

# CIVIL ENGINEERING MAJOR

## Program Curriculum

Code	Title	Credits
<b>Degree Core Requirements</b>		
CEE 2834	Civil Engineering Drawings and Virtual Modeling (C-)	3
CEE 2814	Geomatics (C-)	4
CEE 3814	Analytical Tools in Civil and Environmental Engineering	3
Select two CEE Fundamental Electives (with Lab)		8
Select four CEE Fundamental Electives		12
Subtotal		30
<b>Major Requirements</b>		
CHEM 1045	General Chemistry Laboratory (C-)	1
ESM 2104	Statics (C-)	3
ESM 2204	Mechanics of Deformable Bodies (C-)	3
GEOS 2104	Elements of Geology (C-)	3
ISE 2014	Engineering Economy	2
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus	3
MATH 2214	Introduction to Differential Equations	3
Select three CEE Advanced Electives		9
Select one CEE Advanced Elective (Design Project)		3
<i>Career Bridge Experience</i> <sup>1</sup>		
ENGE 3900		0
<i>Technical and Restricted Electives</i>		
Select appropriate electives from the two lists shown.		12
Subtotal		45
<b>Pathways to General Education</b>		
<i>Pathways Concept 1 - Discourse</i>		
ENGL 1105	First-Year Writing (1F)	3
ENGL 1106	First-Year Writing (1F)	3
CEE 2804	Introduction to Civil and Environmental Engineering (1A)	3
CEE 3304	Fluid Mechanics for Civil and Environmental Engineering (1A)	4
CEE 4804	Professional and Legal Issues in Civil Engineering (1A)	3
<i>Pathways Concept 2 - Critical Thinking in the Humanities</i>		
Select six hours in Pathway 2 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G02</a> )		6
<i>Pathways Concept 3 - Reasoning in the Social Sciences</i>		
Select six hours in Pathway 3 ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G03</a> )		6
<i>Pathways Concept 4 - Reasoning in the Natural Sciences</i>		
PHYS 2305	Foundations of Physics	4
CHEM 1035	General Chemistry	3
<i>Pathways Concept 5 - Quantitative and Computational Thinking</i>		
MATH 1225	Calculus of a Single Variable (5F)	4
MATH 1226	Calculus of a Single Variable (5F ; C-)	4

CEE 3804	Computer Applications for Civil and Environmental Engineers (5A)	3
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<i>Pathways Concept 6 - Critique and Practice in Design and the Arts</i>		
Select three hours in Pathway 6a ( <a href="https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A">https://catalog.vt.edu/course-search/?attrs_pathways=attrs_pathways_G06A</a> )		3
ENGE 1215 & ENGE 1216	Foundations of Engineering and Foundations of Engineering (6D ; C-)	4
or ENGE 1414	Foundations of Engineering Practice	
<i>Pathways Concept 7 - Critical Analysis of Identity and Equity in the United States</i>		
Pathways 7 should be double-counted with either a Pathways 2 or 3 course to avoid taking any additional credit hours.		
Subtotal		53
<b>Total Credits</b>		<b>128</b>

## CEE Electives

The CEE department requires 12 credits of **Fundamental Electives**, 8 credits of **Fundamental Electives with lab**, 9 credits of **Advanced Electives**, 3 additional credits of **Advanced Electives (Design Project)**, and 12 credits of **Technical and Restricted Electives** as follows.

### Fundamental and Advanced Electives (32 credits)

Fundamental and Advanced Electives provide adequate breadth across the discipline and depth of knowledge in specialty areas of interest. Interdisciplinary Technical Electives, Independent Study, and Undergraduate Research courses do not satisfy these requirements but may be taken to satisfy the Technical Electives.

Fundamental and Advanced Electives are selected from the list below and must meet the following criteria:

1. Complete *Fundamental courses* in 6 of the 8 specialty areas, at least two of which must have a lab (20 credits). These courses count toward satisfying degree core requirements.
2. Complete one *Advanced course* in 3 of the 6 specialty areas in which *Fundamental courses* were selected in Step 1 (9 credits).
3. Complete one additional *Advanced course* in a specialty area in which an *Advanced course* was selected in Step 2 (3 credits).
4. Within the selections made above, complete at least one *Design Project course*.

