CIVIL AND INFRASTRUCTURE ENGINEERING, BS

Banner Code: EC-BS-CEIE

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Email: snolder@gmu.edu
Website: http://civil.gmu.edu/

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’s program in civil and infrastructure engineering is accredited by the Engineering Accreditation Commission of ABET, http://www.abet.org.

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/#requirementspoliciestext) 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.

### Civil Engineering

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 101</td>
<td>Introduction to Civil Engineering</td>
<td>2</td>
</tr>
<tr>
<td>or ENGR 107</td>
<td>Introduction to Engineering (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
</tbody>
</table>

### Civil Engineering

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

**Total Credits** 38

### Computing

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CDS 130</td>
<td>Computing for Scientists (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>3</td>
</tr>
<tr>
<td>or SYST 130</td>
<td>Introduction to Computing for Digital Systems Engineering (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
<tr>
<td>or ENGR 125T</td>
<td>Introduction to Engineering Methods - Transfer (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
</tbody>
</table>

**Total Credits** 3

### Technical Electives

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

**Geotechnical Engineering:**
- CEIE 432/532 Foundation Design
- CEIE 435/535 Engineering Geology

**Structural Engineering:**
- CEIE 412/512 Structural Steel Design
- CEIE 413/513 Reinforced Concrete Design
- CEIE 414 Structural Modeling for Engineers

**Transportation Engineering:**
- CEIE 461/561 Traffic Engineering
- CEIE 462/562 Urban Transportation Planning

**Water Resources Engineering:**
- CEIE 440/540 Water Supply and Distribution
- CEIE 442/542 Open Channel Flow

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 113</td>
<td>Analytic Geometry and Calculus I (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>4-6</td>
</tr>
<tr>
<td>or MATH 123 &amp; MATH 124</td>
<td>Calculus with Algebra/Trigonometry, Part A and Calculus with Algebra/Trigonometry, Part B (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td></td>
</tr>
<tr>
<td>MATH 114</td>
<td>Analytic Geometry and Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>MATH 213</td>
<td>Analytic Geometry and Calculus III</td>
<td>3</td>
</tr>
<tr>
<td>MATH 214</td>
<td>Elementary Differential Equations</td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits** 14-16

### Physics

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>PHYS 160</td>
<td>University Physics I (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 161</td>
<td>University Physics I Laboratory (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 260</td>
<td>University Physics II (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 261</td>
<td>University Physics II Laboratory (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>1</td>
</tr>
<tr>
<td>PHYS 266</td>
<td>Introduction to Thermodynamics</td>
<td>1</td>
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</table>

**Total Credits** 9
Chemistry

<table>
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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CHEM 271</td>
<td>General Chemistry for Engineers Lecture (Mason Core)</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 272</td>
<td>and General Chemistry for Engineers Lab (Mason Core)</td>
<td></td>
</tr>
<tr>
<td>or CHEM 211</td>
<td>General Chemistry I (Mason Core)</td>
<td></td>
</tr>
<tr>
<td>&amp; CHEM 213</td>
<td>and General Chemistry Laboratory I (Mason Core)</td>
<td></td>
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Total Credits 4

Biology

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BIOL 177</td>
<td>Introductory Ecology for Environmental Engineers</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 3

Statistics

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAT 344</td>
<td>Probability and Statistics for Engineers and Scientists I</td>
<td>3</td>
</tr>
</tbody>
</table>

Total Credits 3

Communication and Economics

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>COMM 100</td>
<td>Public Speaking (Mason Core)</td>
<td>3</td>
</tr>
<tr>
<td>or COMM 101</td>
<td>Fundamentals of Communication (Mason Core)</td>
<td></td>
</tr>
<tr>
<td>ECON 103</td>
<td>Contemporary Microeconomic Principles (Mason Core)</td>
<td>3</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Written Communication</td>
<td>(<a href="http://catalog.gmu.edu/mason-core/#written">http://catalog.gmu.edu/mason-core/#written</a>)</td>
<td>6</td>
</tr>
<tr>
<td>Literature</td>
<td>(<a href="http://catalog.gmu.edu/mason-core/#literature">http://catalog.gmu.edu/mason-core/#literature</a>)</td>
<td>3</td>
</tr>
<tr>
<td>Select courses from two of the following areas:</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Arts</td>
<td>(<a href="http://catalog.gmu.edu/mason-core/#arts">http://catalog.gmu.edu/mason-core/#arts</a>)</td>
<td></td>
</tr>
</tbody>
</table>

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-structure-engineering-ms/).

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-structure-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)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 571</td>
<td>Construction Administration</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 572</td>
<td>Building Information Modeling</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 573</td>
<td>Legal Aspects of the Construction Process</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 575</td>
<td>Design for Constructability</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 576</td>
<td>Construction Cost Estimating</td>
<td>3</td>
</tr>
</tbody>
</table>

Concentration in Environmental and Water Resources Engineering (EWRE)

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<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 540</td>
<td>Water Supply and Distribution</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 542</td>
<td>Open Channel Flow</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 550</td>
<td>Environmental Engineering Systems</td>
<td>3</td>
</tr>
</tbody>
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Concentration in Geotechnical Engineering (GEOE)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>CEIE 501</td>
<td>Sustainable Development</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 524</td>
<td>Introduction to Bridge Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 531</td>
<td>Earth Retaining Structures and Slope Stability</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 532</td>
<td>Foundation Design</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 535</td>
<td>Engineering Geology</td>
<td>3</td>
</tr>
</tbody>
</table>

