the classroom phase, students are registered for a minimum of 15 credit hours of EMSE 8199 Praxis Research: 6 ch in Fall 2021, 6 ch in Spring 2022 and 3 ch in Summer 2022. A single semester extension through Fall 2022 (6 ch) may be granted. Students who do not successfully complete the requirements will have their work transferred to a professional degree program. Throughout the research phase, the student develops the praxis on an advisor-approved topic related to engineering management. Faculty research directors meet at least monthly with the students, who are expected to attend each meeting. Work on the praxis is completed in one year.

Research Areas For Praxis
With the advisors’ consent, the student may elect to focus on an area within the Engineering Management field. Below, find sample published D.Eng. praxis paper titles:
- A Technology Maturity Assessment of Sustainment-Dominated Systems under the Influence of Obsolescence
- Planning for the Influence of Emerging Disruptive Technologies on IT Systems
- A Generalized Approach to Measure and Predict Innovation Maturity Progression Aligned to Business Objectives
- Identifying and Overcoming the Barriers to Cloud Adoption within the Government Space

Cost
All classes meet live online through synchronous distance learning technologies. Classes are recorded for future viewing. Tuition is billed at $1550 per credit hour for the 2020-2021 year. Required textbooks and software are provided at no additional cost. A non-refundable tuition deposit of $1550, 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/.

EMSE 6025 Entrepreneurship and Technology. Concepts and methods associated with starting an entrepreneurial venture: organization design, team building, protection of intellectual property, strategies for developing and marketing a technology product; financial, legal, and market valuation issues and methods for a start-up venture.

EMSE 6045 International Technology Commercialization. The process of moving ideas to commercial reality in an international setting. Interdisciplinary approach that weaves together study of international and organizational cultures and dynamics, with the disciplines of analytics, engineering management, entrepreneurship, marketing, and technology forecasting, to commercialize innovations of technology.

EMSE 6115 Uncertainty Analysis for Engineers. Basics of probability theory and statistics, with a focus on engineering applications, particularly in the realm of systems. Topics include simulation, uncertainty analysis, central limit theorem, systems examination and analysis, and application to systems design and management.

EMSE 6710 Applied Optimization Modeling Analysis of linear, integer, and nonlinear optimization models of decision problems that arise in industry, business and government. Modeling Techniques and applications; use of optimization software to solve models

EMSE 6765 Data Analysis for Engineers and Scientists. Design of experiments and data collection. Regression, correlation, and prediction. Multivariate analysis, data pooling, data compression. Model validation.

EMSE 6992-A Special Topics: Machine Learning. A broad introduction to fundamental concepts and techniques in machine learning from the perspective of the systems engineer. The field of machine learning explores algorithms that can learn from examples (e.g. experience) without pre-programmed rules or that can make predictions based on automated analysis of prior data. This course provides students with knowledge of the theory and practice of machine learning leveraging an open source framework to explore the ideas, algorithms and techniques, without a prior background in programming. Topics covered in the course include the relationship between Data Mining and Machine Learning, Machine Learning and Statistics, Fundamental concepts (preparing/cleansing input data, attribute selection, sampling), linear models, clustering, training/testing/cross-validation, decision trees, probabilistic methods, deep learning, auto-encoders, convolutional neural networks and ensemble learning methods.

EMSE6992-B Lean Six Sigma for the Engineering Manager. Overview of Six Sigma concepts and methodologies, with a focus on solving novel Engineering Management problems using the DMAIC process. Review of typical tools and methods will be included, using Minitab. Also fundamentals of Lean will be reviewed, focusing on improving efficiency and waste reduction.

EMSE 8030 Risk Management Process for the Engineering Manager. 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.

EMSE 8099 Survey of Research Formulation of Engineering Management. Researching the praxis paper. Introduces the design of research studies in applied engineering management settings from a practical perspective. Fundamentals of applied research, formulating research questions/hypotheses and research designs from empirical data. Restricted to students in the D.Eng. in the field of engineering management program.

EMSE 8100 The Praxis Proposal. Overview of research methods. Aims and purposes 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.

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 who have passed the praxis proposal defense.

The University reserves the right to adjust course offerings, schedules, and tuition rates.