BACHELOR OF SCIENCE WITH A MAJOR IN SYSTEMS ENGINEERING

The bachelor of science with a major in systems engineering degree program provides students with a broad and solid education in the basics of mathematical modeling, software and information systems, and the treatment of uncertainty. Systems engineering can be applied in many areas, including communications, energy, environment, finance, health care, information technology, marketing, national defense, project management, software development, and transportation. The program emphasizes analytical thinking and fosters communication skills and awareness of the current professional world in order to prepare students for graduate education or productive professional employment.

Bachelor of Science with a Second Major in Systems Engineering

Any undergraduate student who is enrolled at GW may declare a second major in systems engineering only if their primary degree is a Bachelor of Science. The student must complete all degree requirements for the Bachelor of Science in systems engineering, including SEAS general, major, technical electives, humanities/social science, and SEAS/technical GPA requirements. Students enrolled in other bachelor's degree programs (e.g., BA, BBA, BFA) are required to complete the major as a double degree (http://bulletin.gwu.edu/university-regulations/#DDegrees).

Graduation grade-point average criteria:
To satisfactorily complete a second major in electrical engineering, a student must have a minimum grade-point average of 2.2 in all technical engineering courses outlined in the fifth, sixth, seventh, and eighth semesters of the curriculum.

Visit the program website (http://www.emse.seas.gwu.edu/bachelor-science-systems-engineering) for additional information.

Requirements

The following requirements must be fulfilled:

• Completion of a total of 129 credits as outlined below.
• Completion of an appropriate internship/co-op experience during the last two years of the program. This requirement may be satisfied by an approved full-time summer position after the second or third year, or by one or two approved part-time positions requiring 15 to 20 hours of work per week during two of the final four semesters. The position may be paid or unpaid. A position obtained through the GW Career Center (http://gwired.gwu.edu/career) usually is acceptable. Consult the faculty advisor for approval.

• A minimum technical GPA of 2.2 and SEAS GPA of 2.0. All technical courses taken during the fifth through eighth semesters, as outlined by the 4-year curriculum sheet respective to each major and approved by the student’s faculty advisor, are counted towards the student’s technical GPA.
• Completion of an approved technical minor that uses the five professional electives courses built into the curriculum.

Plan of Study
The plan of study lists in sequence all course requirements for the degree. Students should review this information carefully and speak to their advisor before changing the sequence of any of these courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EMSE 1001</td>
<td>Introduction to Systems Engineering</td>
<td>1</td>
</tr>
<tr>
<td>MATH 1231</td>
<td>Single-Variable Calculus I</td>
<td>3</td>
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<tr>
<td>SEAS 1001</td>
<td>Engineering Orientation</td>
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<tr>
<td>UW 1020</td>
<td>University Writing</td>
<td>4</td>
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<tr>
<td>Science elective</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Computing track elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Second semester</td>
<td></td>
<td></td>
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<tr>
<td>COMM 1040</td>
<td>Public Communication</td>
<td>3</td>
</tr>
<tr>
<td>or COMM 1041</td>
<td>Interpersonal Communication</td>
<td></td>
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<tr>
<td>or COMM 1042</td>
<td>Business and Professional Speaking</td>
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<tr>
<td>ECON 1011</td>
<td>Principles of Economics I</td>
<td>3</td>
</tr>
<tr>
<td>MATH 1232</td>
<td>Single-Variable Calculus II</td>
<td>3</td>
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<tr>
<td>PHYS 1021</td>
<td>University Physics I</td>
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<tr>
<td>Computing track elective</td>
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<td></td>
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<tr>
<td>Third semester</td>
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<td></td>
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<tr>
<td>APSC 3115</td>
<td>Engineering Analysis III</td>
<td>3</td>
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<tr>
<td>EMSE 2801</td>
<td>Fundamentals of Systems Engineering</td>
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<tr>
<td>MATH 2233</td>
<td>Multivariable Calculus</td>
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<tr>
<td>PHYS 1022</td>
<td>University Physics II</td>
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<tr>
<td>Computing track elective</td>
<td>3</td>
<td></td>
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<tr>
<td>Fourth semester</td>
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<td></td>
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<tr>
<td>EMSE 2705</td>
<td>Mathematics in Operations Research</td>
<td>3</td>
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</table>
EMSE 3815  Requirements Analysis and Elicitation  3
EMSE 4765  Data Analysis for Engineers and Scientists  3

