

CIVIL AND INFRASTRUCTURE ENGINEERING, BS

Banner Code: EC-BS-CEIE

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The bachelor's degree program provides essential underpinnings in the theory and design methods of civil and infrastructure engineering for engineering practice. Students benefit from exposure to practical civil, environmental, and infrastructure engineering problems and their solutions in the classroom, lab, and field. The educational objectives of the Civil and Infrastructure Engineering program describe expectations for graduates approximately three to five years after obtaining their degree. Graduates of the program will be professionals who:

- Engage in the engineering practice of planning, designing, constructing, operating and maintaining sustainable infrastructure;
- Participate in public discussions concerning infrastructure in the urban, suburban, and exurban setting by providing professional guidance;
- Stay current through continuing education opportunities, professional conferences, graduate school, and other self-learning experiences; have the ability to obtain and maintain professional licensing.

Civil engineering students can look forward to a career in local, state, and federal government organizations, and in architectural and engineering firms that specialize in land development, transportation, water resources, environment, structures, geotechnical, construction, and other related fields. The program also prepares students for continuing graduate studies for sophisticated practice, research, and teaching.

The bachelor of science in civil and infrastructure engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>, under the General Criteria and the Civil Engineering Program Criteria.

This is a Green Leaf program (<http://catalog.gmu.edu/student-services/green-leaf-programs-courses/>).

Admissions & Policies

Policies

For policies governing all undergraduate degrees, see AP5 Undergraduate Policies (<http://catalog.gmu.edu/policies/academic/undergraduate-policies/>).

Change of Major

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

Program Requirements

Degree requirements include 121 credits distributed in three main areas: mathematics and basic science, humanities and social sciences, and civil engineering analysis and design. Students must complete all math,

science and College of Engineering and Computing courses presented as part of the required 121 credits for the degree with a grade of C or better.

The prerequisite structure for these courses is extensive. Sample schedules, available from the department, provide a comprehensive listing of major and Mason Core requirements and serve as a guide to the progression of the courses to satisfy all prerequisites.

Students are required to see their academic advisor at least once each year to plan their curriculum, and to develop an approved plan of study, which constitutes a learning plan for the degree program.

Termination from the Major

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 AP5.2.4 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: 121-123

This is a Green Leaf program.

Code	Title	Credits
CEIE 101	Introduction to Civil Engineering	2
or ENGR 107	Introduction to Engineering (Mason Core) (http://catalog.gmu.edu/mason-core/)	

Civil Engineering

Code	Title	Credits
CEIE 203	Geomatics and Engineering Graphics	3
CEIE 210	Statics	3
CEIE 240	Hydraulics	3
CEIE 301	Engineering and Economic Models in Civil Engineering	3
CEIE 310	Mechanics of Materials	3
CEIE 311	Structural Analysis	3
CEIE 331	Soil Mechanics	3
CEIE 340	Water Resource Engineering	3
CEIE 355	Environmental Engineering and Science	3
CEIE 360	Introduction to Transportation Engineering	3
CEIE 370	Construction Systems	3
CEIE 409	Professional Practice and Management in Engineering (Mason Core) (http://catalog.gmu.edu/mason-core/)	1
CEIE 490	Senior Design and Construction Capstone Project I (Mason Core) (http://catalog.gmu.edu/mason-core/)	1
CEIE 491	Senior Design and Construction Project II	3
Total Credits		38

Computing

Code	Title	Credits
CDS 130	Computing for Scientists (Mason Core) (http://catalog.gmu.edu/mason-core/)	3
or SYST 130	Introduction to Computing for Digital Systems Engineering (Mason Core) (http://catalog.gmu.edu/mason-core/)	
or ENGR 125T	Introduction to Engineering Methods - Transfer (Mason Core) (http://catalog.gmu.edu/mason-core/)	
Total Credits		3

Technical Electives

Code	Title	Credits
Select 12 credits of CEIE Technical Electives from four different specialty areas from among the following six Civil Engineering specialty areas:		12

Construction Engineering:

CEIE 471/571	Construction Administration ¹
CEIE 476/576	Construction Cost Estimating ¹

CEIE 478/578 Construction Planning and Scheduling¹

Environmental Engineering:

CEIE 450/550	Environmental Engineering Systems ¹
CEIE 453/553	Water and Wastewater Treatment Processes ¹

Geotechnical Engineering:

CEIE 432/532	Foundation Design ¹
CEIE 435/535	Engineering Geology ¹

Structural Engineering:

CEIE 412/512	Structural Steel Design ¹
CEIE 413/513	Reinforced Concrete Design ¹
CEIE 414	Structural Modeling for Engineers

Transportation Engineering:

CEIE 461/561	Traffic Engineering ¹
CEIE 462/562	Urban Transportation Planning ¹

Water Resources Engineering:

CEIE 440/540	Water Supply and Distribution ¹
CEIE 442/542	Open Channel Flow ¹

Select 12 credits of CEIE Technical Elective courses from any CEIE 4XX course (<http://catalog.gmu.edu/courses/ceie/>)² 12

Total Credits 24

¹

Taking a 500-level course requires prior approval by the department's undergraduate program director.

