The Master of Science in Operations Research prepares students for research and professional practice associated with the formulation, analysis, and computer implementation of mathematical models for decision making. Major components include optimization, stochastic modeling, computer simulation, predictive data analytics, and application of these components to realistic and relevant operational analysis problems. Students focus their studies in a concentration area such as data analytics, financial engineering, military operations research, optimization, or stochastic modeling; students can also choose a self-defined concentration with approval of a faculty advisor.

To obtain the MS degree, students complete an approved plan of study that contains a minimum of 30 graduate credits. Appropriate courses may be transferred, with advisor approval, into this degree program. Students may also take courses through the Commonwealth Graduate Engineering Program. The program also prepares students for pursuing advanced graduate study leading to the PhD degree in Systems Engineering and Operations Research (https://catalog.gmu.edu/colleges-schools/engineering/systems-operations-research/systems-engineering-operations-research-phd/).

### Admissions & Policies

#### Admissions

To be admitted to the program, students must hold a baccalaureate degree from an accredited institution in engineering, mathematics, computer science, physical sciences, economics, or a related field. They also must have completed courses in:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113</td>
<td>Analytic Geometry and Calculus I (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>4</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>MATH 203</td>
<td>Linear Algebra</td>
<td>3</td>
</tr>
<tr>
<td>MATH 214</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>STAT 346</td>
<td>Probability for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>CS 112</td>
<td>Introduction to Computer Programming (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>4</td>
</tr>
</tbody>
</table>

Specific application deadlines and requirements (https://www2.gmu.edu/admissions-aid/apply-now/how-apply/graduate/) are available through the Office of Graduate Admissions.

### Requirements

#### Degree Requirements

Total credits: 30

Students must complete four core courses and the project (15 credits). The remaining 15 credits are electives subject to the requirements below, and can be taken in one of five concentration areas or in an individual plan approved by the student’s advisor.

#### Required Core Courses

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models</td>
<td>3</td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models</td>
<td>3</td>
</tr>
<tr>
<td>OR 568</td>
<td>Applied Predictive Analytics</td>
<td>3</td>
</tr>
<tr>
<td>OR 635</td>
<td>Discrete System Simulation</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

#### Project or Thesis (Optional)

Students must complete three credit hours of OR 699 Masters Project. Students in this course work in teams on approved applied project. A project report is submitted at the end of the semester, and a final project presentation is made to the entire faculty of the SEOR Department.

Students with the consent of a faculty adviser and departmental approval, may be approved to complete a thesis.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 699</td>
<td>Masters Project</td>
<td>3</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

#### Methods Courses

Select at least one deterministic methods and one stochastic methods course:

**Deterministic Methods Courses:**
- OR 641 Linear Programming
- OR 642 Integer Programming
- OR 643 Network Modeling
- OR 644 Nonlinear Programming
- OR 670 Metaheuristics for Optimization

**Stochastic Methods Courses:**
- OR 645 Stochastic Processes
- OR 646 Stochastic Optimization
- OR 647 Queuing Theory
OR 674  Dynamic Programming
OR 675  Reliability Analysis
SYST 664  Bayesian Inference and Decision Theory

Total Credits 6

Additional Electives
Code  Title  Credits
Select up to three additional electives from the list of allowable electives with written concurrence of the advisor 1

Total Credits 9

1 At least two of these electives must be taken from SEOR course offerings, and one of these must be OR 600-level or higher. The remaining course should be taken in an area appropriate to the student’s interests, such as operations research, systems engineering, computer science, information systems, statistics, data analytics, electrical and computer engineering, economics, mathematics or supply chain management.

The allowable elective for MS students includes:
A. Within CEC:
   o Any OR course ≥ 600 (http://catalog.gmu.edu/courses/or/)
   o Any SYST course > 500 (http://catalog.gmu.edu/courses/syst/)
   o Any STAT course ≥ 554 (http://catalog.gmu.edu/courses/stat/)
   o Any CS course ≥ 500 (http://catalog.gmu.edu/courses/cs/)
   o Any ECE course: 500 but not 528 (http://catalog.gmu.edu/courses/ece/)
   o Any CEIE course: > 500 but not 601 (http://catalog.gmu.edu/courses/ceie/)
B. External to CEC (subject to approval by the Department Chair):
   o Any MATH course > 601 and permitted for Math majors (http://catalog.gmu.edu/courses/math/)
   o Any CSI course > 610 (http://catalog.gmu.edu/courses/csi/)
   o Any ECON course ≥ 611 (http://catalog.gmu.edu/courses/econ/)

Concentrations
Students may construct concentration areas by choosing electives from among special groupings. The six concentrations available are data analytics, decision analysis, financial engineering, military operations research, optimization, and stochastic modeling. In addition to the required core courses (12 credits) and project course (3 credits), the remaining 15 credit hours consist of methods and elective courses associated with the concentration areas as outlined below. Students can also devise their own grouping of electives subject to prior approval of their advisor.

