College of Engineering

VIA DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

Degree: Bachelor of Science in Civil Engineering (BSCE)

Major: Civil Engineering

For Students Entering Under UG Catalog 2022-2023

Credits Required for Graduation: 128

FALL SEMESTER FIRST YEAR	Credits	SPRING SEMESTER FIRST YEAR	Credits
CHEM 1035 General Chemistry(2) **(C-)#** Pre: Eligible to enroll	3	ENGL 1106 First-Year Writing(2) *Pre: ENGL 1105*	3
CHEM 1045 General Chemistry Lab **(C-)#** *Co: CHEM 1035*	1	MATH 1226 Calculus of a Single Variable(2) **(C-)#** *Pre: MATH 1225 (C-)*	4
ENGL 1105 First-Year Writing(2)	3	PHYS 2305 Foundations of Physics with lab(2) **(C-)#** Co: 2325 (MATH 1206 or MATH 1206H or MATH 1226). Pre: (MATH 1205 or MATH 1205H or MATH 1225) or (MATH 1206 or MATH 1206H or MATH 1226)	4
MATH 1225 Calculus of a Single Variable(2) **(C-)#** *Pre: Eligible to enroll*	4	ENGE 1216 Foundations of Engineering(2) **(C-)#** *Pre: ENGE 1215 (C-)*	2
ENGE 1215 Foundations of Engineering(2)	2	ECON 2005 Principles of Economics(2). *Pre: none*	3
Pathways(2)	3		
TOTAL	**16**	**TOTAL**	**16**

FALL SEMESTER SECOND YEAR	Credits	SPRING SEMESTER SECOND YEAR	Credits
ESM 2104 Statics **(C-)#.** Pre: MATH 1226. (Co: MATH 2204 or MATH 2204H or MATH 2224 or MATH 2406H)	3	ESM 2204 Mechanics of Deformable Bodies **(C-)#** Pre: (2104 or 2114), (MATH 2224 or MATH 2224H or MATH 2204 or MATH 2204H))	3
MATH 2114 Introduction to Linear Algebra *Pre: MATH 1225 (min grade of B) or MATH 1226*	3	GEOS 2104 Elements of Geology **(C-)#.** *Pre: none*	3
MATH 2204 Multivariable Calculus *Pre: MATH 1226*	3	CEE 3804 Computer Applications for Civil and Environmental Engineers(2) **(C-)#** *Pre: none*	3[F,S]
CEE 2834 Civil Engineering Drawings and Virtual Modeling(1) **(C-)#.** *Pre: none*	3[F,S]	MATH 2214 Differential Equations *Pre:* MATH 1114 or MATH 2114 or MATH 2114H or MATH 2405H, MATH 1226	3
CEE 2804 Introduction to Civil and Environmental Engineering(2) **(C-)#.** *Pre: none*	3[F]	CEE 2814 Civil and Environmental Engineering Measurements with lab(1) **(C-)#** Pre: (ENGE 1216 or ENGE 1414 or BC 1224), MATH 1226. Co: 2834	4[F,S]
TOTAL	**15**	**TOTAL**	**16**

FALL SEMESTER THIRD YEAR	Credits	SPRING SEMESTER THIRD YEAR	Credits
CEE 3304 Fluid Mechanics for Civil and Environmental Engineering with lab(2) Pre: ESM 2104, CEE 2804	4[F,S]	CEE 3814 Analytics in CEE(1) *Pre: 3804*	3[F,S]
ISE 2014 Engineering Economy *Pre: none*	2[F,S]	CEE Fundamental Program Elective with Lab(1)	4[F,S]
CEE Fundamental Program Elective with Lab(1)	4[F,S]	CEE Fundamental Program Elective(1)	3[F,S]
CEE Fundamental Program Elective(1)	3[F,S]	CEE Fundamental Program Elective(1)	3[F,S]
Restricted Elective	3	CEE 4804 Professional and Legal Issues in Engineering(2) *Pre: 2804; Co: 3304*	3[F,S]
TOTAL	**16**	**TOTAL**	**16**