### Technical and Restricted Electives (12 credits)

Technical Electives include any course selected from the list of Fundamental, Advanced, and Interdisciplinary Technical Electives. Restricted Electives are earned by selecting courses from the approved list of Restricted Electives or selecting courses within an officially declared minor selected from the list of approved minors. Technical and Restricted Electives can be satisfied in one of three ways as follows:

1. Complete 6 credits of Technical Electives and 6 credits of Restricted Electives
2. Complete 9 credits of Technical electives and 3 credits of Restricted Electives
3. Complete 12 credits of Technical Electives

Another option for earning Technical and Restricted Electives allows students to request substitution of up to 6 credits of Restricted Electives for up to 6 credits of Technical Electives. To be considered for the substitution option, students must follow these steps:

1. Meet with an Academic Advisor. Discuss the goals for the substitutions and seek guidance. Students should carefully consider their options and ensure they are making the best choices for their educational and professional development.
2. Develop a Plan of Study. Outline which courses you wish to substitute and how they fit into your overall academic plan.
3. Prepare a Written Proposal. In the narrative, describe the added value of the courses to your degree and career aspirations. Clearly articulate how the courses will help you achieve your professional goals.
4. Verbal Presentation. Orally defend your proposal to the Associate Department Head for Undergraduate Affairs or their designee.

### Fundamental, Advanced and Interdisciplinary Technical Electives

Code	Title	Credits
<b>Construction Engineering and Management</b>		
CEE 3014	Construction Management (Fundamental)	3
CEE 4014	Estimating, Production, and Cost Engineering <sup>2</sup>	3
CEE 4024	Construction Control Techniques	3
CEE 4034	Smart Sustainable Infrastructure	3
CEE 4074	Construction Engineering: Means and Methods	3
<b>Structural Engineering and Materials</b>		
CEE 3404	Introduction to Structural Engineering (Fundamental)	3
CEE 3424	Reinforced Concrete Structures I	3
CEE 3434	Design of Steel Structures I <sup>2</sup>	4
CEE 4404	Intermediate Structural Analysis	3
CEE 4454	Masonry Structural Design	3
<b>Environmental Engineering</b>		
CEE 3104	Introduction to Environmental Engineering (Fundamental)	3
CEE 4104	Water and Wastewater Treatment Design <sup>2</sup>	3
CEE 4114	Fundamentals of Public Health Engineering	3
CEE 4134	Environmental Sustainability - A Systems Approach	3
CEE 4144	Air Resources Engineering	3
CEE 4174	Solid and Hazardous Waste Management	3
<b>Materials</b>		
CEE 3684	Civil Engineering Materials (Fundamental with lab)	4
CEE 4610	Mechanics of Composite Materials	3
CEE 4614	Concrete Materials	3
CEE 4634	Infrastructure Condition Assessment	3
CEE 4664	Pavement Design <sup>2</sup>	3
<b>Land Development</b>		
CEE 3274	Introduction to Land Development Design (Fundamental)	3
CEE 4264	Sustainable Land Development	3
CEE 4274	Land Development Design <sup>2</sup>	3
CEE 4284	Advanced Land Development Design	3
<b>Geotechnical Engineering</b>		
CEE 3514	Introduction to Geotechnical Engineering (Fundamental with lab)	4
CEE 4514	Methods in Geotechnical Engineering	3
CEE 4534	Earth Pressures and Foundation Structures	3
CEE 4544	Design of Earth Structures <sup>2</sup>	3

CEE 4564	Introduction to Coastal and Marine Geotechnics	3
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### Water Resources Engineering

CEE 3314	Water Resources Engineering (Fundamental with lab)	4
CEE 4304	Hydrology	3
CEE 4314	Groundwater Resources	3
CEE 4324	Open Channel Flow	3
CEE 4334	Hydraulic Structures <sup>2</sup>	3
CEE 4344	Water Resources Planning	3
CEE 4384	Coastal Engineering	3
CEE 4394	Urban Water Sustainability	3