Available Concentrations
• Concentration in Data Analytics (DNIC)
• Concentration in Financial Engineering (FNNE)
• Concentration in Military Operations Research (MOR)
• Concentration in Optimization (OPT)
• Concentration in Stochastic Models (STM)

Concentration in Data Analytics (DNIC)
Code  Title  Credits
Students concentrating in data analytics must complete the following:
CS 504  Principles of Data Management and Mining  3

Concentration in Financial Engineering (FNNE)
Code  Title  Credits
OR 588  Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives  3
OR 688  Financial Systems Engineering II: Derivative Products and Risk Management  3
Select one from the following:  3
OR 538  Analytics for Financial Engineering and Econometrics
SYST 548  Technologies and Security for Cryptocurrencies and Financial Transactions
OR 645  Stochastic Processes
OR 671  Judgment and Choice Processing and Decision Making
OR 681  Decision and Risk Analysis
OR 682  Computational Methods in Engineering and Statistics

Students must also complete:
One deterministic methods course
One stochastics methods course 1

Total Credits 15

1 If the student has already taken OR 645 Stochastic Processes this can be substituted for an elective course with written concurrence of the student’s advisor.

Concentration in Military Operations Research (MOR)
Code  Title  Credits
OR 651  Military Operations Research I: Cost Analysis  3
OR 652  Military Operations Research Modeling II: Effectiveness Analysis  3
SYST 683  Modeling, Simulation, and Gaming  3

One deterministic methods course
One stochastics methods course

Total Credits 15

Concentration in Optimization (OPT)
Code  Title  Credits
Select three courses from the following:  9
OR 604  Practical Optimization
Dual Degree Options

Operations Research and Statistical Science Dual-Degree MS

This program allows students to earn an MS in Operations Research and an MS in Statistical Science (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/statistical-science-ms/) by completing 48 credits of coursework in both areas instead of the 60 that would be required if the degrees were sought independently.

Admission Requirements


MS-OPRS/STAT Dual Degree Requirements

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models</td>
<td>3</td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models</td>
<td>3</td>
</tr>
<tr>
<td>OR 635</td>
<td>Discrete System Simulation</td>
<td>3</td>
</tr>
<tr>
<td>OR 699</td>
<td>Masters Project</td>
<td>3</td>
</tr>
<tr>
<td>STAT 544</td>
<td>Applied Probability</td>
<td>3</td>
</tr>
<tr>
<td>STAT 554</td>
<td>Applied Statistics I</td>
<td>3</td>
</tr>
<tr>
<td>STAT 634</td>
<td>Case Studies in Data Analysis</td>
<td>3</td>
</tr>
<tr>
<td>STAT 652</td>
<td>Statistical Inference</td>
<td>3</td>
</tr>
<tr>
<td>STAT 654</td>
<td>Applied Statistics II</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits: 27

Elective Credits in OR Courses

Select 12 elective credits in OR courses at the 600 level, including at least one deterministic methods course and at least one stochastic methods course:

**Deterministic Methods Courses:**

- OR 641 Linear Programming
- OR 642 Integer Programming
- OR 643 Network Modeling
- OR 644 Nonlinear Programming
- OR 670 Metaheuristics for Optimization

**Stochastic Methods Courses:**

- OR 645 Stochastic Processes
- OR 646 Stochastic Optimization
- OR 647 Queuing Theory
- OR 674 Dynamic Programming
- OR 675 Reliability Analysis
- SYST 664 Bayesian Inference and Decision Theory

Total Credits: 12

Elective Credits in STAT Courses

Select 9 elective credits from any STAT courses numbered 540-775

Total Credits: 9

Notes

- Students currently enrolled in one of the MS programs must declare pursuit of the dual MS within one year of matriculation into the first MS program.
- A maximum of 6 credits across the two disciplines may be in independent research (thesis). The requirements for independent research are the same as detailed for the associated MS program.
- Students in either the BS (selected)/Operations Research, Accelerated MS program or the BS (selected)/Statistical Science, Accelerated MS program (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/statistical-science-ms/#acceleratedmasterstext) cannot get a reduction of 6 credits toward this dual degree. Students who want to proceed to a PhD degree will only be able to waive the number of credits specified in the associated PhD degree requirements, even though they will have 48 credits at the MS level.
• If a student decides not to complete the required 48 credits, a single MS degree will not be granted unless the student fulfills the requirements for the MS in Operations Research or the MS in Statistical Science (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/statistics/statistical-science-ms/).