FALL SEMESTER FOURTH YEAR	Credits	SPRING SEMESTER FOURTH YEAR	Credits
CEE Fundamental Program Elective(1)	3[F,S]	CEE Advanced Program Elective-Design Project. If 4 cr. course taken, reduce Restricted Electives by 1 credit	3
CEE Advanced Program Elective	3		
CEE Advanced Program Elective	3	CEE Advanced Program Elective	3
Technical Elective. If 4 cr. course taken, reduce Restricted Electives by 1 credit.	3	Technical Elective. If 4 cr. course taken, reduce Restricted Electives by 1 credit.	3
Pathways(2)	3	Restricted Elective	3
Pathways(2)	3	Pathways(2)	3
TOTAL	**18**	*Pathways 7 taken here if not previously satisfied* **TOTAL**	**15**

General Information about Checksheet: Superscripts [F,S,SI,SII] in the Credits column indicates semesters when a CEE course is known to be offered. However, course offerings are subject to change and the availability of sufficient resources. Some CEE Advanced Program and Technical Elective courses are not be offered each academic term. Students must confirm course offerings in advance with their CEE Advisor.

C- policy: A C- or better grade is required in any course that is a prerequisite for a course with a CEE designator. 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. The (C-)# notation is not shown in subsequent years. Students must verify C- policy requirements for all planned courses.

(1)Indicates a degree core requirement. Note: Six of the eight Fundamental electives partially satisfy degree core requirements.

(2)Indicates a course used to satisfy Pathways requirements.

Pathways to General Education – Required courses that count toward meeting Pathways requirements are indicated in bold font inside the shaded cells in table below**.** Consult: pathways.prov.vt.edu/about/table.html for courses. Pathways courses must be completed prior to graduation.

Pathways Concept 1: Discourse (9 credits)	*Foundational:* **ENGL 1105**	**(3)**	*Foundational:* **ENGL 1106**	**(3)**
	Advanced: **CEE 2804+3304+4804**			**(3)**
Pathways Concept 2: Critical Thinking in the Humanities (6 cr)		**(3)**		**(3)**
Pathways Concept 3: Reasoning in the Social Sciences (6 cr)	**ECON 2005**	**(3)**		**(3)**
Pathways Concept 4: Reasoning in the Natural Sciences (6 cr)	**PHYS 2305**	**(3)**	**CHEM 1035**	**(3)**
Pathways Concept 5: Quantitative and Computational Thinking (9 cr)	*Foundational:* **MATH 1225**	**(3)**	*Foundational:* **MATH 1226**	**(3)**
	Advanced: **CEE 3804**			**(3)**
Pathways Concept 6: Critique and Practice in Design and the Arts (6 cr)	*Arts:*			**(3)**
	Design: **ENGE 1215 + ENGE 1216 or ENGE 1414**			**(3)**
Pathways Concept 7: Critical Analysis of Identity & Equity in the US	Pathways 7 should be double-counted with either a Pathways 2 or 3 course to avoid taking any additional credit hours.			**(3)**

CEE Electives: The CEE department requires 44 credits of Program, Technical, and Restricted Elective courses broken down as follows:

1. 12 credits of **CEE Fundamental Program Elective** courses from the list on p. 3 (courses are 3 cr. unless noted)
2. 8 credits of **CEE Fundamental Program Elective** courses **with Lab** from the list on p. 3 (courses are 4 cr.)
3. 9 credits of **CEE Advanced Program Elective** courses from the list on p. 3
4. 3 credits of **CEE Advanced Program Elective** course–**Design Project** from the list on p. 3
5. 6 credits of **Technical Electives** selected from Fundamental and Advanced electives courses in the lists on p. 3
6. 6 credits of **Restricted Electives**.

