SYSTEMS ENGINEERING, BACHELOR OF SCIENCE

Many of the challenges facing modern society require not only new technological solutions, but also efficient, effective, and equitable implementations of these technologies to ensure the betterment of society. Venturing beyond the confines of traditional engineering coursework, the **Bachelor of Science degree in Systems Engineering** is trans-disciplinary and collaborative, connecting mathematics, engineering, social and physical sciences, and medicine.

The program provides students with knowledge of theory, computational methods, and research in the fundamental frameworks of optimization, network theory and uncertainty quantification, providing the tools required to envision solutions to big-picture problems in a range of applications. Examples include monitoring and modeling the COVID-19 outbreak, optimizing hospital resource allocation, optimizing equitable access to food, and designing infrastructure, energy systems, and smart cities that are interconnected, resilient to hazards, and cybersecure.

Students will gain significant experience in collaborative problem solving that will serve them well in a broad range of careers, including those related to future energy infrastructure, smart cities, decision-making in healthcare, data mining and decision making, and cybersecurity of infrastructure.

Financial Aid

Student Financial Support (https://finaid.jhu.edu/undergraduate-aid/financial-aid-at-hopkins/) will help to navigate the financial aid application process and explore the resources available to help your family pay for college now and throughout your time here. In addition, some undergraduate students are employed by departmental faculty to provide assistance on research projects.

Departmental Honors

The Whiting School of Engineering and the Department of Civil Engineering recognize students with exemplary academic records. For graduating students, these awards include General Honors and Departmental Honors:

- General Honors are awarded to students with a cumulative GPA of 3.5 or higher.
- Departmental Honors are awarded to students with a 3.75 GPA or higher in their major-specific courses.

Combined Bachelor's/Master's Programs

The Department of Civil and Systems Engineering offers two options for earning a combined bachelor's/master's degree.

One option combines a **B.S. in Systems Engineering** with a **Master of Science in Engineering (M.S.E.) in Civil or Systems Engineering***. For students who are admitted to this program, the two degrees typically require five years total to complete. Students who enroll in the combined Bachelor's/Master's program or pursue a master's degree after having earned a the B.S. in Civil Engineering at Hopkins may double-count one advanced course (400-level or higher) towards both the bachelor's and master's degrees with the permission of the master's faculty advisor. More detail on double-counting courses can be found here (https://engineering.jhu.edu/education/graduate-studies/graduate-academic-policies-procedures/).

The other option combines a **B.S. in Systems Engineering** with a Master of Science in Engineering Management (M.S.E.M.) **(**http://msem.engineering.jhu.edu/**)**. Students are required to submit a formal application through the M.S.E.M. Program (http://msem.engineering.jhu.edu/).

Students enrolled in either the B.S./M.S.E. or B.S./M.S.E.M program are awarded a Dean's Master's Fellowship, covering half their tuition, after they have completed eight semesters of undergraduate study. More information about these programs can be found at http://engineering.jhu.edu/academics/combined-bachelors-masters/. (http://engineering.jhu.edu/academics/combined-bachelors-masters/.html)

**_Effective Spring 2024, due to accreditation compliance requirements, the residential MSE (Master of Science in Engineering) in Systems Engineering has been renamed as Master of Science (MS) in Systems Engineering. Please visit_ Systems Engineering _(_https://engineering.jhu.edu/case/academics/masters-program/mse-systems-engineering/_) for additional information._

Requirements

The B.S. degree in Systems Engineering requires 127 credits in Mathematics, Basic Sciences, Humanities, Social Sciences, and Engineering courses.

Code	Title	Credits
BASIC SCIENCES		
AS.171.101	General Physics: Physical Science Major I	4
or AS.171.107	General Physics for Physical Sciences Majors (AL)	
AS.173.111	General Physics Laboratory I [1]	1
EN.560.112	Electromagnetism & Sensors Lab	1
AS.030.101	Introductory Chemistry I	3
AS.030.105	Introductory Chemistry Laboratory I	1
AS.270.103	Introduction to Global Environmental Change	3
MATHEMATICS		
AS.110.108	Calculus I (Physical Sciences & Engineering)	4
AS.110.109	Calculus II (For Physical Sciences and Engineering)	4
AS.110.202	Calculus III	4
EN.553.291	Linear Algebra and Differential Equations	4
HUMANITIES AND SOCIAL SCIENCES [2]		
Select 15 credits of H or S electives		15
SYSTEMS ENGINEERING FUNDAMENTALS		
EN.500.113	Gateway Computing: Python	3
EN.500.132	Bootcamp: Java (or other advanced programming course)	1
EN.560.100	Civilization Engineered	3
EN.560.201	Statics & Mechanics of Materials	3
EN.560.211	Statics and Mechanics of Materials Laboratory	1
EN.560.240	Uncertainty, Reliability and Decision-making	3
EN.560.250	Intro to Mathematical Decision Making	3
EN.560.255	Dynamical Systems	3
EN.560.458	Natural Disaster Risk Modeling	3
Systems Engineering Elective (e.g. Thermodynamics or Circuits or Fluid Mechanics or Control Theory)		3

