

# INFORMATION SYSTEMS ENGINEERING, MASTER OF SCIENCE

Customize your online master's degree in Information Systems Engineering as part of the Johns Hopkins Engineering for Professionals program and select from focus areas that span multiple disciplines. Narrow your focus to Enterprise Engineering, Software Engineering, Data Engineering, Intelligent Systems Engineering, Human-Computer Engineering, Internet of Things, Cyber Security, and Project Management. With senior executives from the Johns Hopkins Physics Lab and other industry leaders as key faculty members, prepare to:

- Design, build, deploy, and maintain complex and dynamic information systems that are powered by modern artificial intelligence and machine learning algorithms
- Engineer and manage the lifecycle of real-world systems of systems
- Assure the performance and accuracy of high-stakes and time-critical systems that are complicated by the unpredictability of intelligent components
- Develop collaborative human-machine teams to gain insights from information, make decisions, and achieve goals
- Secure applications that exist in highly-connected and vulnerable cyber ecosystems
- Learn on your terms and select a flexible course schedule in a format that works best for you

A focus area must be chosen for this program.

- **Enterprise Engineering:** Understand the principles of engineering complex information systems
- **Software Engineering:** Discover the principles of engineering and assuring large software systems that include intelligent components
- **Data Engineering:** Learn to engineer large data systems to enable sensemaking and decision support
- **Intelligent Systems Engineering:** Understand the uses of artificial intelligence and machine learning in large-scale information systems
- **Human-Computer Interaction:** Study how to make information systems work best for people through data visualization, human systems engineering, and more
- **Internet of Things:** Learn the principles of employing the internet of things to achieve enterprise capabilities
- **Cybersecurity:** Master the art of securing your information system infrastructure from cyber exploits
- **Project Management:** Learn to manage complex information systems projects

## Admission Requirements

Applicants (degree-seeking and special student) must meet the general requirements for admission (<https://e-catalogue.jhu.edu/engineering/engineering-professionals/admission-requirements/>) to graduate study. The applicant's prior education must include the following prerequisites:

1. One year of college math (2 semesters or 3 quarters) which must include Discrete Mathematics or Calculus;

2. One semester/term of Java (C++ will be accepted but the student must be knowledgeable in Java);

3. One semester/term of Data Structures is conditionally required for those students seeking to take selected courses from Computer Science and Cybersecurity that require Data Structures.

Applicants whose prior education does not include the prerequisites listed above may still enroll under provisional status, followed by full admission status once they have completed the missing prerequisites. Missing prerequisites may be completed with Johns Hopkins Engineering (all prerequisites are available) or at another regionally accredited institution. 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. Applicants may submit a detailed resume if they would like their academic and professional background to be considered.

## Program Requirements

Ten courses must be completed within five years. Students are required to choose a focus area to follow. The curriculum consists of three foundation courses and five courses from the Information Systems Engineering program courses, which include selected courses from Information Systems Engineering (EN.635.xxx), Computer Science (EN.605.xxx), Cybersecurity (EN.695.xxx), Systems Engineering (EN.645.xxx), and Engineering Management (EN.595.xxx) programs as listed throughout the Courses section. At least three courses must be from the same focus area, at least three courses must be at the 700-level, and at least one 700-level course must be in the chosen focus area. Up to two electives may be selected from other programs. Course selections outside of the lists below are subject to advisor approval. Transfer courses will be considered electives. Transfer courses must meet all general Engineering for Professionals requirements for transfer, must be directly applicable to Information Systems Engineering, and will be considered on a case-by-case basis. Only **one** C-range grade (C+, C, or C-) can count toward the master's degree.

Graduate students who are not pursuing a master's degree in Information Systems Engineering should consult with their advisor to determine which courses must be successfully completed before 600- or 700-level courses may be taken.