A. <u>Program Electives–32 credits (C- policy applies)</u>

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

Program Electives are selected from the lists on p. 3 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 1 *Advanced course* in 3 of the 6 specialty areas in which Fundamental courses were selected in Step 1 (9 credits).
3. Complete an additional *Advanced course* in 1 of the 3 specialty areas in which advanced courses were selected in Step 2 (3 credits).
4. Within selections made in the above steps, complete at least one of the following *Design Project* courses: **CEE 3434** (4 credit course. Reduce Restricted Electives by 1-credit if taken), **4014, 4104, 4274, 4334, 4544, 4654, or 4664**.

B. <u>Technical Electives–6 credits (C- policy applies)</u>

Technical Electives are selected from any of the Fundamental and Advanced courses listed on p. 3, including the Interdisciplinary Technical Electives, Independent Study, Undergraduate Research courses. Note: if a 4-credit course is taken, reduce Restricted Electives by 1 credit.

C. <u>Restricted Electives–6 credits</u>. Restricted Electives (non-CEE) can be satisfied in one of the following ways:

1. Complete 6 credits of courses from the list of approved courses on p. 4. All courses 3 credits unless noted otherwise.
2. *Complete* one of the approved minors listed on p. 5.

Fundamental (20 credits), Advanced (12 credits) and Technical Elective (6 credits) courses. *See instructions under **A** and **B** on p. 2.* C- policy applies. Courses in **bold font** are *Design Project* courses.

Construction Engineering and Management	*Structural Engineering and Materials*
CEE 3014 Construction Management. *(Fundamental)* *Pre: Junior standing*	CEE 3404 Intro. to Structural Engineering. *(Fundamental)* *Pre: ESM 2204*
CEE 4014 Est, Prod & Cost Engr. *Pre: 3014*	CEE 3424 Reinforced Concrete Structures I. *Pre: (CEE 3404, CEE 3684) or BC 2044*
CEE 4024 Const Control Tech. *Pre: 3014*	**CEE 3434 Design of Steel Structures I (4cr).** *Pre: (CEE 3404, CEE 3684) or BC 2044*
CEE 4034 Smart Sustainable Infrastructure. *Pre: 3804*	CEE 4404 Intermediate Struct Analysis. *Pre: 3404*
CEE 4074 Const Means & Methods. *Pre: 3014 or CEM 2104*	CEE 4454 Masonry Structural Design. *Pre: 3684, 3424*

Environmental Engineering	*Materials*
CEE 3104 Intro to Environmental Engineering. (Fundamental) *Pre: CHEM 1035, CHEM 1045, (MATH 1026 or MATH 1206 or MATH 1206H or MATH 1226 or MATH 2016 or MATH 2024), (PHYS 2305 or PHYS 2205)*	CEE 3684 Civil Engineering Materials, with Lab, 4 cr. (*Fundamental*). *Pre: CHEM 1035, CHEM 1045, ESM 2204, CEE 2814, GEOS 2104*
CEE 4104 Water & Wastewater Design, *Pre: 3104*	CEE 4610 (ESM 4044) Mech. Composite Materials. *Pre: ESM 2204 or AOE 2024/P*
CEE 4114 Fund Public Health Engr. *Pre: 3104*	CEE 4614 Advanced Structural Concretes. *Pre: 3684 or BC 2044*
CEE 4134 Sustainable Systems. *Pre: Sr. standing*	CEE 4634 Infrastructure Condition Assessment. *Pre: 3684*
CEE 4144 Air Resources Engineering. *Pre: 3104*	**CEE 4664 Pavement Design.** *Pre: 3684*
CEE 4174 Solid & Haz Waste Mgt. *Pre: 3104*	