²

One 3 credit course of those remaining credits may be from related advanced science or engineering course offerings. Approval from the student's academic advisor is required before a non-CEIE course is taken to meet senior technical elective requirements for the degree.

Mathematics

Code	Title	Credits
MATH 113	Analytic Geometry and Calculus I (Mason Core) (http://catalog.gmu.edu/mason-core/)	4-6
or MATH 123 & MATH 124	Calculus with Algebra/Trigonometry, Part A and Calculus with Algebra/Trigonometry, Part B (Mason Core) (http://catalog.gmu.edu/mason-core/)	
MATH 114	Analytic Geometry and Calculus II	4
MATH 213	Analytic Geometry and Calculus III	3
MATH 214	Elementary Differential Equations	3
Total Credits		14-16

Physics

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
PHYS 266	Introduction to Thermodynamics	1
Total Credits		9

Chemistry

Code	Title	Credits
CHEM 271 & CHEM 272	General Chemistry for Engineers Lecture (Mason Core) (http://catalog.gmu.edu/mason-core/) and General Chemistry for Engineers Lab (Mason Core) (http://catalog.gmu.edu/mason-core/)	4
or CHEM 211 & CHEM 213	General Chemistry I (Mason Core) (http://catalog.gmu.edu/mason-core/) and General Chemistry Laboratory I (Mason Core) (http://catalog.gmu.edu/mason-core/)	
Total Credits		4

Biology

Code	Title	Credits
BIOL 177	Introductory Ecology for Environmental Engineers	3
Total Credits		3

Statistics

Code	Title	Credits
STAT 344	Probability and Statistics for Engineers and Scientists I	3
Total Credits		3

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

Writing-Intensive Requirement

The university's writing-intensive requirement for civil and infrastructure engineering majors is satisfied by the successful completion of CEIE 301 Engineering and Economic Models in Civil Engineering.

Additional Mason Core

Students must complete all Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements not fulfilled by major requirements with one modification. CEIE students are required to take 6 credits of written communication, 3 credits of literature, and courses in two of the following three areas: arts, global understanding, and western civilization/world history.

Code	Title	Credits
	Written Communication (http://catalog.gmu.edu/mason-core/#written)	6
	Literature (http://catalog.gmu.edu/mason-core/#literature)	3
	Select courses from two of the following areas:	6
	Arts (http://catalog.gmu.edu/mason-core/#arts)	
	Global History (http://catalog.gmu.edu/mason-core/#global-history)	
	Global Understanding (http://catalog.gmu.edu/mason-core/#global)	
Total Credits		15

4-Year Plan

Bachelor of Science in Civil & Infrastructure Engineering Sample Study Plan

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

Honors

Honors in the Major

The Sid and Reva Dewberry Department of Civil, Environmental and Infrastructure Engineering offers an Honors Program in Civil and Infrastructure Engineering that creates a community of outstanding scholars in civil engineering who share a commitment to learning, service, and leadership. The Program is crafted around the civil and infrastructure curriculum, and is distinct from the University Honors Curriculum. Entry to the Honors Program is by invitation, extended to students with a minimum high school GPA of 3.80.

Requirements

The Honors Program is challenging, designed for the highly motivated student, and consists of 121 credits. Honors students must satisfy requirements in addition to those of the normal BS CEIE degree, including:

- An advanced communication course, COMM 320 Business and Professional Communication or COMM 637 Risk Communication, which may serve as a substitute for one CEIE (4xx) level senior technical elective.
- A minimum of 6 credits of CEIE graduate (5xx/6xx) level courses (these courses may substitute for CEIE (4xx) level senior technical electives by approval of the Department Chair). Students must submit a Graduate Course for Undergraduate Credit Form for approval to the course instructor and Department Chair.

Once admitted to the Honors Program, students must remain in good standing and maintain a minimum cumulative GPA of 3.50 and a minimum GPA of 3.20 in each semester for all courses counting toward the BS CEIE degree, maintain continuous enrollment working toward the BS CEIE degree, and abide by the Mason Honor Code.

Accelerated Master's

Civil and Infrastructure Engineering, BS/ Civil and Infrastructure Engineering, Accelerated MS

Overview

Highly-qualified students in the Civil and Infrastructure Engineering, BS have the option of obtaining an accelerated Civil and Infrastructure Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/civil-environmental-infrastructure/civil-infrastructure-engineering-ms/>).

See AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#ap-6-7>) 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/>).

Admission Requirements

Students in the Civil and Infrastructure Engineering, BS program may apply to this option if they have earned 60 undergraduate credits with an overall GPA of at least 3.30. All other criteria for admission are identical to criteria for admission into the Civil and Infrastructure Engineering, MS (<http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/civil-environmental-infrastructure/civil-infrastructure-engineering-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 pre-requisites.

Accelerated Option Requirements

Students register for up to 12 credits of overlapping graduate level courses in place of undergraduate technical elective courses.

Students are encouraged to take up to four of the following courses, based on their chosen concentration area in the master's program:

Concentration in Construction Engineering and Management (CEM)

Code	Title	Credits
CEIE 571	Construction Administration	3
CEIE 572	Building Information Modeling	3
CEIE 573	Legal Aspects of the Construction Process	3
CEIE 575	Design for Constructability	3
CEIE 576	Construction Cost Estimating	3

Concentration in Environmental and Water Resources Engineering (EWRE)

Code	Title	Credits
CEIE 540	Water Supply and Distribution	3
CEIE 542	Open Channel Flow	3
CEIE 550	Environmental Engineering Systems	3

CEIE 553	Water and Wastewater Treatment Processes	3
CEIE 557	Remote Monitoring Techniques for Civil Engineering Applications	3

Concentration in Geotechnical Engineering (GEOE)

Code	Title	Credits
CEIE 501	Sustainable Development	3
CEIE 524	Introduction to Bridge Engineering	3
CEIE 531	Earth Retaining Structures and Slope Stability	3
CEIE 532	Foundation Design	3
CEIE 535	Engineering Geology	3

Concentration in Structural Engineering (STRE)

Code	Title	Credits
CEIE 512	Structural Steel Design	3
CEIE 513	Reinforced Concrete Design	3
CEIE 524	Introduction to Bridge Engineering	3
CEIE 525	Structural Evaluation and Rehabilitation	3
CEIE 532	Foundation Design	3
CEIE 575	Design for Constructability	3

Concentration in Transportation Engineering (TRNE)

Code	Title	Credits
CEIE 560	Public Transportation Systems	3
CEIE 561	Traffic Engineering	3
CEIE 562	Urban Transportation Planning	3
STAT 544	Applied Probability	3

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 from the list below. Reserve graduate credits do not apply to the undergraduate degree.

Code	Title	Credits
CEIE 601	Infrastructure Modeling	3
CEIE 605	Risk and Uncertainty in Civil Engineering	3

Degree Requirements

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 students must have satisfactory performance (grade of 'B' or better) in each of the graduate courses intended to be applied towards the MS degree.

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 (<https://registrar.gmu.edu/wp-content/uploads/BAMT-Bach-Acel-Masters-June21.pdf>). At the completion of MS requirements, a master's degree is conferred.

Bachelor's Degree (selected)/ Environmental Science and Policy, Accelerated MS

Overview

This bachelor's/accelerated master's degree program allows academically strong undergraduates with a commitment to advance their education to obtain a Green Leaf-designated (<http://catalog.gmu.edu/student-services/green-leaf-programs-courses/>) bachelor's degree and the Environmental Science and Policy, MS (<https://catalog.gmu.edu/colleges-schools/science/environmental-policy/environmental-science-policy-ms/>) degrees within an accelerated timeframe. Upon completion of this 141-credit accelerated program, students will be exceptionally well prepared for entry into their careers or into a doctoral program in the field or in a related discipline.

Students are eligible to apply for this accelerated program once they have earned at least 60 undergraduate credits and can enroll in up to 18 credits of graduate coursework after successfully completing 75 undergraduate credits. This flexibility makes it possible for students to complete a bachelor's and a master's in five years.

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/>). For more information on undergraduates enrolling in graduate courses, see AP.1.4.4 Graduate Course Enrollment by Undergraduates (<https://catalog.gmu.edu/policies/academic/registration-attendance/#text>).

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 the Graduate Admission Policies (<http://catalog.gmu.edu/admissions/graduate-policies/>) section of this catalog.

Important application information and processes for this accelerated master's program can be found here (<https://www2.gmu.edu/admissions-aid/how-apply/accelerated-masters/>).

The GRE exam is not required for this accelerated master's program.

Students should submit three letters of recommendation (at least one from a former professor or someone with a PhD), a recent resume, a statement of interest/research goals and interests (including information on the candidate's proposed MS research), and a letter from their advisor (Perspective Advisor Form (<https://science.gmu.edu/media/prospective-advisor-form-dnp-form-revised-mar-2023/>)) stating that the advisor agrees to take on the candidate as an MS student, how the candidate would be a good fit for them and why candidate's research topic would be suitable.