Computing track elective  3
Humanities or social sciences elective  4

Fifth semester
APSC 2113  Engineering Analysis I  3
EMSE 3740W  Systems Thinking and Policy Modeling  3
EMSE 3850  Quantitative Models in Systems Engineering  3
EMSE 4755  Quality Control and Acceptance Sampling  3

Humanities or social sciences elective  4
Engineering elective  5  3

Sixth semester
EMSE 3820  Project Management for Engineering Systems  3
EMSE 3855W  Critical Infrastructure Systems  3
EMSE 4410  Engineering Economic Analysis  3
EMSE 4770  Techniques of Risk Analysis and Management  3
PHIL 2135  Ethics in Business and the Professions  3

Engineering elective  5  3

Seventh semester
EMSE 3760  Discrete Systems Simulation  3
EMSE 4190  Senior Project in Systems Engineering I  3
EMSE 4710  Applied Optimization Modeling  3

Two professional electives  6  6

Eighth semester
EMSE 4191  Senior Project in Systems Engineering II  3
STAT 2183W  Intermediate Statistical Laboratory: Statistical Computing Packages  3

Three professional electives  6  9

Total Credits  129

Code  Title  Credits

Computing track electives:  3

Option One
Taken sequentially:
CSCI 1111  Introduction to Software Development  3
CSCI 1112  Algorithms and Data Structures  3
CSCI 2113  Software Engineering  3
CSCI 2441W  Database Systems and Team Projects  3

Option Two
Taken sequentially:
CSCI 1111  Introduction to Software Development  3
or CSCI 1121  Introduction to C Programming  3
or CSCI 1131  Introduction to Programming with C  3
EMSE 6574  Programming for Analytics  3
EMSE 6575  Applied Machine Learning for Analytics  3
EMSE 6577  Data-Driven Policy  3

1 Course satisfies the university general education requirement in math, science, and writing.
2 One course, or pair of courses, from the following for a total of 4 credits: BISC 111 or BISC 1115 and BISC 1125; or BISC 1112 or BISC 1116 and BISC 1126; or CHEM 1111; or CHEM 1112. Note that Honors Program students and those who have been invited to join the Scholars in Quantitative and Natural Sciences (SQNS) Program take BISC 1120 instead of BISC 1125 for the lab component.
3 Computing track elective requirements may be met with the courses in either option in the list directly above.
4 One social and behavioral sciences course and one humanities course must be selected from the University General Education Requirement (http://bulletin.gwu.edu/university-regulations/general-education) list.
5 In consultation with the faculty advisor, the student selects two approved courses with engineering topics, both offered by the same SEAS department.
6 Professional electives: Each systems engineering major will gain specific expertise in a chosen technical area by taking a five-course sequence leading to a minor from another department of the University. Technical electives are selected with the approval of the student’s academic advisor. Areas frequently chosen are computer science, economics, finance, management, mathematics, naval science, statistics, or specific
fields of engineering. Consult the advisor for other approved areas and requirements.

**Internship requirement**—All EMSE majors are required to complete an appropriate internship/co-op experience during the last two years of the program. This requirement may be satisfied by an approved full-time summer position after the second or third year, or by one or two approved part-time positions requiring 15 to 20 hours per week during two of the final four semesters. A position obtained through the GW Career Center ([http://gwired.gwu.edu/career](http://gwired.gwu.edu/career)) will usually be acceptable; the position may be either paid or unpaid. Consult the advisor for approval.