

# CYBER SECURITY ENGINEERING, BS

**Banner Code:** EC-BS-CYSE

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Cyber Security Engineering is concerned with the development of cyber-resilient systems which include the protection of physical as well as computer and network systems. It requires a proactive approach in engineering design of physical systems with cyber security incorporated from the beginning of system development. Cyber security engineering is an important quantitative methodology to be used in all industries including transportation, energy, healthcare, infrastructure, finance, government (federal, state, and local), and defense. The program is focused on the cyber security engineering of integrated cyber-physical systems. This degree provides a foundation in cyber security engineering and is most appropriate for students with a strong mathematics and science background.

## Admissions & Policies

### Policies

For policies governing all undergraduate degrees, see AP.5 Undergraduate Policies (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/>).

### Advising and Plan of Study

All cyber security engineering students are assigned a faculty advisor. With the advisor's help and approval, each student is required to complete a plan of study, which constitutes a learning plan for the degree program. The plan of study must be signed by the student's advisor and the Program Chair and be updated and signed by the advisor at least once a year.

### Change of Major

See Change of Major (<http://catalog.gmu.edu/colleges-schools/engineering-computing/#requirementspolicytext>) for more information.

### Grade Requirements

Students in the Cyber Security Engineering, BS program must complete all mathematics, science, and CEC courses with a grade of C or better.

### Termination from the Major Policy

No math, science, or College of Engineering and Computing course that is required for the major may be attempted more than three times. Those students who do not successfully complete such a course within three attempts will be terminated from the major. Undeclared students in the College of Engineering and Computing who do not successfully complete a course required for a College of Engineering and Computing major within three attempts will also be terminated.

In addition, students in the College of Engineering and Computing with evidence of continued failure to make adequate progress toward declaring or completing a College of Engineering and Computing major will be terminated from the school. Adequate progress is determined by

the major program. For more information, see AP.5.2.4 Termination from the Major (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-2-4>).

Once a student has attempted one of these courses twice unsuccessfully, the third attempt must be no later than the next semester of enrollment, excluding summers. Failure to take the course at that time will result in termination from the major. A third attempt of a College of Engineering and Computing course requires support by the student's major department as well as permission by the department offering the course. This permission is not guaranteed. If the student is unable to take the course when required, the student may request an extension to a future semester; extensions require approval of the student's advisor, their department, and the Associate Dean for Undergraduate Programs. The deadline for extension requests is the add deadline for the semester in which the course is required.

Students who have been terminated from a College of Engineering and Computing major may not register for a College of Engineering and Computing course without permission of the department offering the course. This applies to all undergraduate courses offered by the College of Engineering and Computing except IT 104 Introduction to Computing (Mason Core) (<http://catalog.gmu.edu/mason-core/>) and STAT 250 Introductory Statistics I (Mason Core) (<http://catalog.gmu.edu/mason-core/>).

A student may not declare any major in the College of Engineering and Computing if the student has previously met the termination criteria for that major at any time, regardless of what the student's major was at the time the courses were taken.

## Requirements

### Degree Requirements

Total credits: 126

#### Cyber Security Engineering Core

Code	Title	Credits
<b>Core Courses</b>		
CYSE 101	Introduction to Cyber Security Engineering	3
CYSE 130	Introduction to Computing for Digital Systems Engineering (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
CYSE 211	Operating Systems and Lab	3
CYSE 230	Computer Networking	3
CYSE 411	Secure Software Engineering	3
CYSE 421	Industrial Control Systems Security	3
CYSE 425	Secure RF Communications	3
CYSE 430	Critical Infrastructure Protection	3
CYSE 445	System Security and Resilience	3
CYSE 450	Cyber Vulnerability Lab	1
CYSE 470	Human Factors and Cyber Security Engineering	3
CYSE 476	Cryptography Fundamentals	3

CYSE 491	Engineering Senior Seminar	2
CYSE 492	Senior Advanced Design Project I	2
CYSE 493	Senior Advanced Design Project II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3

**Technical Electives**

Select 9 credits from the following approved technical courses: 9

CYSE 424	Embedded and Real Time Systems	
CYSE 460	Power Systems and Smart Grid Security	
CYSE 462	Mobile Devices and Network Security	
CYSE 465	Transportation Systems Design	
CYSE 467	GPS Security	
CYSE 477	Intrusion Detection	
CYSE 478	Cyber Security Audit and Compliance	
CYSE 479	Methods of User Authentication	
CYSE 480	Reverse Software Engineering	
CYSE 499	Special Topics in Cyber Security Engineering	

Total Credits 50

**Electrical and Computer Engineering**

Code	Title	Credits
ECE 301	Digital Electronics <sup>1</sup>	3
Total Credits		3

1

Transfer credit for ECE 231 Digital System Design & ECE 232 Digital System Design Lab will be used to fulfill the ECE 301 requirement.

