

# SYSTEMS ENGINEERING, MASTER OF SCIENCE

## Admission Requirements

Applicants must meet the general requirements for admission to graduate study, as outlined in the Admission Requirements (<https://e-catalogue.jhu.edu/engineering/engineering-professionals/admission-requirements/>). A minimum of one year of relevant full-time work experience in the field is required, and a detailed work résumé and transcripts from all college studies must be submitted. Admitted students typically have earned a grade point average of at least 3.0 on a 4.0 scale (B or above) in the latter half of their undergraduate studies. When reviewing an application, the candidate's academic and professional background will be considered.

The Systems Engineering program offers two degree distinctions—a Master of Science in Engineering (MSE) and a Master of Science (MS). In order to be admitted into the MSE program, applicants need to hold a degree issued by a program accredited by the Engineering Accreditation Commission (EAC) of ABET (<https://www.abet.org/>). Students admitted without a Bachelor of Science degree from an EAC of ABET-accredited program (or who did not complete the prerequisites that meet all of the EAC of ABET-accreditation requirements for the attainment of student outcomes and for sufficient math, science, and engineering design at the Bachelor of Science level) will receive a regionally accredited Master of Science degree. There is no difference in the curriculum for the MSE and MS programs.

## Program Requirements

Ten courses must be completed within five years. The curriculum consists of seven or eight core courses and two or three electives, depending on whether the master's project or the master's thesis is selected. Elective courses do not need to be from the same focus area.

Only one C-range grade (C+, C, or C–) can count towards the master's degree. All course selections outside of the Systems Engineering program requirements are subject to advisor approval.

## Courses

### Required Courses for Master's Degrees

Code	Title	Credits
<b>Required Courses</b>		
EN.645.662	Introduction to Systems Engineering	3
EN.645.667	Management of Systems Projects	3
EN.645.764	Software Systems Engineering	3
EN.645.767	System Conceptual Design	3
EN.645.768	System Design & Integration	3
EN.645.769	System Test & Evaluation	3
EN.645.800	Systems Engineering Master's Project	3-6
or EN.645.801 & EN.645.802	Systems Engineering Master's Thesis and Systems Engineering Master's Thesis	

### Electives

Customize your program of study by selecting three electives from one or more of the following focus areas:<sup>1</sup>

Systems (p. 1)

Cybersecurity (p. 1)

Human Systems (p. 1)

Modeling and Simulation (p. 2)

Project Management (p. 2)

Software Systems (p. 2)

<sup>1</sup> Students who take the two-semester thesis option only select two from the list of courses by focus area. Other JHU/WSE courses may be accepted as electives with the approval of the student's advisor. The focus areas below represent related groups of courses that are relevant for students with interests in the selected areas.

## Focus Areas

### Systems

Code	Title	Credits
<b>Courses</b>		
EN.645.669	Systems Engineering of Deployed Systems	3
EN.645.742	Management of Complex Systems	3
EN.645.753	Enterprise Systems Engineering	3
EN.645.761	Systems Architecting	3
EN.645.766	Systems Engineering Advanced Technology	3
EN.645.771	System of Systems Engineering	3
EN.645.780	Agile Systems Engineering	3
EN.645.781	Systems Thinking and Systems Dynamics	3
EN.645.783	Systems Engineering Process Improvement	3
EN.645.784	Decision Science & Analytics in Systems Engineering	3

### Cybersecurity

Code	Title	Credits
<b>Courses</b>		
EN.635.611	Principles of Network Engineering	3
EN.635.672	Privacy Engineering	3
EN.635.673	Protecting Critical Infrastructure Against Cyber Attacks	3
EN.635.676	Cybersecurity in Information Systems	3
EN.635.682	Website Development	3
EN.635.683	E-Business: Models, Architecture, Technologies, and Infrastructure	3
EN.695.601	Foundations of Information Assurance	3
EN.695.621	Public Key Infrastructure and Managing E-Security	3
EN.695.744	Reverse Engineering and Vulnerability Analysis	3

### Human Systems

Code	Title	Credits
<b>Courses</b>		
EN.635.661	Principles of Human Computer Interaction	3
EN.645.621	Engineering and Measuring Influence	3
EN.645.650	Foundations of Human Systems Engineering	3
EN.645.651	Integrating Humans and Technology	3
EN.645.755	Methods in Human-System Performance Measurement and Analysis	3

## Modeling and Simulation

Code	Title	Credits
Courses		Credits
EN.625.603	Statistical Methods and Data Analysis	3
EN.645.631	Introduction to Model Based Systems Engineering	3
EN.645.632	Applied Analytics for Model Based Systems Engineering	3
EN.645.756	Metrics, Modeling, and Simulation for Systems Engineering	3
EN.645.757	Foundations of Modeling and Simulation in Systems Engineering	3
EN.645.758	Advanced Systems Modeling and Simulation	3
EN.645.782	Foundations of Digital and Mission Engineering	3

## Project Management

Code	Title	Credits
Courses		Credits
EN.595.662	Technical Organization Management	3
EN.595.665	Strategic Communications in Technical Organizations	3
EN.595.676	Finance, Contracts, and Compliance for Technical Professionals	3
EN.595.727	Advanced Concepts in Agile Technical Management	3

## Software Systems

Code	Title	Credits
Courses		Credits
EN.605.604	Object-Oriented Programming with C++	3
EN.605.607	Agile Software Development Methods	3
EN.605.608	Software Project Management	3
EN.605.704	Object-Oriented Analysis and Design	3
EN.605.705	Software Safety	3
EN.605.708	Tools and Techniques of Software Project Management	3

Please refer to the course schedule (<https://ep.jhu.edu/courses/>) published each term for exact dates, times, locations, fees, and instructors.

## Learning Outcomes

### JHU Systems Engineering Program Educational Objectives

Within 2–5 years after graduation, Master of Science in Engineering in Systems Engineering graduates of Johns Hopkins University will:

1. Attain programmatic or technical leadership roles in systems engineering or the management of complex systems.
2. Employ systems engineering methods and tools throughout the life cycle of complex systems.

### JHU Systems Engineering Student Outcomes

Upon completing the Master of Science in Engineering in Systems Engineering Program, students will be able to:

1. Apply technical knowledge in mathematics, science, and engineering to lead the realization and evaluation of complex systems and systems of systems.
2. Demonstrate the ability to conceive of, gather user needs and requirements for, design, develop, integrate, and test complex systems by employing systems engineering thinking and processes within required operational and acquisition system environments.
3. Understand and utilize the life cycle stages of systems development from concept development through manufacturing and operational maintenance.
4. Lead and participate in interdisciplinary teams to manage the cost-effective systems.
5. Communicate complex concepts and methods in spoken and written format.
6. Demonstrate awareness and capability in employing tools and techniques in the systems engineering process.