Land Development	*Geotechnical Engineering*
CEE 3274 Intro to Land Development. (Fundamental) *Pre: 2814, (2824 or 2834)*	CEE 3514 Intro to Geotechnical Engineering with Lab, 4 cr. (Fundamental) *Pre: GEOS 2104, ESM 2204*
CEE 4254 Municipal Engineering. *Pre: 3274*	CEE 4514 Methods in Geotechnical Engineering. *Pre: 3514*
CEE 4264 Sustainable Land Development. *Pre: 3274*	CEE 4534 Earth Pressures & Foundation Structures. *Pre: 3514*
CEE 4274 Land Development Design. *Pre: 3274*	**CEE 4544 Design of Earth Structures.** *Pre: 3514*
CEE 4284 Advanced Land Development Design. *Pre: 3274, Co: 4274*	CEE 4564 Intro to Coastal Marine Geotechnics. *Pre: 3514*

Water Resources Engineering	*Transportation Engineering*
CEE 3314 Water Resources Engineering with Lab, 4 cr. (Fundamental) *Pre: 3304*	CEE 3604 Intro to Transportation Engineering (Fundamental). *Pre: Junior standing*
CEE 4304 Hydrology. *Pre: 3304*	CEE 4604 Traffic Engineering. *Pre: 3604*
CEE 4314 Groundwater Resources. *Pre: 3304*	CEE 4624 Planning Transportation Facilities. *Pre: 3604*
CEE 4324 Open Channel Flow. *Pre: 3314*	**CEE 4654 Geometric Design of Highways.** *Pre: 3604*
CEE 4334 Hydraulic Structures. *Pre: 3314*	CEE 4674 Airport Planning and Design. *Pre: 3604*
CEE 4344 Water Resources Planning. *Pre: Sr. standing*	CEE 4684 Transportation Safety. *Pre: 3604*
CEE 4384 Coastal Engineering. *Pre: 3304*	CEE 4694 Freight Operations. *Pre: 3604*
CEE 4394 Urban Water Sustainability.	

*Interdisciplinary Technical Electives, Independent Study, Undergraduate Research**	*5000-Level Advanced Electives*
CEE 4554 Natural Disasters. *Pre: Sr. Standing*	Students in their senior year, with a 3.0 or better GPA, may enroll in 5000-level courses satisfying undergraduate degree requirements. See your academic advisor.
CEE 4814 Risk and Reliability in CEE. *Pre: 3804*	
CEE 4824 Intro to Forensic Engineering. *Pre: ESM 2204, 3684*	
CEE 4844 BIM and Integrated Practices. *Pre: Sr. standing*	
CEE 4834 Cyber Phys. and Remote Sensing in CEE. *Pre: 3814 or BSE 3144*	
CEE 4974 Independent Study.	
CEE 4994 Undergraduate Research.	

*These courses do not satisfy Program Elective requirements but may be taken as Technical Electives.

Restricted Electives (6 credits). *See **C** on p. 2 for instructions.* Note: Courses are 3 cr. unless noted.