## Courses

Code	Title	Credits
<b>Prerequisites (or approved equivalent) <sup>1</sup></b>		
EN.605.201	Introduction to Programming Using Java	3
EN.605.202	Data Structures <sup>2</sup>	3
EN.605.203	Discrete Mathematics	3
EN.605.206	Introduction to Programming Using Python	3

### Foundation Courses

Students working toward a master's degree in Information Systems Engineering are required to take the following three foundation courses before taking any other courses: <sup>3</sup>

EN.605.601	Foundations of Software Engineering	3
EN.635.601	Foundations of Information Systems Engineering	3
EN.695.601	Foundations of Information Assurance	3

### Focus Areas

Select one of the following Focus Areas:

Cybersecurity (p. 2)

Data Engineering (p. 2)

Enterprise Engineering (p. 2)
Human-Computer Engineering (p. 2)
Intelligent Systems Engineering (p. 2)
Internet of Things (p. )
Project Management (p. 3)
Software Engineering (p. 3)
Independent Study and Special Topics (p. 3)

<sup>1</sup> Applicants whose prior education does not include the prerequisites listed under Admission Requirements may still be admitted under provisional status, followed by full admission once they have completed the missing prerequisites. All prerequisite courses beyond calculus are available at Johns Hopkins Engineering. These courses do not count toward the degree or certificate requirements.

<sup>2</sup> One semester/term of Data Structures is conditionally required for those students seeking to take selected courses from Computer Science and Cybersecurity that require Data Structures.

<sup>3</sup> One or more foundation courses can be waived by the student's advisor if a student has received an A or B in equivalent graduate courses. In this case, the student may replace the waived foundation courses with the same number of other graduate courses and may take these courses after all remaining foundation course requirements have been satisfied.

## Courses by Focus Area

The focus areas offered represent related groups of courses that are relevant for students with interests in the selected areas. Students are required to choose a focus area to follow and to take at least three courses from the selected focus area, including at least one 700-level course. The focus areas are presented as an aid to students in planning their course selections and are only applicable to students seeking a master's degree. They do not appear as official designations on a student's transcript or diploma.

### Cybersecurity

*This focus area requires Data Structures.*

Code	Title	Credits
EN.635.673	Protecting Critical Infrastructure Against Cyber Attacks	3
EN.635.775	Cyber Operations, Risk, and Compliance	3
EN.605.602	Software Analysis and Design	3
EN.605.731	Survey of Cloud Computing Security	3
EN.695.611	Embedded Computer Systems-Vulnerabilities, Intrusions, and Protection Mechanisms	3
EN.695.612	Operating Systems Security	3
EN.695.614	Security Engineering	3
EN.695.615	Cyber Physical Systems Security	3
EN.695.621	Public Key Infrastructure and Managing E-Security	3
EN.695.622	Web Security	3
EN.695.642	Intrusion Detection	3
EN.695.712	Authentication Technologies	3
EN.695.721	Network Security	3

### Data Engineering

Code	Title	Credits
EN.605.641	Principles of Database Systems	3
EN.605.643	Linked Data and the Semantic Web	3

EN.605.644	XML Design Paradigms	3
EN.685.652	Data Engineering Principles and Practice	3
EN.605.741	Large-Scale Database Systems	3
EN.605.744	Information Retrieval	3
EN.605.788	Big Data Processing Using Hadoop	3

### Enterprise Engineering

Code	Title	Credits
EN.635.632	Engineering Data Intensive Systems	3
EN.635.672	Privacy Engineering	3
EN.595.758	Data Science for the Technical Leader	3
EN.605.609	DevOps and Secure Software Development	3
EN.605.611	Foundations of Computer Architecture	3
EN.605.702	Service-Oriented Architecture	3
EN.605.705	Software Safety	3
EN.605.716	Modeling and Simulation of Complex Systems	3
EN.605.729	Formal Methods	3
EN.605.786	Enterprise System Design and Implementation	3
EN.605.789	Service API Design and Development	3
EN.645.753	Enterprise Systems Engineering	3
EN.645.757	Foundations of Modeling and Simulation in Systems Engineering	3
EN.645.761	Systems Architecting	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.695.741	Information Assurance Analysis	3
EN.695.791	Information Assurance Architectures and Technologies	3