• Once a student receives one of the MS degrees from either department, the student will no longer be eligible for the reduction in credit (i.e., will need to complete 30 credits) if the student later decides to earn the other MS degree.

**Accelerated Master's**

**Bioengineering, BS/Operations Research, Accelerated MS**

**Overview**

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Bioengineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/bioengineering/bioengineering-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 140 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP.6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

**BAM Pathway Admission Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Bioengineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/bioengineering/bioengineering-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

**Accelerated Master's Admission Requirements**

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

• An overall GPA of at least 3.3

• Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

**Accelerated Pathway Requirements**

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master's level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

• Students selecting up to two courses (6 credits) of approved master's level courses may select from the Bioengineering courses given below.

• Students selecting up to three or four courses (9 or 12 credits) of approved master's level courses may select at most two courses from the Bioengineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master's degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.

• Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.

• Students must pay attention to the prerequisites required for a course, and the master's degree concentration that the course may satisfy.

Select from the following Bioengineering courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BENG 575</td>
<td>Intellectual Property, Regulatory Concepts and Product Development</td>
<td></td>
</tr>
<tr>
<td>BENG 501</td>
<td>Bioengineering Research Methods</td>
<td></td>
</tr>
<tr>
<td>BENG 514</td>
<td>Pathophysiology Research Methods</td>
<td></td>
</tr>
<tr>
<td>BENG 520</td>
<td>Biomedical Data Analytics</td>
<td></td>
</tr>
<tr>
<td>BENG 521</td>
<td>Cell and Tissue Engineering</td>
<td></td>
</tr>
<tr>
<td>or BENG 541</td>
<td>Biomaterials</td>
<td></td>
</tr>
<tr>
<td>BENG 526</td>
<td>Neural Engineering</td>
<td></td>
</tr>
</tbody>
</table>
BENG 537 Medical Image Processing
or BENG 538 Medical Imaging

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>OR 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 568</td>
<td>Applied Predictive Analytics (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master's program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

**Degree Conferral**

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor's/Accelerated Master's Transition form. At the completion of MS requirements, a master's degree is conferred.

**Civil and Infrastructure Engineering, BS/Operations Research, Accelerated MS**

**Overview**

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Civil and Infrastructure Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/civil-environmental-infrastructure/civil-infrastructure-engineering-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 139 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.

See AP6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master's degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

**BAM Pathway Admission Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master's Degree policies.

Civil and Infrastructure Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/civil-environmental-infrastructure/civil-infrastructure-engineering-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

**Accelerated Master's Admission Requirements**

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason's requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

**Accelerated Pathway Requirements**

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

- Students selecting up to two courses (6 credits) of approved master’s level courses may select from the Civil and Infrastructure Engineering courses given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master’s level courses may select at most two courses from the Civil and Infrastructure Engineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master's degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.
• Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.

• Students must pay attention to the prerequisites required for a course, and the master's degree concentration that the course may satisfy.

Select at most two from the following Civil and Infrastructure Engineering courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 501</td>
<td>Sustainable Development</td>
<td></td>
</tr>
<tr>
<td>CEIE 512</td>
<td>Structural Steel Design</td>
<td></td>
</tr>
<tr>
<td>CEIE 532</td>
<td>Foundation Design</td>
<td></td>
</tr>
<tr>
<td>CEIE 535</td>
<td>Engineering Geology</td>
<td></td>
</tr>
<tr>
<td>CEIE 540</td>
<td>Water Supply and Distribution</td>
<td></td>
</tr>
<tr>
<td>CEIE 542</td>
<td>Open Channel Flow</td>
<td></td>
</tr>
<tr>
<td>CEIE 550</td>
<td>Environmental Engineering Systems</td>
<td></td>
</tr>
<tr>
<td>CEIE 553</td>
<td>Water and Wastewater Treatment Processes</td>
<td></td>
</tr>
<tr>
<td>CEIE 557</td>
<td>Remote Monitoring Techniques for Civil Engineering Applications</td>
<td></td>
</tr>
<tr>
<td>CEIE 561</td>
<td>Traffic Engineering</td>
<td></td>
</tr>
<tr>
<td>CEIE 562</td>
<td>Urban Transportation Planning</td>
<td></td>
</tr>
<tr>
<td>CEIE 571</td>
<td>Construction Administration</td>
<td></td>
</tr>
<tr>
<td>CEIE 572</td>
<td>Building Information Modeling</td>
<td></td>
</tr>
<tr>
<td>CEIE 573</td>
<td>Legal Aspects of the Construction Process</td>
<td></td>
</tr>
<tr>
<td>CEIE 574</td>
<td>Construction Computer Application and Informatics</td>
<td></td>
</tr>
<tr>
<td>CEIE 576</td>
<td>Construction Cost Estimating</td>
<td></td>
</tr>
</tbody>
</table>

