

CYBER SECURITY ENGINEERING, BS

Banner Code: EC-BS-CYSE

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Fairfax Campus

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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/#requirementspoliciestext>) for more information.

Grade Requirements

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

Termination from the Major Policy

No math, science, or Volgenau School of Engineering 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 Volgenau School who do not successfully complete a course required for a Volgenau School major within three attempts will also be terminated.

In addition, students in the Volgenau School with evidence of continued failure to make adequate progress toward declaring or completing a Volgenau School 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 Volgenau School of Engineering 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 Volgenau School of Engineering major may not register for a Volgenau School course without permission of the department offering the course. This applies to all undergraduate courses offered by the Volgenau School 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 Volgenau School of Engineering 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

(Banner code updated on July 12, 2021. Formerly: VS-BS-CYSE)

Degree Requirements

Total credits: 126

Cyber Security Engineering Core

| Code | Title | Credits |
|---------------------|---|---------|
| Core Courses | | |
| CYSE 101 | Introduction to Cyber Security Engineering | 3 |
| CYSE 130 | Introduction to Computing for Digital Systems Engineering | 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) (http://catalog.gmu.edu/mason-core/) | 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 | 3 |

Total Credits 3

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) (http://catalog.gmu.edu/mason-core/) | 4 |
| MATH 114 | Analytic Geometry and Calculus II | 4 |
| MATH 125 | Discrete Mathematics I (Mason Core) (http://catalog.gmu.edu/mason-core/) | 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) (http://catalog.gmu.edu/mason-core/) | 3 |
| PHYS 161 | University Physics I Laboratory (Mason Core) (http://catalog.gmu.edu/mason-core/) | 1 |
| PHYS 260 | University Physics II (Mason Core) (http://catalog.gmu.edu/mason-core/) | 3 |

| | | |
|----------|---|---|
| PHYS 261 | University Physics II Laboratory (Mason Core) (http://catalog.gmu.edu/mason-core/) | 1 |
|----------|---|---|

Total Credits 8

Computing

| Code | Title | Credits |
|----------|--------------------------------------|---------|
| CS 112 | Introduction to Computer Programming | 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) (http://catalog.gmu.edu/mason-core/) | 2 |

Total Credits 2

Oral Communication and Economics

| Code | Title | Credits |
|-------------|--|---------|
| COMM 100 | Public Speaking (Mason Core) (http://catalog.gmu.edu/mason-core/) | 3 |
| or COMM 101 | Fundamentals of Communication (Mason Core) (http://catalog.gmu.edu/mason-core/) | |
| ECON 103 | Contemporary Microeconomic Principles (Mason Core) (http://catalog.gmu.edu/mason-core/) | 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 (http://catalog.gmu.edu/mason-core/#written) | 6 |
| | Literature (http://catalog.gmu.edu/mason-core/#literature) | 3 |
| | Arts (http://catalog.gmu.edu/mason-core/#arts) | 3 |
| | Western Civilization/World History (http://catalog.gmu.edu/mason-core/#western-civilization-world-history) | 3 |
| | Global Understanding (http://catalog.gmu.edu/mason-core/#global) | 3 |

Total Credits 18

Note:

All students must submit at least 24 credits of social science and humanities coursework, which is normally satisfied by the 24 credits of Mason Core (<http://catalog.gmu.edu/mason-core/>) social science and humanities courses listed above and with the oral communication and economics requirement.

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 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>).

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 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 program.

For more detailed information on coursework and timeline requirements, see AP6.7 Bachelor's/Accelerated Master's Degree policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>).

Cyber Security Engineering, BS/Digital Forensics, Accelerated MS

Overview

Highly-qualified students in the 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 AP6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>). For policies governing all graduate degrees, see AP6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>).

Admission Requirements

Students in the Cyber Security Engineering, BS program may apply for this option if they have earned 90 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.

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.

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/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 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.

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/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/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/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/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/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 | |
| 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 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/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 (<https://catalog.gmu.edu/colleges-schools/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 (<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 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 (<https://catalog.gmu.edu/colleges-schools/engineering/systems-operations-research/systems-engineering-ms/>) program. Students already admitted in the BAM Pathway will be admitted to the Systems Engineering, MS (<https://catalog.gmu.edu/colleges-schools/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 (<https://catalog.gmu.edu/colleges-schools/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 (<https://catalog.gmu.edu/colleges-schools/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 (<https://catalog.gmu.edu/colleges-schools/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 (<https://catalog.gmu.edu/colleges-schools/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 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 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 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.