### Transportation Engineering

CEE 3604	Introduction to Transportation Engineering (Fundamental)	3
CEE 4604	Traffic Engineering	3
CEE 4624	Planning Transportation Facilities	3
CEE 4654	Geometric Design of Highways <sup>2</sup>	3
CEE 4674	Airport Planning and Design	3
CEE 4684	Transportation Safety	3
CEE 4694	Freight Operations	3

### Interdisciplinary Technical Electives, Independent Study, Undergraduate Research

CEE 4554	Natural Disaster Mitigation and Recovery	3
CEE 4824	Introduction to Forensic Engineering	3
CEE 4844	Building Information Modeling and Integrated Practices	3
CEE 4834	Cyber-Physical and Remote Sensing Methods in Civil Engineering	3
CEE 4974		1-19
CEE 4994	Undergraduate Research	1-19

### 5000-Level Advanced Electives

Students in their senior year with a 3.00 or better GPA may enroll in 5000-level courses satisfying undergraduate degree requirements. See your academic advisor.

### Restricted Electives

Code	Title	Credits
<b>Study Abroad</b>		
CEE 3954		
<b>Programming</b>		
CS 1044	Introduction to Programming in C	3
CS 1064	Introduction to Programming in Python	3
CS 1114	Introduction to Software Design	3
CS 2064	Intermediate Programming in Python	3
<b>Engineering Fundamentals, Mechanics, and Materials</b>		
AOE 4054	Stability of Structures	3
BSE 3154	Thermodynamics of Biological Systems	3
CHE 2114	Mass and Energy Balances	3
ESM 3054	Mechanical Behavior of Materials	3
ESM 2304	Dynamics	3
ISE 3204	Manufacturing Processes <sup>3</sup>	3
ME 2134	Thermodynamics <sup>3</sup>	4
MSE 2034	Elements of Materials Engineering	3
MSE 4304	Metals and Alloys <sup>3</sup>	3

SBIO 2124	Structure and Properties of Sustainable Biomaterials	3
SBIO 3324	Green Building Systems	3
SBIO 4314	Design of Wood Structures	3
SBIO 4714	Performance of Sustainable Biomaterials in Buildings	3

**Statistics and Math**

MATH 3414	Numerical Methods	3
MATH 4564	Operational Methods for Engineers	3
STAT 4604	Statistical Methods for Engineers	3

**Science**

CHEM 1036	General Chemistry	3
PHYS 2306	Foundations of Physics	4
BIOL 1105	Principles of Biology	3
GEOS 3014	Environmental Geosciences	3
GEOG 3304	Geomorphology	3
GEOS 4634	Environmental Geochemistry	3
GEOS 4824	Engineering Geology	3

**Public Policy and Planning**

SPIA 2314	Active Transportation for a Healthy, Sustainable Planet	3
SPIA 2554	Collaborative Policy-Making and Planning	3
SPIA 3554	Transdisciplinary Problem Solving for Social Issues	3
SPIA 3704	Urban Contention and Mobilization	3
SPIA 4454	Future of Cities	3
SPIA 4464	Data and the Art of Policy-Making and Planning	3
UAP 3014	Urban Policy and Planning	3
UAP 3024	Urban and Regional Analysis	3
UAP 3224	Policy Implementation <sup>3</sup>	3

**Real Estate**

REAL 4754	Real Estate Law	3
UAP 2004	Principles of Real Estate	3
REAL 2034	Real Estate Data Analysis	3

**Sustainability, Environment, Climate Change**

GEOG 2244	Sustainable Urbanization	3
AAEC 3314	Environmental Law	3
BSE 3324	Small Watershed Hydrology	3
BSE 4224	Field Methods in Hydrology	3
CEM 3074	Global Design and Construction for Sustainable Development	3
FREC 2124	Forests, Society & Climate	3
FREC 4464	Water Resources Policy and Economics	3
FREC 4784	Wetland Hydrology and Biogeochemistry	3
ENGR 3124	Introduction to Green Engineering	3
ENGR 4134	Environmental Life Cycle Assessment	3
MINE 2114	Energy and Raw Materials: Geopolitics and Sustainable Development	3
SBIO 2504	Circular Economy Analytics for Sustainable Systems	3
UAP 3354	Introduction to Environmental Policy and Planning	3
UAP 4374	Land Use and Environment: Planning and Policy	3