Concentration in Structural Engineering (STRE)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 512</td>
<td>Structural Steel Design</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 513</td>
<td>Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 524</td>
<td>Introduction to Bridge Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 525</td>
<td>Structural Evaluation and Rehabilitation</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 532</td>
<td>Foundation Design</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 575</td>
<td>Design for Constructability</td>
<td>3</td>
</tr>
</tbody>
</table>

Concentration in Transportation Engineering (TRNE)

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<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 560</td>
<td>Public Transportation Systems</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 561</td>
<td>Traffic Engineering</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 562</td>
<td>Urban Transportation Planning</td>
<td>3</td>
</tr>
<tr>
<td>STAT 544</td>
<td>Applied Probability</td>
<td>3</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CEIE 601</td>
<td>Infrastructure Modeling</td>
<td>3</td>
</tr>
<tr>
<td>CEIE 605</td>
<td>Risk and Uncertainty in Civil Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

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 (http://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:

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<tr>
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<tbody>
<tr>
<td>Option 1:</td>
<td>Cell Structure and Function (Mason Core) (<a href="http://catalog.gmu.edu/mason-core/">http://catalog.gmu.edu/mason-core/</a>)</td>
<td>13</td>
</tr>
<tr>
<td>BIOL 213</td>
<td>Biostatistics for Biology Majors</td>
<td></td>
</tr>
<tr>
<td>BIOL 214</td>
<td>Foundations of Ecology and Evolution</td>
<td></td>
</tr>
<tr>
<td>BIOL 308</td>
<td>Environmental Biology: Molecules and Cells</td>
<td></td>
</tr>
<tr>
<td>Option 2:</td>
<td>Environmental Science: Biological Diversity and Ecosystems</td>
<td></td>
</tr>
<tr>
<td>EVPP 210</td>
<td>Environmental Microbiology Essentials</td>
<td></td>
</tr>
<tr>
<td>EVPP 301</td>
<td>Environmental Science: Biomes and Human Dimensions</td>
<td></td>
</tr>
<tr>
<td>EVPP 302</td>
<td>Environmental Microbiology Essentials</td>
<td></td>
</tr>
<tr>
<td>EVPP 305</td>
<td>Environmental Microbiology Essentials</td>
<td></td>
</tr>
<tr>
<td>EVPP 306</td>
<td>Environmental Microbiology Essentials</td>
<td></td>
</tr>
<tr>
<td>Option 3:</td>
<td>Conservation Theory</td>
<td></td>
</tr>
<tr>
<td>CONS 401</td>
<td>Applied Conservation</td>
<td></td>
</tr>
<tr>
<td>CONS 402</td>
<td>6 credits of BIOL or CONS electives</td>
<td></td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>EVPP 518</td>
<td>Conservation Biology</td>
<td>3</td>
</tr>
<tr>
<td>EVPP 529</td>
<td>Environmental Science Communication</td>
<td>3</td>
</tr>
<tr>
<td>EVPP 621</td>
<td>Overview of Biodiversity Conservation</td>
<td>3</td>
</tr>
<tr>
<td>EVPP 635</td>
<td>Environment and Society</td>
<td>3</td>
</tr>
</tbody>
</table>

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/) 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:
Civil and Infrastructure Engineering, BS/Systems Engineering, 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 a Systems Engineering, MS (http://catalog.gmu.edu/colleges-schools/engineering-computing/engineering/systems-operations-research/systems-engineering-ms/) in an accelerated timeframe 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 (http://catalog.gmu.edu/policies/academic/graduate-policies/#text) for policies related to this program.

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

BAM Pathway Admission Requirements

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

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:

### Systems Engineering, Accelerated MS

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

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

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

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

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

Degree Conferral

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

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- 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-operaitons-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-operaitons-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:

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<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>SYST 510</td>
<td>Systems Definition and Cost Modeling (Core)</td>
<td></td>
</tr>
<tr>
<td>SYST 514</td>
<td>Systems Thinking</td>
<td></td>
</tr>
<tr>
<td>SYST 520</td>
<td>System Engineering Design (Core)</td>
<td></td>
</tr>
<tr>
<td>SYST 530</td>
<td>Systems Engineering Management I (Core)</td>
<td></td>
</tr>
<tr>
<td>SYST 542</td>
<td>Decision Support Systems Engineering</td>
<td></td>
</tr>
<tr>
<td>SYST 573</td>
<td>Decision and Risk Analysis</td>
<td></td>
</tr>
<tr>
<td>SYST 538</td>
<td>Analytics for Financial Engineering and Econometrics</td>
<td></td>
</tr>
<tr>
<td>SYST 560</td>
<td>Introduction to Air Traffic Control</td>
<td></td>
</tr>
<tr>
<td>SYST 563</td>
<td>Evidence-Based Systems Engineering</td>
<td></td>
</tr>
<tr>
<td>SYST 568</td>
<td>Applied Predictive Analytics</td>
<td></td>
</tr>
<tr>
<td>SYST 584</td>
<td>Heterogeneous Data Fusion</td>
<td></td>
</tr>
<tr>
<td>SYST 588</td>
<td>Financial Systems Engineering I: Introduction to Options, Futures, and Derivatives</td>
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