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
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<td>OR 538</td>
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<tr>
<td>OR 568</td>
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</tr>
<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

**Degree Conferral**

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student's final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.

**Computer Engineering, BS/Operations Research, Accelerated MS**

**Overview**

Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain a Computer Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/computer-engineering-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 144 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor’s degree and with satisfactory performance (grade of ‘B’ or better) in each of the graduate courses, students are given advanced standing in the master’s program.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

**BAM Pathway Admission Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor's/Accelerated Master’s Degree policies.

Computer Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/computer-engineering-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS 160/161, and PHYS 260/261 requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

**Accelerated Master's Admission Requirements**

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:
• An overall GPA of at least 3.3
• Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair.

• Students selecting up to two courses (6 credits) of approved master’s level courses may select from the Electrical and Computer Engineering courses given below.

• Students selecting up to three or four courses (9 or 12 credits) of approved master’s level courses may select at most two courses from the Electrical and Computer Engineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Note that ECE 542 can be used to meet the ECE 465 requirement for the Computer Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/computer-engineering-bs/) program. Students are highly recommended to select courses marked as core courses because it applies to the master’s degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.

• Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.

• Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

Select at most two from the following Electrical and Computer Engineering courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 505</td>
<td>Hardware Security</td>
<td></td>
</tr>
<tr>
<td>ECE 508</td>
<td>Internet of Things</td>
<td></td>
</tr>
<tr>
<td>ECE 511</td>
<td>Computer Architecture</td>
<td></td>
</tr>
<tr>
<td>ECE 512</td>
<td>Computer Architecture Security</td>
<td></td>
</tr>
<tr>
<td>ECE 516</td>
<td>Mobile Systems and Applications</td>
<td></td>
</tr>
<tr>
<td>ECE 521</td>
<td>Linear Systems and Control</td>
<td></td>
</tr>
<tr>
<td>ECE 527</td>
<td>Learning From Data</td>
<td></td>
</tr>
<tr>
<td>ECE 528</td>
<td>Introduction to Random Processes in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Electrical and Computer Engineering</td>
<td></td>
</tr>
<tr>
<td>ECE 530</td>
<td>Sensor Engineering</td>
<td></td>
</tr>
<tr>
<td>ECE 531</td>
<td>Introduction to Wireless Communications</td>
<td></td>
</tr>
<tr>
<td></td>
<td>and Networks</td>
<td></td>
</tr>
<tr>
<td>ECE 535</td>
<td>Digital Signal Processing</td>
<td></td>
</tr>
</tbody>
</table>

ECE 542  Computer Network Architectures and Protocols
ECE 545  Digital System Design with VHDL
ECE 554  Machine Learning for Embedded Systems
ECE 555  GPU Architecture and Programming
ECE 556  Neuromorphic Computing
ECE 557  Optical Fiber Communications
ECE 580  Small Spacecraft Engineering
ECE 590  Selected Topics in Engineering

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>OR 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 568</td>
<td>Applied Predictive Analytics (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.

Computer Science, BS/Operations Research, Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Computer Science, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/computer-science/computer-science-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor's degree and with satisfactory performance (grade of 'B' or better) in each of the graduate courses, students are given advanced standing in the master's program.
See AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

**BAM Pathway Admission Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor’s/Accelerated Master’s Degree policies.

Computer Science, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/school-computing/computer-science/computer-science-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and Science requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

**Accelerated Master’s Admission Requirements**

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor’s/Accelerated Master’s Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

**Accelerated Pathway Requirements**

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

- Students selecting up to two courses (6 credits) of approved master’s level courses may select from the combined Computer Science course list and Systems Engineering and Operations Research course list given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master’s level courses may select at most two courses from the Computer Science course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master’s degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.
- Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