**Geographic Information Science**

BSE 4344	Geographic Information Systems for Engineers	3
GEOG 2084	Principles of Geographic Information Systems	3

**Business, Management, and Economics**

AAEC 2104	Personal Financial Planning	3
AAEC 3324	Environment and Sustainable Development Economics	3
ECON 2005	Principles of Economics	3
ECON 2006	Principles of Economics	3
ISE 4304	Global Issues in Industrial Management <sup>3</sup>	3

**Construction**

CEM 2714	Construction Safety Systems	3
CEM 4714	Construction Safety Culture	3
CEM 4724	Construction Industry Futures: Safety, Health, and Wellness	3

**Approved Minors**

- Business (BUSR)
- Computer Science (CS)
- Data and Decisions (DTDC)
- Economics (ECAS)
- Engineering Science and Mechanics (ESM)
- Entrepreneurship-New Venture Growth (ENVG)
- Environmental Policy and Planning (EPP)
- Geographic Information Science (GIS)
- Geosciences (GEOS)
- Green Engineering (GREN)<sup>4</sup>
- Industrial Design (IDS)
- Innovation (INNO)
- Mathematics (MATH)
- Professional and Technical Writing (PTW)
- Public and Urban Affairs (PUA)
- Real Estate (REAL)
- Smart and Sustainable Cities (SSC)
- Statistics (STAT)
- Watershed Management (WSM)

<sup>1</sup> Career Bridge Experiences help prepare students for post-graduation life and develop a professional identity. Internships, Co-ops, and Undergraduate Research are examples of possible Career Bridge Experiences. Students must participate in a Career Bridge Experience to complete the BSCE degree. Because some of these experiences are not credit bearing, the ENGE 3900 course is used to track and assess student participation in Career Bridge and to record fulfillment of this degree requirement on the transcript. Students should enroll in ENGE 3900 during the semester (or one of the semesters) that they undertake the Career Bridge Experience. Enrollment in ENGE 3900 requires approval of a Career Bridge Plan. Further information about acceptable Career Bridge Experiences and the process for submitting a Career Bridge Plan are explained in CEE 2804.

<sup>2</sup> Design Project Course

<sup>3</sup> Enrollment is on a space-available basis during drop-add.

<sup>4</sup> Electives chosen within the minor must include 6 credit hours of non CEE courses that do not satisfy BSCE degree requirements.

## Satisfactory Progress Towards Degree

University Policy 91 outlines university-wide minimum criteria to determine if students are making satisfactory progress towards the completion of their degrees. The CEE Department fully supports this policy. Specific expectations for satisfactory progress for Civil Engineering majors are as follows:

- Each student must meet the minimum University-wide criteria as described in Policy 91 and summarized in the Undergraduate Catalog ([undergradcatalog.registrar.vt.edu/](http://undergradcatalog.registrar.vt.edu/) (<http://undergradcatalog.registrar.vt.edu/>)).
- A 2.0 overall GPA and a 2.0 in-major GPA must be maintained for continued enrollment in CEE. The in-major GPA consists of all courses taken with a CEE designator.
- Upon completion of 64 GPA hours, a student must have satisfactorily completed CEE 2804 Introduction to Civil and Environmental Engineering, CEE 2814 Geomatics, and CEE 2834 Civil Engineering Drawings and Virtual Modeling.
- Be enrolled in at least one 3-credit CEE course each fall and spring semester.

## Graduation Requirements

Students must pass all required courses and both the in-major and overall GPA must be at least 2.0 for graduation. The in-major GPA consists of all courses taken under the CEE designation.

### C- Policy

A C- or better grade is required in any course that is a prerequisite for a CEE course. The notation (C-) is provided for first and second-year advising purposes only and indicates that those courses are prerequisites for a course with a CEE designator.