ANALYTICS AND OPTIMIZATION ELECTIVES		
Analytics Elective 1 (e.g. Data Structures)		3
Analytics Elective 2 (e.g. Machine Learning)		3
Optimization Elective 1 (e.g. Intro to Optimization I)		3
Optimization Elective 2 (e.g. Intro to Network Modeling)		3
Analytics or Optimization Elective 3		3
CaSE EXPERIENCES		
EN.560.191	CaSE Collaborative	0.5
EN.560.192	CaSE Design	0.5
EN.560.291	CaSE Coding	0.5
EN.560.292	CaSE Research	0.5
EN.560.391	CaSE Careers I	0.5
EN.560.392	CaSE Careers II	0.5
CaSE PROFESSIONAL PRACTICE		
EN.560.401	Design Theory and Practice	3
EN.560.402	Integrated Design Project	3
EN.660.463	Engineering Management & Leadership	3
EN.661.110	Professional Writing and Communication	3
CaSE TECHNICAL ELECTIVES		
Technical electives are designed to provide students with opportunities to explore systems engineering in greater depth. To that end, these courses must have E distribution and be at or above the 300-level. 300-level courses with N or Q distribution may be allowed with the faculty advisor's permission.		9
FREE ELECTIVES		
Select 18 credits of free electives		18
Total Credits		**127**

[1] If a student earns AP credit for Physics I, they MUST still take either General Physics Lab I (173.111) or another 1 credit N laboratory course.

[2] This Whiting School requirement recognizes that human-centered engineering design relies not only on strong technical skills, but on an understanding of the humanities and social sciences as well. Any five 3-credit H or S elective courses may be used to fulfill this requirement.   See the Distribution tab in the Requirements for a Bachelor's Degree (https://e-catalogue.jhu.edu/ksas-wse/undergraduate-policies/academic-policies/requirements-bachelors-degree/)section for two exceptions to the rule that each H/S distribution course is at least 3 credits. (Note that because Professional Writing & Communication has an S distribution credit, only 15 credits are required here, as opposed to the reported 18 required by the Whiting School).

Additional Notes:

- No required courses may be taken as Satisfactory/Unsatisfactory (S/U)
- A maximum of 3 credits from the Humanities and Social Science (H/S) requirements may be taken S/U
- Technical electives may be taken S/U only with the approval of the advisor.
- No more than two grades of D in the required engineering and technical electives may be counted

Sample Program

Please visit Civil and Systems Engineering website - https://engineering.jhu.edu/case/

First Year

Fall	Credits	Spring	Credits
AS.030.101	3	AS.171.101	4
AS.030.105	1	AS.173.111	1
AS.110.108	4	AS.110.109	4
EN.560.100	3	EN.500.113	3
EN.560.191	0.5	EN.560.112	1
Free Elective	3	EN.560.192	0.5
Optional HEART course or First Year Seminar	0-3	EN.661.110	3
	14.5-17.5		**16.5**

Second Year

Fall	Credits	Spring	Credits
EN.553.291	4	EN.500.132 (or other advanced programming course)	1
EN.560.201	3	EN.560.250	3
EN.560.211	1	EN.560.255	3
EN.560.240	3	EN.560.292	0.5
EN.560.291	0.5	Systems Engineering Elective (e.g. Thermodynamics, Circuits, Fluid Mechanics, or Control Thry)	3
H/S Elective	3	H/S Elective	3
Free Elective	3	Free Elective	3
	17.5		**16.5**

Third Year

Fall	Credits	Spring	Credits
AS.110.202	4	EN.560.392	0.5
AS.270.103	3	Analytics or Optimization Elective	3
EN.560.391	0.5	Analytics or Optimization Elective	3
Analytics or Optimization Elective	3	CaSE Technical Elective	3
H/S Elective	3	H/S Elective	3
Free Elective	3	Free Elective	3
	16.5		**15.5**

Fourth Year

Fall	Credits	Spring	Credits
EN.560.401	3	EN.560.402	3
EN.660.463	3	EN.560.458	3
CaSE Technical Elective	3	CaSE Technical Elective	3
Analytics or Optimization Elective	3	Free Elective	3

Analytics or Optimization Elective	3	Free Elective	3
	15		**15**

Total Credits 127-130