Students with an overall GPA of at least 3.20 who are pursuing any Green Leaf-designated (<http://catalog.gmu.edu/student-services/green-leaf-programs-courses/>) major or minor may apply to this accelerated master's program after completing two semesters of chemistry (including CHEM 211 General Chemistry I (Mason Core) (<http://catalog.gmu.edu/mason-core/>) and CHEM 212 General Chemistry II (Mason Core) (<http://catalog.gmu.edu/mason-core/>) and three semesters of biology, including a course in ecology, or the equivalent, for example:

Code	Title	Credits
Select one of the following options:		13
Option 1:		
BIOL 213	Cell Structure and Function (Mason Core) (http://catalog.gmu.edu/mason-core/)	
BIOL 214	Biostatistics for Biology Majors	
BIOL 308	Foundations of Ecology and Evolution	
Option 2:		
EVPP 210	Environmental Biology: Molecules and Cells	
EVPP 301	Environmental Science: Biological Diversity and Ecosystems	
EVPP 302	Environmental Science: Biomes and Human Dimensions	
EVPP 305	Environmental Microbiology Essentials	
EVPP 306	Environmental Microbiology Essentials Laboratory	
Option 3:		
CONS 401	Conservation Theory	
CONS 402	Applied Conservation	
6 credits of BIOL or CONS electives		

Graduate Advisor

By at least the beginning of their senior year, students should seek out a faculty member in the Department of Environmental Science and Policy (<http://catalog.gmu.edu/colleges-schools/science/environmental-policy/#facultytext>) who is willing to serve as their advisor. This advisor will aid the student in choosing the appropriate graduate courses to take and help to prepare the student for graduate studies. Admission into a research-oriented master's concentration is dependent upon securing the agreement of a faculty advisor. Faculty from a variety of departments and colleges at George Mason University (called "program faculty") can serve as master's advisors. Potential students are encouraged to speak with the graduate program coordinator in the department to obtain guidance on this issue.

Accelerated Option Requirements

After the completion of 75 undergraduate credits, students may complete 3 to 12 credits of graduate coursework that can apply to both the undergraduate and graduate degrees.

In addition to applying to graduate from the undergraduate program, students in the accelerated program must submit a bachelor's/accelerated master's transition form (available from the Office of the University Registrar (<https://registrar.gmu.edu/forms/>)) to the College of Science's Office of Academic and Student Affairs (<https://cos.gmu.edu/about/contact-us/>) by the last day to add classes of their final undergraduate semester. Students should enroll for courses in the master's program in the fall or spring semester immediately following conferral of the bachelor's degree, but should contact an advisor if they would like to defer up to one semester.

Students must maintain an overall GPA of 3.00 or higher in all graduate coursework and should consult with their faculty advisor to coordinate their academic goals.

Reserve Graduate Credits

Accelerated master's students may also take up to 6 graduate credits as reserve graduate credits. These credits do not apply to the undergraduate

degree, but will reduce the master's degree by up to 6 credits. With 12 graduate credits counted toward the undergraduate and graduate degrees plus the maximum 6 reserve graduate credits, the credits necessary for the graduate degree can be reduced by up to 18.

Graduate Course Suggestions

The following list of suggested courses is provided for general reference. To ensure an efficient route to graduation and post-graduation readiness, students are strongly encouraged to meet with an advisor before registering for graduate-level courses.

Code	Title	Credits
EVPP 518	Conservation Biology	3
EVPP 529	Environmental Science Communication	3
EVPP 621	Overview of Biodiversity Conservation	3
EVPP 635	Environment and Society	3

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 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 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 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.

Civil and 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 (<http://catalog.gmu.edu/colleges-schools/>

[engineering-computing/engineering/systems-operations-research/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 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 (<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 Civil and Infrastructure Engineering courses:

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

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 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/ Systems Engineering, Accelerated MS

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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 (<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

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Civil and 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 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 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 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 Civil and Infrastructure Engineering courses:

Code	Title	Credits
CEIE 501	Sustainable Development	
CEIE 512	Structural Steel Design	
CEIE 532	Foundation Design	
CEIE 535	Engineering Geology	
CEIE 540	Water Supply and Distribution	
CEIE 542	Open Channel Flow	
CEIE 550	Environmental Engineering Systems	
CEIE 553	Water and Wastewater Treatment Processes	
CEIE 557	Remote Monitoring Techniques for Civil Engineering Applications	

CEIE 561	Traffic Engineering
CEIE 562	Urban Transportation Planning
CEIE 571	Construction Administration
CEIE 572	Building Information Modeling
CEIE 573	Legal Aspects of the Construction Process
CEIE 574	Construction Computer Application and Informatics
CEIE 576	Construction Cost Estimating

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 (<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.