CIVIL AND INFRASTRUCTURE ENGINEERING, BS

Banner Code: VS-BS-CEIE

Lisa Nolder, Associate Director for Undergraduate Programs
Phone: 703-993-1675
Email: snolder@gmu.edu
Website: http://civil.gmu.edu/undergraduate

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 BS CIE 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.

Admissions & Policies

Policies
For policies governing all undergraduate degrees, see AP5 Undergraduate Policies.

Change of Major
See Change of Major for more information.

Program Requirements
Degree requirements include 120 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 Volgenau School of Engineering courses presented as part of the required 120 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 faculty 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 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. For more information, see AP5.2.4 Termination from the Major.

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. 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) and STAT 250 Introductory Statistics I (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

Degree Requirements
Total credits: 120

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 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 304</td>
<td>Jr Engineering Competency Exam</td>
<td>0</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>
</tbody>
</table>
Civil and Infrastructure Engineering, BS

CEIE 355 Environmental Engineering and Science 3
CEIE 360 Introduction to Transportation Engineering 3
CEIE 370 Construction Systems 3
CEIE 404 Sr Engineering Competency Exam 0
CEIE 409 Professional Practice and Management in Engineering (Mason Core) 1
CEIE 490 Senior Design Project (Mason Core) 3
Total Credits 37

Computing
Code Title Credits
CDS 130 Computing for Scientists (Mason Core) 3
Total Credits 3

Engineering
Code Title Credits
ENGR 107 Introduction to Engineering (Mason Core) 2
Total Credits 2

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

Construction Engineering:
- CEIE 471/571 Construction Administration 1
- CEIE 472/572 Building Information Modeling 1

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 2
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) 4
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

Physics
Code Title Credits
PHYS 160 University Physics I (Mason Core) 3
PHYS 161 University Physics I Laboratory (Mason Core) 1
PHYS 260 University Physics II (Mason Core) 3
PHYS 261 University Physics II Laboratory (Mason Core) 1
PHYS 266 Introduction to Thermodynamics 1
Total Credits 9

Chemistry
Code Title Credits
CHEM 271 General Chemistry for Engineers Lecture
& CHEM 272 General Chemistry for Engineers Lab
or CHEM 211 General Chemistry I (Mason Core)
& CHEM 213 General Chemistry Laboratory I (Mason Core)
Total Credits 4

Biology
Code Title Credits
BIOL 107 Intro Biology II Lecture (Mason Core) 3
or BIOL 177 Ecological Applications
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) 3
or COMM 101 Fundamentals of Communication (Mason Core)
ECON 103 Contemporary Microeconomic Principles (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 requirements not fulfilled by major requirements with one modification. CIE 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. This exemption means that CIE students meet the Volgenau School of Engineering's requirement for humanities and social science courses by taking 21 credits rather than 24. The two additional Mason Core areas to be satisfied must be approved by the CEIE faculty advisor with the goal of best meeting the Mason Core needs of the student. All other Mason Core requirements must be met.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>Written Communication</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Literature</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Select courses from two of the following areas:</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Arts</td>
<td></td>
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<tr>
<td></td>
<td>Global Understanding</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Western Civilization/World History</td>
<td></td>
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<tr>
<td>Total Credits</td>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

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 120 credits. Honors students must satisfy requirements in addition to those of the normal BS CIE 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 CIE degree, maintain continuous enrollment working toward the BS CIE 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.

For more detailed information, see AP6.7 Bachelor's/Accelerated Master's Degrees. For policies governing all graduate degrees, see AP6 Graduate Policies.

Admission Requirements
Students in the Civil and Infrastructure Engineering, BS program may apply to this option if they have earned 90 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 program.

Accelerated Option Requirements
Students must complete all credits that satisfy requirements for both the BS and MS programs. Students register for 6 credits of overlapping graduate level courses in place of undergraduate technical elective courses. The courses selected for this purpose must be approved by the academic advisor.

Degree Requirements
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.

Bachelor's Degree (selected)/ Environmental Science and Policy, Accelerated MS
Overview
This degree option allows highly qualified George Mason University students to earn an Environmental Science and Policy, MS in less time than if they had first graduated with an environmentally-focused Green Leaf-designated BA or BS degree and then applied to the MS program sequentially.

For more detailed information, see AP6.7 Bachelor’s/Accelerated Master’s Degrees. For policies governing all graduate programs, see AP6 Graduate Policies.