Select at most two from the following Computer Science courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CS 540</td>
<td>Language Processors</td>
<td></td>
</tr>
<tr>
<td>CS 550</td>
<td>Database Systems</td>
<td></td>
</tr>
<tr>
<td>CS 551</td>
<td>Computer Graphics</td>
<td></td>
</tr>
<tr>
<td>CS 555</td>
<td>Computer Communications and Networking</td>
<td></td>
</tr>
<tr>
<td>CS 571</td>
<td>Operating Systems</td>
<td></td>
</tr>
<tr>
<td>CS 580</td>
<td>Introduction to Artificial Intelligence</td>
<td></td>
</tr>
<tr>
<td>CS 583</td>
<td>Analysis of Algorithms</td>
<td></td>
</tr>
<tr>
<td>CS 584</td>
<td>Theory and Applications of Data Mining</td>
<td></td>
</tr>
</tbody>
</table>

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

**Degree Conferral**

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.

**Cyber Security Engineering, BS/Operations Research, Accelerated MS Overview**

Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain a Cyber Security Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/cyber-security-engineering/cyber-security-engineering-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 144 credits.
Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor’s degree and with satisfactory performance (grade of ‘B’ or better) in each of the graduate courses, students are given advanced standing in the master’s program.

See AP.6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

**BAM Pathway Admission Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor’s/ Accelerated Master’s Degree policies.

Cyber Security Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/cyber-security-engineering/cyber-security-engineering-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

**Accelerated Master’s Admission Requirements**

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor’s/ Accelerated Master’s Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

**Accelerated Pathway Requirements**

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

- Students selecting up to two courses (6 credits) of approved master’s level courses may select from the combined Cyber Security Engineering course list and Systems Engineering and Operations Research course list given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master’s level courses may select at most two courses from the Cyber Security Engineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master’s degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.
- Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

Select at most two from the following Cyber Security Engineering courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CYSE 570</td>
<td>Fundamentals of Operating Systems</td>
<td></td>
</tr>
<tr>
<td>CYSE 580</td>
<td>Hardware and Cyber Physical Systems</td>
<td></td>
</tr>
</tbody>
</table>

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>SYST 548</td>
<td>Technologies and Security for Cryptocurrencies and Financial Transactions</td>
<td></td>
</tr>
<tr>
<td>OR 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 568</td>
<td>Applied Predictive Analytics (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

**Degree Conferral**

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must...
Accelerated Master's Transition form. At the completion of MS requirements, a master's degree is conferred.

**Electrical Engineering, BS/Operations Research, Accelerated MS**

**Overview**

Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain an Electrical Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/electrical-engineering-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 139 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor’s degree and with satisfactory performance (grade of ‘B’ or better) in each of the graduate courses, students are given advanced standing in the master’s program.

See AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

**BAM Pathway Admission Requirements**

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor’s/Accelerated Master’s Degree policies.

Electrical Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/electrical-engineering-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH, PHYS 160/161, and PHYS 260/261 requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

**Accelerated Master’s Admission Requirements**

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor’s/Accelerated Master’s Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

**Accelerated Pathway Requirements**

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair.

- Students selecting up to two courses (6 credits) of approved master’s level courses may select from the Electrical and Computer Engineering courses given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master’s level courses may select at most two courses from the Electrical and Computer Engineering course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Note that ECE 587 can be used to meet the ECE 433 requirement for the Electrical Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/electrical-computer/electrical-engineering-bs/) program. Students are highly recommended to select courses marked as core courses because it applies to the master’s degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.
- Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