### Additional Comments

Displayed course offerings are subject to sufficient resources. Courses are taught in the term in which they appear on the roadmap. CEE Fundamentals courses are typically taught each fall and spring term, whereas CEE Advanced courses may not be offered each academic term. Consult the CEE course listing and your departmental advisor for updates.

## Acceptable Substitutions

1. MATH 2405H Mathematics in a Computational Context may be substituted for MATH 2114 Introduction to Linear Algebra
2. MATH 2405H Mathematics in a Computational Context + MATH 2406H Mathematics in a Computational Context may be substituted for MATH 2114 Introduction to Linear Algebra and MATH 2204 Introduction to Multivariable Calculus and MATH 2214 Introduction to Differential Equations
3. ESM 2114 Statics & Structures may be substituted for ESM 2104 Statics
4. ME 3024 Engineering Design and Economics may be substituted for ISE 2014 Engineering Economy
5. ESM 2114 Statics & Structures + AOE 2024 Thin-Walled Structures may be substituted for ESM 2104 Statics and ESM 2204 Mechanics of Deformable Bodies

## Foreign Language Requirements

Students must have had 2 years of a foreign language in high school or one year at the college level (6 credit hours) of the same language. College-level credits used to meet this requirement do not count towards the degree.

### Roadmap

First Year		Credits
<b>Fall Semester</b>		
CHEM 1035	General Chemistry (C-)	3
CHEM 1045	General Chemistry Laboratory (C-)	1
ENGL 1105	First-Year Writing	3
MATH 1225	Calculus of a Single Variable (C-)	4
ENGE 1215	Foundations of Engineering	2
Pathways		3
<b>Credits</b>		<b>16</b>
<b>Spring Semester</b>		
ENGL 1106	First-Year Writing	3
MATH 1226	Calculus of a Single Variable (C-)	4
PHYS 2305	Foundations of Physics (C-)	4
ENGE 1216	Foundations of Engineering (C-)	2
Pathways		3
<b>Credits</b>		<b>16</b>
<b>Second Year</b>		
<b>Fall Semester</b>		
ESM 2104	Statics (C-)	3
MATH 2114	Introduction to Linear Algebra	3
MATH 2204	Introduction to Multivariable Calculus	3
CEE 2834	Civil Engineering Drawings and Virtual Modeling (C-)	3
CEE 2804	Introduction to Civil and Environmental Engineering (C-)	3
<b>Credits</b>		<b>15</b>
<b>Spring Semester</b>		
ESM 2204	Mechanics of Deformable Bodies (C-)	3
GEOS 2104	Elements of Geology (C-)	3
CEE 3804	Computer Applications for Civil and Environmental Engineers (C-)	3
MATH 2214	Introduction to Differential Equations	3
CEE 2814	Geomatics (C-)	4
<b>Credits</b>		<b>16</b>
<b>Third Year</b>		
<b>Fall Semester</b>		
CEE 3304	Fluid Mechanics for Civil and Environmental Engineering	4
ISE 2014	Engineering Economy	2
CEE Fundamental Elective (with Lab)		4
CEE Fundamental Elective		3
Pathways		3
<b>Credits</b>		<b>16</b>
<b>Spring Semester</b>		
CEE 3814	Analytical Tools in Civil and Environmental Engineering	3
CEE Fundamental Elective (with Lab)		4
CEE Fundamental Elective		3
CEE Fundamental Elective		3
CEE 4804	Professional and Legal Issues in Civil Engineering	3
<b>Credits</b>		<b>16</b>
<b>Fourth Year</b>		
<b>Fall Semester</b>		
CEE Fundamental Elective		3

CEE Advanced Elective (Design Project)	3
CEE Advanced Elective	3
Technical Elective	3
Restricted Electives	3
Pathways	3
<b>Credits</b>	<b>18</b>
<b>Spring Semester</b>	
CEE Advanced Elective	3
CEE Advanced Elective	3
Technical Elective	3
Restricted Elective	3
Pathways	3
<b>Credits</b>	<b>15</b>
<b>Total Credits</b>	<b>128</b>