**Systems Engineering**

Code	Title	Credits
SYST 205	Systems Engineering Principles	3
Total Credits		3

**Mathematics and Statistics**

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
MATH 114	Analytic Geometry and Calculus II	4
MATH 125	Discrete Mathematics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
MATH 203	Linear Algebra	3
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations	3
STAT 344	Probability and Statistics for Engineers and Scientists I	3
Total Credits		23

**Natural Sciences**

Code	Title	Credits
PHYS 160	University Physics I (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 161	University Physics I Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
PHYS 260	University Physics II (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
PHYS 261	University Physics II Laboratory (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	1
Total Credits		8

**Computing**

Code	Title	Credits
CS 112	Introduction to Computer Programming (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	4
SYST 230	Object-oriented Modeling and Design	4
CS 222	Computer Programming for Engineers	3
Total Credits		11

**Engineering**

Code	Title	Credits
ENGR 107	Introduction to Engineering (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	2
Total Credits		2

**Oral Communication and Economics**

Code	Title	Credits
COMM 100	Public Speaking (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
or COMM 101	Fundamentals of Communication (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	
ECON 103	Contemporary Microeconomic Principles (Mason Core) ( <a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a> )	3
Total Credits		6

**Remaining Mason Core**

Students must complete all Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements not fulfilled by major requirements.

Code	Title	Credits
Written Communication ( <a href="http://catalog.gmu.edu/mason-core/#written">http://catalog.gmu.edu/mason-core/#written</a> )		6
Literature ( <a href="http://catalog.gmu.edu/mason-core/#literature">http://catalog.gmu.edu/mason-core/#literature</a> )		3
Arts ( <a href="http://catalog.gmu.edu/mason-core/#arts">http://catalog.gmu.edu/mason-core/#arts</a> )		3
Global History ( <a href="http://catalog.gmu.edu/mason-core/#global-history">http://catalog.gmu.edu/mason-core/#global-history</a> )		3
Global Understanding ( <a href="http://catalog.gmu.edu/mason-core/#global">http://catalog.gmu.edu/mason-core/#global</a> )		3
Total Credits		18

## 4-Year Plan

### Bachelor of Science in Cyber Security Engineering Sample Plan of Study

Detailed four year plans and degree planning checklists can be found at <https://advising.gmu.edu/current-student/majors-at-mason/>.

## Accelerated Master's

### Cyber Security Engineering, BS/Computer Engineering, Accelerated MS

#### Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a BS in Cyber Security Engineering (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/cyber-security-engineering-bs/>) and an MS in Computer Engineering (<http://catalog.gmu.edu/colleges-schools/engineering/electrical-computer/computer-engineering-ms/>) in an accelerated time-frame after satisfactory completion of a minimum of 150 credits.

See AP.6.7 Bachelor's/Accelerated Master's Degrees (<https://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>) for policies related to this program.

This accelerated option is offered jointly by the Cyber Security Engineering Department and the Electrical and Computer Engineering Department.

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.

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of 3.0.

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

Students already admitted in the BAM Pathway will be admitted to the MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form: 3.0 overall GPA, 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 courses: Students may take up to 6 credits of graduate-level courses that will count as advanced standing (i.e., overlap between the BS/MS program) from the list below:

Code	Title	Credits
ECE 505	Hardware Security	3
ECE 508	Internet of Things	3
ECE 511	Computer Architecture	3
ECE 512	Computer Architecture Security	3
ECE 542	Computer Network Architectures and Protocols	3

These courses may be used as technical electives in the Cyber Security Engineering, BS program.

Reserve credit courses: Additional courses (up to 6 credits) may be selected from the above list as credits to be put on reserve to be later applied to the graduate program. Students can take these courses while undergraduates but these reserve courses will only count for the graduate degree program.

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/#ap-6-7>).

#### 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/Cyber Security Engineering, Accelerated MS

#### Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a BS in Cyber Security Engineering (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/cyber-security-engineering-bs/>) and an MS in Cyber Security Engineering (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/cyber-security-engineering-ms/>) in an accelerated time-frame after satisfactory completion of a minimum of 144 credits.

See AP.6.7 Bachelor's/Accelerated Master's Degree (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>) for policies related to this program.

This accelerated option is offered by the Department of Cyber Security Engineering (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/>).

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 (<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 (<http://>

catalog.gmu.edu/admissions/graduate-policies/) and Bachelor's/Accelerated Master's Degree policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

Students will be considered for admission into the BAM Pathway after completion of a minimum of 60 credits with an overall GPA of 3.0.