Select at most two from the following Electrical and Computer Engineering courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ECE 505</td>
<td>Hardware Security</td>
<td></td>
</tr>
<tr>
<td>ECE 508</td>
<td>Internet of Things</td>
<td></td>
</tr>
<tr>
<td>ECE 511</td>
<td>Computer Architecture</td>
<td></td>
</tr>
<tr>
<td>ECE 513</td>
<td>Applied Electromagnetic Theory</td>
<td></td>
</tr>
<tr>
<td>ECE 514</td>
<td>Grid Digitization and Automation</td>
<td></td>
</tr>
<tr>
<td>ECE 516</td>
<td>Mobile Systems and Applications</td>
<td></td>
</tr>
<tr>
<td>ECE 517</td>
<td>Cyber Infrastructure of the Smart Grid</td>
<td></td>
</tr>
<tr>
<td>ECE 518</td>
<td>Power System Protection and Control</td>
<td></td>
</tr>
<tr>
<td>ECE 519</td>
<td>Power Electronics for Modern Power Systems</td>
<td></td>
</tr>
<tr>
<td>ECE 521</td>
<td>Linear Systems and Control</td>
<td></td>
</tr>
<tr>
<td>ECE 527</td>
<td>Learning From Data</td>
<td></td>
</tr>
<tr>
<td>ECE 528</td>
<td>Introduction to Random Processes in Electrical and Computer Engineering</td>
<td></td>
</tr>
<tr>
<td>ECE 530</td>
<td>Sensor Engineering</td>
<td></td>
</tr>
<tr>
<td>ECE 531</td>
<td>Introduction to Wireless Communications and Networks</td>
<td></td>
</tr>
</tbody>
</table>
ECE 532 Secure Wireless Communications and Networks
ECE 535 Digital Signal Processing
ECE 538 Medical Imaging
ECE 539 Neural Engineering
ECE 542 Computer Network Architectures and Protocols
ECE 550 System Engineering Design
ECE 552 Big Data Technologies
ECE 555 Introduction to Optical Electronics
ECE 557 Optical Fiber Communications
ECE 580 Small Spacecraft Engineering
ECE 584 Semiconductor Device Fundamentals
ECE 586 Digital Integrated Circuits
ECE 587 Design of Analog Integrated Circuits
ECE 590 Selected Topics in Engineering

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>OR 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 568</td>
<td>Applied Predictive Analytics (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

Degree Conferral
Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.

Mechanical Engineering, BS/Operations Research, Accelerated MS Overview
Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain a Mechanical Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/mechanical/mechanical-engineering-bs/) and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 139 credits.

Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor’s degree and with satisfactory performance (grade of ‘B’ or better) in each of the graduate courses, students are given advanced standing in the master’s program.

See AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements
Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor’s/Accelerated Master’s Degree policies.

Mechanical Engineering, BS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/mechanical/mechanical-engineering-bs/) students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

Accelerated Master’s Admission Requirements
The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor’s/Accelerated Master’s Transition form:

• An overall GPA of at least 3.3
• Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

Accelerated Pathway Requirements
To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students
may choose the graduate version of such elective courses to replace the

- Students selecting up to two courses (6 credits) of approved master's
  level courses may select from the combined Mechanical Engineering
  course list and Systems Engineering and Operations Research course
  list given below.
- Students selecting up to three or four courses (9 or 12 credits) of
  approved master's level courses may select at most two courses
  from the Mechanical Engineering course list and select the remaining
  courses from the Systems Engineering and Operations Research course
  list given below. Students are highly recommended to select
courses marked as core courses because it applies to the master’s
degree regardless of the graduate-level concentration chosen in
the Operations Research, MS. The undergraduate version of these
courses, if any, may not be applied toward the Operations Research,
MS. Credit may not be received for both the undergraduate and
graduate version of these courses.
- Some of the courses in the Systems Engineering and Operations
  Research course list applies only to certain concentrations in
  the Operations Research, MS program.
- Students must pay attention to the prerequisites required for a
course, and the master’s degree concentration that the course may
  satisfy.

Select at most two from the following Mechanical Engineering courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ME 521</td>
<td>Energy Transfer</td>
<td></td>
</tr>
<tr>
<td>ME 531</td>
<td>Energy Transmission</td>
<td></td>
</tr>
<tr>
<td>ME 541</td>
<td>Power Generation</td>
<td></td>
</tr>
<tr>
<td>ME 542</td>
<td>Energy Utilization</td>
<td></td>
</tr>
</tbody>
</table>

Select the remaining from the following Systems Engineering and
Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>OR 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 568</td>
<td>Applied Predictive Analytics (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate
credits may be taken as reserve graduate credit and applied to the
master’s program. Reserve graduate credits do not apply to the
undergraduate degree.

For more detailed information on coursework and timeline requirements,
see AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://
catalog.gmu.edu/policies/academic/graduate-policies/#text).

Degree Conferral

Students must apply the semester before they expect to complete the
BS requirements to have the BS degree conferred. In addition, at the
beginning of the student’s final undergraduate semester, students must
complete a Bachelor’s/Accelerated Master’s Transition form. At the
completion of MS requirements, a master’s degree is conferred.

Statistics, BS/Operations Research,
Accelerated MS

Overview

Highly-qualified undergraduates may be admitted to the bachelor’s/
accelerated master’s program and obtain a Statistics, BS (http://
catalog.gmu.edu/colleges-schools/engineering-computing/school-
computing/statistics/statistics-bs/) and an Operations Research, MS in
an accelerated time-frame after satisfactory completion of a minimum of
138 credits.