Admission Requirements
Students with an overall GPA of at least 3.20 who are pursuing any Green Leaf-designated major or minor may apply for provisional acceptance
into this accelerated master’s program after completing two semesters of chemistry (including CHEM 211 General Chemistry I (Mason Core) and CHEM 212 General Chemistry II (Mason Core)) and three semesters of biology, including a course in ecology, or the equivalent, for example:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Select one of the following options:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Option 1:</strong></td>
<td>13</td>
</tr>
<tr>
<td>BIOL 213</td>
<td>Cell Structure and Function (Mason Core)</td>
<td></td>
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<tr>
<td>BIOL 214</td>
<td>Biostatistics for Biology Majors</td>
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<tr>
<td>BIOL 308</td>
<td>Foundations of Ecology and Evolution</td>
<td></td>
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<tr>
<td></td>
<td><strong>Option 2:</strong></td>
<td></td>
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<tr>
<td>EVPP 210</td>
<td>Environmental Biology: Molecules and Cells</td>
<td></td>
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<tr>
<td>EVPP 301</td>
<td>Environmental Science: Biological Diversity and Ecosystems</td>
<td></td>
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<tr>
<td>EVPP 302</td>
<td>Environmental Science: Biomes and Human Dimensions</td>
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<tr>
<td>EVPP 305</td>
<td>Environmental Microbiology Essentials</td>
<td></td>
</tr>
<tr>
<td>EVPP 306</td>
<td>Environmental Microbiology Essentials Laboratory</td>
<td></td>
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<tr>
<td></td>
<td><strong>Option 3:</strong></td>
<td></td>
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<tr>
<td>CONS 401</td>
<td>Conservation Theory</td>
<td></td>
</tr>
<tr>
<td>CONS 402</td>
<td>Applied Conservation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 credits of BIOL or CONS electives</td>
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<tr>
<td></td>
<td><strong>Option 4:</strong></td>
<td></td>
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<tr>
<td>CONS 403</td>
<td>Ecology and Conservation Theory</td>
<td></td>
</tr>
<tr>
<td>CONS 404</td>
<td>Biodiversity Monitoring</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6 credits of BIOL or CONS electives</td>
<td></td>
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By the beginning of the undergraduate’s senior year, they should first submit a Graduate Application for Accelerated Master’s Program form (obtained from the Office of Academic and Student Affairs (https://cos.gmu.edu/about/contact-us)). Secondly, in their senior year accelerated master’s students must complete the two graduate courses indicated on their Accelerated Master’s Program Application with a minimum grade of 3.00 in each course. They must maintain a minimum GPA of 3.00 in all coursework and in coursework applied to their major. Upon completion and conferral of the undergraduate degree in a Green Leaf-designated program, in the semester indicated in the application, they must additionally submit the Bachelor’s/Accelerated Master’s Transition form (found on the Office of the University Registrar website (http://registrar.gmu.edu/forms)) and will subsequently be admitted into graduate status.

By at least the beginning of their senior year, they should seek out a faculty member in the Department of Environmental Science and Policy who is willing to serve as their advisor (unless the student is planning to enroll in the MS concentration in Environmental Management). 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 (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.

Application Requirements

Applicants to all graduate programs at Mason must meet the admission standards and application requirements for graduate study as specified in the Graduate Admission Policies section of this catalog, excluding the GRE exam requirement (which is not required for those enrolled in the accelerated program). This includes 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 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 (please note that a letter of endorsement from an advisor not necessary for candidates taking the Environmental Management concentration).

For information specific to the accelerated Environmental Science and Policy, MS, see Graduate Admissions on the department’s website (http://esp.gmu.edu/academic-programs/graduate/admissions).

Reserved Graduate Credits

Students admitted to this program may take graduate courses after completing 90 undergraduate credits, and up to 6 credits of appropriate environmentally-focused graduate coursework may be used in partial satisfaction of the requirements for the undergraduate degree. If students earn at least a 3.00 GPA in these classes, they are granted advanced standing in the master’s program and must then complete an additional 27-31 credits to receive the master’s degree.

To apply these credits to the master’s degree, students must request that the credits be moved from the undergraduate degree to the graduate degree using the Bachelor’s/Accelerated Master’s Transition form found on the Office of the University Registrar website (http://registrar.gmu.edu/forms) (as noted above). Students may take up to 6 additional environmentally-focused graduate credits as reserve graduate credit. These credits do not apply to the undergraduate degree but will reduce the subsequent master’s degree credits accordingly (e.g., with 6 credits counted towards undergraduate degree plus the maximum 6 reserve credits, an MS could be completed with 21 post-bachelor’s credits). The ability to take courses for reserve graduate credit is available to all high achieving undergraduates with the permission of the department.

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

Highly-qualified students in the Civil and Infrastructure Engineering, BS have the option of obtaining an accelerated Operations Research, MS.

For more detailed information, see AP6.7 Bachelor’s/Accelerated Master’s Degrees. For policies governing all graduate degrees, see AP6 Graduate Policies.

Admission Requirements

Mason undergraduate students majoring in Civil and Infrastructure Engineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Operations Research, MS program.
Students must additionally complete MATH 203 Linear Algebra prior to applying for the graduate program.

**Accelerated Options Requirement**

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 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.

**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.

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

**Overview**

Highly-qualified students in the Civil and Infrastructure Engineering, BS have the option of obtaining an accelerated Systems Engineering, MS.

For more detailed information, see AP.6.7 Bachelor’s/Accelerated Master’s Degrees. For policies governing all graduate degrees, see AP.6 Graduate Policies.

**Admission Requirements**

Mason undergraduate students majoring in Civil and Infrastructure Engineering, BS may apply to this option if they have earned 90 undergraduate credits with an overall GPA of at least 3.30 and completed all MATH and PHYS requirements. Criteria for admission are identical to criteria for admission to the Systems Engineering, MS program.

**Accelerated Options Requirement**

Students must complete all credits that satisfy requirements for both the BS and MS programs. Up to two courses (6 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.

**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.