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

Students already admitted in the BAM Pathway will be admitted to the MS program, if they have met the following criteria, as verified on the Bachelor's/Accelerated Master's Transition form:

- 3.0 overall GPA,
- 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 Courses

Students may take up to 12 credits of graduate-level courses that will count as advanced standing (i.e., overlap between the BS/MS program) from the list below:

Code	Title	Credits
CYSE 521	Industrial Control Systems Security	3
CYSE 570	Fundamentals of Operating Systems	3
CYSE 580	Hardware and Cyber Physical Systems	3
CYSE 587	Cyber Security Systems Engineering	3

These courses may be used as technical electives in the Cyber Security Engineering, BS (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/cyber-security-engineering-bs/>) program.

For more detailed information on coursework and timeline requirements, see AP.6.7 Bachelor's/Accelerated Master's Degree policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

### Degree Conferral

Students must apply to graduate the semester before they expect to complete all BS requirements. 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 all MS requirements, a master's degree is conferred.

## Cyber Security Engineering, BS/Digital Forensics, Accelerated MS

### Overview

Highly-qualified students in the Cyber Security Engineering, BS (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/cyber-security-engineering-bs/>) have the option of obtaining an accelerated Digital Forensics, MS (<http://catalog.gmu.edu/colleges-schools/engineering/electrical-computer/digital-forensics-ms/>).

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>).

### Admission Requirements

Students in the Cyber Security Engineering, BS (<http://catalog.gmu.edu/colleges-schools/engineering/cyber-security-engineering/cyber-security-engineering-bs/>) program may apply for this option if they have earned 60 undergraduate credits with an overall GPA of at least 3.25. Criteria for admission are identical to criteria for admission to the Digital Forensics, MS (<http://catalog.gmu.edu/colleges-schools/engineering/electrical-computer/digital-forensics-ms/>) 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 Option Requirements

Students must complete all credits that satisfy requirements for the BS and MS programs, with 6 credits overlapping.

Students register for two Digital Forensics core courses (6 credits) in place of two of the three required technical electives, as part of the undergraduate degree requirements. Specifically, students must take:

DFOR 510 Digital Forensics Analysis

DFOR 660 Network Forensics

Note: Students complete all Digital Forensics, MS (<http://catalog.gmu.edu/colleges-schools/engineering/electrical-computer/digital-forensics-ms/>) core courses and apply the two courses from the above list toward the Digital Forensics, MS (<http://catalog.gmu.edu/colleges-schools/engineering/electrical-computer/digital-forensics-ms/>) requirements.

### 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 that is submitted to the Office of the University Registrar and the VSE Graduate Admissions Office. 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 and an Operations Research, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/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 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.

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 (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/>) program. Students already admitted in the BAM Pathway will be admitted to the Operations Research, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/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 (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/operations-research-ms/>). The undergraduate version of these courses, if any, may *not* be applied toward the Operations Research, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/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 (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/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:

Code	Title	Credits
CYSE 570	Fundamentals of Operating Systems	
CYSE 580	Hardware and Cyber Physical Systems	

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

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

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.

## Cyber Security Engineering, BS/Systems Engineering, Accelerated MS

### Overview

Highly-qualified undergraduates may be admitted to the bachelor's/accelerated master's program and obtain a Cyber Security Engineering, BS and a Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-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 (<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 AP.6 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.

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 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 Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/>) program. Students already admitted in the BAM Pathway will be admitted to the Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-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 Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/>) program. The undergraduate version of these courses, if any, may *not* be applied toward the Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/>). Credit may not be received for both the undergraduate and graduate version of these courses.
- Except for the courses marked as core, any course chosen from either course list can be used to satisfy SYST 505 Systems Engineering Principles core requirement in the Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/>) program.
- Some of the courses in the Systems Engineering and Operations Research course list applies only to certain concentrations in the Systems Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-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:

Code	Title	Credits
CYSE 570	Fundamentals of Operating Systems	
CYSE 580	Hardware and Cyber Physical Systems	

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

Code	Title	Credits
SYST 510	Systems Definition and Cost Modeling (Core)	
SYST 514	Systems Thinking	
SYST 520	System Engineering Design (Core)	
SYST 530	Systems Engineering Management I (Core)	
SYST 542	Decision Support Systems Engineering	
SYST 573	Decision and Risk Analysis	
SYST 538	Analytics for Financial Engineering and Econometrics	
SYST 548	Technologies and Security for Cryptocurrencies and Financial Transactions	
SYST 560	Introduction to Air Traffic Control	
SYST 563	Evidence-Based Systems Engineering	
SYST 568	Applied Predictive Analytics	
SYST 584	Heterogeneous Data Fusion	
SYST 588	Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives	

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 (<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.