Admitted students are able to use up to 12 graduate credits in partial
satisfaction of requirements for the undergraduate degree. Upon
completion and conferral of the bachelor’s degree and with satisfactory
performance (grade of ‘B’ or better) in each of the graduate courses,
students are given advanced standing in the master’s program.

See AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://
catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies
related to this program.

Students in an accelerated degree program must fulfill all university
requirements for the master’s degree. For policies governing all graduate
degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/
academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must
meet the admission standards and application requirements for graduate
study as specified in Graduate Admissions Policies and Bachelor’s/
Accelerated Master’s Degree policies.

Statistics, BS (http://catalog.gmu.edu/colleges-schools/engineering-
computing/school-computing/statistics/statistics-bs/) students will be
considered for admission into the BAM Pathway after completion of
a minimum of 60 credits with an overall GPA of at least 3.3, and
completion of all MATH requirements. Students must additionally
complete MATH 203 Linear Algebra prior to applying for the graduate
program.

Students who are accepted into the BAM Pathway will be allowed to
register for graduate level courses after successful completion of a
minimum of 75 undergraduate credits and course-specific prerequisites.

Accelerated Master’s Admission Requirements

The criteria for admission are identical to criteria for admission to
the Operations Research, MS program. Students already admitted in
the BAM Pathway will be admitted to the Operations Research, MS program,
if they have met the following criteria, as verified on the Bachelor’s/
Accelerated Master’s Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason’s requirements for undergraduate
degree conferral (graduation) and completing the application for
  graduation.
Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

Advanced Standing course: Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree. The courses selected for this purpose must be approved by the academic advisors of both the BS and MS programs and by the SEOR department chair. For the BS programs that allow undergraduate electives from the department of system engineering and operations research, the students may choose the graduate version of such elective courses to replace the corresponding undergraduate courses.

- Students selecting up to two courses (6 credits) of approved master’s level courses may select from the combined Statistics course list and Systems Engineering and Operations Research course list given below.
- Students selecting up to three or four courses (9 or 12 credits) of approved master’s level courses may select at most two courses from the Statistics course list and select the remaining courses from the Systems Engineering and Operations Research course list given below. Students are highly recommended to select courses marked as core courses because it applies to the master’s degree regardless of the graduate-level concentration chosen in the Operations Research, MS. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.
- Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

Select from the following Statistics courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 544</td>
<td>Applied Probability</td>
<td></td>
</tr>
<tr>
<td>STAT 554</td>
<td>Applied Statistics I</td>
<td></td>
</tr>
</tbody>
</table>

Select the remaining from the following Systems Engineering and Operations Research courses:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 573</td>
<td>Decision and Risk Analysis</td>
<td></td>
</tr>
<tr>
<td>SYST 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>SYST/OR 568</td>
<td>Applied Predictive Analytics (Core)</td>
<td></td>
</tr>
<tr>
<td>SYST 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
<tr>
<td>OR 541</td>
<td>Operations Research: Deterministic Models (Core)</td>
<td></td>
</tr>
<tr>
<td>OR 542</td>
<td>Operations Research: Stochastic Models (Core)</td>
<td></td>
</tr>
</tbody>
</table>

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.

Systems and Industrial Engineering BS/Operations Research, Accelerated MS Overview

Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain a Systems and Industrial Engineering, BS and an Operations Research, MS in an accelerated timeframe after satisfactory completion of a minimum of 141 credits.

Admitted students are able to use up to 12 credits of approved advanced standing graduate courses in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor’s degree and with satisfactory performance (grade of ‘B’ or better) in each of the advanced standing graduate courses, the courses are applied to partial satisfaction of requirements for the master’s program.

See AP.6.7 Bachelor’s/Accelerated Master’s Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (http://catalog.gmu.edu/policies/academic/graduate-policies/).

BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor’s/Accelerated Master’s Degree policies.

Systems and Industrial Engineering, BS students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of at least 3.3, and completion of all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

Accelerated Master’s Admission Requirements

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program,
if they have met the following criteria, as verified on the Bachelor’s/Accelerated Master’s Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

### Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

**Advanced Standing course:** Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to four courses (12 credits) of approved master’s level courses taken as part of the undergraduate degree may be applied to the graduate degree.

These courses may be chosen from the list of graduate courses in the following table. For Systems and Industrial Engineering, BS students, these graduate courses replace the corresponding undergraduate courses listed in the table. The undergraduate version of these courses may not be applied toward the Operations Research, MS.

