

CIVIL AND INFRASTRUCTURE ENGINEERING, BS

Banner Code: VS-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'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/archives/2020-2021/student-services/green-leaf-programs-courses/>).

Admissions & Policies

Policies

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

Change of Major

See Change of Major (<http://catalog.gmu.edu/colleges-schools/engineering/#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 Volgenau School of Engineering 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 Volgenau School of Engineering course that is required for the major may be attempted more than three times. Those students who do not successfully complete such a course within three attempts will be terminated from the major. Undeclared students in the Volgenau School who do not successfully complete a course required for a Volgenau School major within three attempts will also be terminated.

In addition, students in the Volgenau School with evidence of continued failure to make adequate progress toward declaring or completing a Volgenau School major will be terminated from the school. Adequate progress is determined by the major program. For more information, see AP.5.2.4 Termination from the Major (<https://catalog.gmu.edu/policies/academic/undergraduate-policies/#ap-5-2-4>).

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

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

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

Requirements

Degree Requirements

Total credits: 121

This is a Green Leaf program.

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

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	Civil Engineering Senior Design Project I (Mason Core) (http://catalog.gmu.edu/mason-core/)	1
CEIE 491	Civil Engineering Senior Design Project II	3
Total Credits		38

Computing

Code	Title	Credits
CDS 130	Computing for Scientists	3
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 Scheduling 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 (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
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) (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 107	Intro Biology II Lecture (Mason Core) (http://catalog.gmu.edu/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) (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. 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 (<http://catalog.gmu.edu/mason-core/>) areas to be satisfied must be approved by the CEIE faculty advisor with the goal of best meeting the Mason Core (<http://catalog.gmu.edu/mason-core/>) needs of the student. All other Mason Core (<http://catalog.gmu.edu/mason-core/>) requirements must be met.

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)	
	Western Civilization/World History (http://catalog.gmu.edu/mason-core/#western-civilization-world-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 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 (<http://catalog.gmu.edu/colleges-schools/engineering/civil-environmental-infrastructure/civil-infrastructure-engineering-ms/>).

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

Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>).

Admission Requirements

Students in the 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 (<http://catalog.gmu.edu/colleges-schools/engineering/civil-environmental-infrastructure/civil-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 (<http://catalog.gmu.edu/colleges-schools/science/environmental-policy/environmental-science-policy-ms/>) in less time than if they had first graduated with an environmentally-focused Green Leaf-designated (<http://catalog.gmu.edu/student-services/green-leaf-programs-courses/>) BA or BS degree and then applied to the MS program sequentially.

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 programs, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/graduate-policies/>).

Admission Requirements

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 for provisional acceptance into 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:		
Option 1:		
BIOL 213	Cell Structure and Function (Mason Core) (http://catalog.gmu.edu/mason-core/)	13
BIOL 214	Biostatistics for Biology Majors	
BIOL 308	Foundations of Ecology and Evolution	
Option 2:		
EVPP 210	Environmental Biology: Molecules and Cells	13
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	13
CONS 402	Applied Conservation	
6 credits of BIOL or CONS electives		

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 (<http://catalog.gmu.edu/student-services/green-leaf-programs-courses/>) 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 (<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 (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 (<http://catalog.gmu.edu/admissions/graduate-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.

For information specific to the accelerated Environmental Science and Policy, MS (<http://catalog.gmu.edu/colleges-schools/science/environmental-policy/environmental-science-policy-ms/>), see Graduate Admissions on the department's website (<http://esp.gmu.edu/academic-programs/graduate/admissions/>).

Reserve 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 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 (<http://catalog.gmu.edu/colleges-schools/engineering/systems-operations-research/operations-research-ms/#text>).

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#text>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/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 (<http://catalog.gmu.edu/colleges-schools/engineering/systems-operations-research/operations-research-ms/#text>) 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 chose 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 (<http://catalog.gmu.edu/colleges-schools/engineering/systems-operations-research/systems-engineering-ms/>).

For more detailed information, see AP.6.7 Bachelor's/Accelerated Master's Degrees (<http://catalog.gmu.edu/policies/academic/graduate-policies/#text>). For policies governing all graduate degrees, see AP.6 Graduate Policies (<http://catalog.gmu.edu/policies/academic/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 (<http://catalog.gmu.edu/colleges-schools/engineering/systems-operations-research/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 chose 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.