### Human-Computer Engineering

Code	Title	Credits
EN.635.661	Principles of Human Computer Interaction	3
EN.525.747	Speech Processing	3
EN.525.786	Human Robotics Interaction	3
EN.535.691	Haptic Interface Design	3
EN.535.782	Haptic Applications	3
EN.605.646	Natural Language Processing	3
EN.605.662	Data Visualization	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

### Intelligent Systems Engineering

*This focus area requires Data Structures.*

Code	Title	Credits
EN.635.627	Intelligent Decision Support Systems	3
EN.605.645	Artificial Intelligence	3
EN.605.742	Deep Neural Networks	3
EN.695.637	Introduction to Assured AI and Autonomy	3

EN.695.715	Assured Autonomy	3
EN.695.737	AI for Assured Autonomy	3

### Internet of things

Code	Title	Credits
EN.635.611	Principles of Network Engineering	3
EN.635.711	Advanced Topics in Network Engineering	3
EN.635.775	Cyber Operations, Risk, and Compliance	3
EN.635.776	Building Information Governance	3
EN.525.678	Next Generation Mobile Networks and Security with 5G	3
EN.525.768	Wireless Networks	3
EN.605.671	Principles of Data Communications Networks	3
EN.605.674	Network Programming	3
EN.605.677	Internetworking with TCP/IP I	3
EN.605.771	Wired and Wireless Local and Metropolitan Area Networks	3
EN.605.772	Network Security Management	3
EN.605.776	Fourth Generation Wireless Communications: WiMAX and LTE	3
EN.605.777	Internetworking with TCP/IP II	3
EN.605.779	Network Design and Performance Analysis	3
EN.695.601	Foundations of Information Assurance	3
EN.695.611	Embedded Computer Systems-Vulnerabilities, Intrusions, and Protection Mechanisms	3
EN.695.614	Security Engineering	3
EN.695.634	Intelligent Vehicles: Cybersecurity for Connected and Autonomous Vehicles	3

### Project Management

Code	Title	Credits
EN.635.671	Data Recovery & Continuing Operations	3
EN.635.775	Cyber Operations, Risk, and Compliance	3
EN.635.776	Building Information Governance	3
EN.635.792	Entrepreneurship, Innovation, and Corporate Success	3
EN.595.660	Planning and Managing Projects	3
EN.605.608	Software Project Management	3
EN.605.708	Tools and Techniques of Software Project Management	3
EN.645.667	Management of Systems Projects	3
EN.645.742	Management of Complex Systems	3

### Software Engineering

*This focus area requires Data Structures.*

Code	Title	Credits
EN.635.683	E-Business: Models, Architecture, Technologies, and Infrastructure	3
EN.605.604	Object-Oriented Programming with C++	3
EN.605.607	Agile Software Development Methods	3
EN.605.621	Foundations of Algorithms	3
EN.605.629	Programming Languages	3
EN.605.635	Cloud Computing	3
EN.605.649	Introduction to Machine Learning	3
EN.605.681	Principles of Enterprise Web Development	3

EN.605.682	Web Application Development with Java	3
EN.605.683	Java Enterprise Development: Processes, Tools and Infrastructure	3
EN.605.701	Software Systems Engineering	3
EN.605.704	Object-Oriented Analysis and Design	3
EN.605.784	Enterprise Computing with Java	3
EN.605.787	Front End Web App Development	3

### Independent Study and Special Topics

Code	Title	Credits
EN.635.795	Information Systems Engineering Capstone Project	3
EN.635.801	Independent Study in Information Systems Engineering I	3
EN.635.802	Independent Study in Information Systems and Technology II	3

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