<table>
<thead>
<tr>
<th>Undergraduate</th>
<th>Graduate</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR 441</td>
<td>OR 541</td>
<td>Core course in the graduate program. Credit may not be received for both courses.</td>
</tr>
<tr>
<td>OR 442</td>
<td>OR 542</td>
<td>Core course in the graduate program. Credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 414</td>
<td>SYST 514</td>
<td>The course applies only to certain concentrations in the graduate program; credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 420</td>
<td>SYST 521/OR 643</td>
<td>Credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 438</td>
<td>SYST 538</td>
<td>The course applies only to certain concentrations in the graduate program; credit may not be received for both courses.</td>
</tr>
<tr>
<td>SYST 448</td>
<td>SYST 548</td>
<td>The course applies only to certain concentrations in the graduate program; credit may not be received for both courses.</td>
</tr>
</tbody>
</table>

Any other 500-level course may be applied to both the undergraduate and graduate degrees with approval of the advisor and SEOR department chair. Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees (http://catalog.gmu.edu/policies/academic/graduate-policies/#text).

### Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.

**BS (selected)/Operations Research, Accelerated MS**

**Overview**

Highly-qualified undergraduates may be admitted to the bachelor’s/accelerated master’s program and obtain a BS in their major and an Operations Research, MS in an accelerated time-frame after satisfactory completion of a minimum of 138 credits.
Admitted students are able to use up to 12 graduate credits in partial satisfaction of requirements for the undergraduate degree. Upon completion and conferral of the bachelor’s degree and with satisfactory performance (grade of ‘B’ or better) in each of the graduate courses, students are given advanced standing in the master’s program.

See AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

Students in an accelerated degree program must fulfill all university requirements for the master’s degree. For policies governing all graduate degrees, see AP6 Graduate Policies (https://catalog.gmu.edu/policies/academic/graduate-policies/).

### BAM Pathway Admission Requirements

Applicants to all graduate programs at George Mason University must meet the admission standards and application requirements for graduate study as specified in Graduate Admissions Policies and Bachelor’s/Accelerated Master’s Degree policies.

Mason undergraduate students majoring in both engineering and non-engineering disciplines will be considered for admission into the BAM Pathway if 1) such an accelerated Operations Research, MS pathway is allowable from the student’s BS program, which will be determined by the academic advisors of both the BS and MS programs and by the SEOR department chair, 2) they have completed a minimum of 60 credits with an overall GPA of at least 3.3, and 3) they have completed all MATH and PHYS requirements. Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

Students who are accepted into the BAM Pathway will be allowed to register for graduate level courses after successful completion of a minimum of 75 undergraduate credits and course-specific pre-requisites.

### Accelerated Master’s Admission Requirements

The criteria for admission are identical to criteria for admission to the Operations Research, MS program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS program, if they have met the following criteria, as verified on the Bachelor’s/Accelerated Master’s Transition form:

- An overall GPA of at least 3.3
- Successfully meeting Mason’s requirements for undergraduate degree conferral (graduation) and completing the application for graduation.

### Accelerated Pathway Requirements

To maintain the integrity and quality of both the undergraduate and graduate degree programs, undergraduate students interested in taking graduate courses must choose from the following:

- Students are highly recommended to select courses marked as core courses because it applies to the master’s degree regardless of the graduate-level concentration chosen in the Operations Research, MS program. The undergraduate version of these courses, if any, may not be applied toward the Operations Research, MS. Credit may not be received for both the undergraduate and graduate version of these courses.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Operations Research, MS program.
- Students must pay attention to the prerequisites required for a course, and the master’s degree concentration that the course may satisfy.

The courses may be chosen from the list of Systems Engineering and Operations Research graduate courses in the following table.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 521</td>
<td>Network Analysis</td>
<td></td>
</tr>
<tr>
<td>OR 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
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<tr>
<td>OR 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
<td></td>
</tr>
</tbody>
</table>

Any other 500-level course may be applied to both the undergraduate and graduate degrees with approval of the advisor and SEOR department chair.

While still in undergraduate status, a maximum of 6 additional graduate credits may be taken as reserve graduate credit and applied to the master’s program. Reserve graduate credits do not apply to the undergraduate degree.

For more detailed information on coursework and timeline requirements, see AP6.7 Bachelor’s/Accelerated Master’s Degrees (https://catalog.gmu.edu/policies/academic/graduate-policies/#text).

### Degree Conferral

Students must apply the semester before they expect to complete the BS requirements to have the BS degree conferred. In addition, at the beginning of the student’s final undergraduate semester, students must complete a Bachelor’s/Accelerated Master’s Transition form. At the completion of MS requirements, a master’s degree is conferred.