Programming	**Engineering Mechanics and Materials**
CS 1064 Intro to Programming in Python. *Pre: none*	ESM 3054 (MSE 3054) Mech Behavior of Materials. *Pre:* 2204, (MSE 2034 or MSE 2044 or MSE 3094 or AOE 3094 or 3684)
CS 1044 Intro to Programming in C. *Pre: none. Not for students planning to major or minor in CS.*	ESM 2304 Dynamics. *Pre: (ESM 2104 or 2114)*, (MATH 2224 or MATH 2224H or MATH 2204 or MATH 2204H). Co: MATH 2214
CS 2064 Intermediate Programming in Python. *Pre: CS 1064*	AOE 4054 (ESM 4444) Stability of Structures. *Pre: 2024 or 3024 or CEE 3404*
Public Policy and Planning	MSE 2034 Elements of Materials Engineering. *Pre: CHEM 1035. Co: PHYS 2305*
SPIA 2244 (GEOG 2244) Sustainable Urbanization. *Pre: none, Fee required.*	MSE 4304: Metals and Alloys. *Pre: MSE 2034 or MSE 2044. (Enrollment is on a space-available basis during drop add)*
SPIA 2314 (HNFE 2314) Active Transportation for a Healthy, Sustainable Planet. *Pre: none*	SBIO 2124 Structure and Properties of Sustainable Biomaterials. *Pre: BIOL 1005, CHEM 1035*
SPIA 2554 Collaborative Policy-Making & Planning. *Pre: none*	SBIO 3324 Green Building Systems. *Pre: none*
SPIA 3554 Transdisciplinary Problem Solving for Social Issues. *Pre: none*	SBIO 4314 (CEM 4314) (CNST 4314): Design of Wood Structures. *Pre: 3314 or CEE 3404*
SPIA 3704 Urban Contention and Mobilization. *Pre: none*	SBIO 4714 Performance of Sustainable Biomaterials in Buildings. *Pre: 2124*
SPIA 4454 Future of Cities.	ISE 3204 Manufacturing Processes. *Pre: ENGE 1216 or ENGE 1414 (Enrollment is on a space-available basis during drop add)*
SPIA 4464 Data and The Art of Policy-Making and Planning. *Pre: none*	**Statistics and Math**
UAP 3014 Urban Policy and Planning. *Pre: UAP 1024*	MATH 3414 (CS 3414): Numerical Methods. *Pre: (CS 1044 or CS 1705 or CS 1114 or CS 1124), MATH 2406H or (CMDA 2005, CMDA 2006) or (MATH 2214 or MATH 2214H), (MATH 2204 or MATH 2204H)*
UAP 3024 Urban and Regional Analysis. *Pre: none*	MATH 4564 Operational Methods for Engineers. *Pre: (MATH 2214 or 2214H) or MATH 2406H or CMDA 2006*
UAP 3224 Policy Implementation. *Pre: 3014, STAT 3604 (Contact UAP Undergrad. Advisor during drop add to enroll)*	STAT 4604 Statistics for Engineers. *Pre: MATH 1206 or MATH 1226*
Real Estate	**Science**
AAEC 4754 Real Estate Law. *Pre: Junior standing*	BIOL 1105 Principles of Biology. *Pre: none*
UAP 2004 (REAL 2004) Principles of Real Estate. *Pre: none*	CHEM 1036 General Chemistry. *Pre: CHEM 1035 or CHEM 1055 or CHEM 1055H*
Sustainability, Environment, Climate Change	PHYS 2306 Foundations of Physics (4cr). *Pre: (MATH 1206 or MATH 1206H or MATH 1226), PHYS 2305*
AAEC 3314 Environmental Law. *Pre: none*	GEOS 3014. Environmental Geosciences.
BSE 3324 - Small Watershed Hydrology. *Pre: PHYS 2305*	GEOS 3304 (CSES 3304) (GEOG 3304) Geomorphology. *Pre: GEOG 1104 or GEOS 1004 or GEOS 2104 or GEOS 2024.*
CEM 3074 Global Design and Construction for Sustainable Development. *Pre: Junior Standing*	GEOS 4634: Environmental Geochemistry. *Pre: MATH 1225, CHEM 1035.*
FREC 2124 Forests, Society and Climate. *Pre: none*	GEOS 4824 Engineering Geology. *Pre: (GEOS 1004 or GEOS 2024 or GEOS 2104), (PHYS 2305 or PHYS 2205), (CHEM 1035 or CHEM 1015), (MATH 1225 or MATH 1025)*
FREC 4464 (WATR 4464) (AAEC 4464) Water Resources Policy & Economics. *Pre: AAEC 1005 or ECON 2005*	**GIS**
FREC 4784 Wetland Hydrology and Biogeochemistry. *Pre: none*	GEOG 2084 Principles of GIS. *Pre: None*
ENGR 3124 Green Engineering. Pre: (CHEM 1034 or CHEM 1074), (ENGE 2216 or ENGE 1104 or ENGE 1114), PHYS 2306. *Restricted to those in Green Engineering Minor until drop/add.*	**Business, Management and Economics**
ENGR 4134 Engineering Life Cycle Assessment. *Pre: ENGR 3124.*	AAEC 2104 Personal Financial Planning. *Pre: none*
MINE 2114 Energy and Raw Materials: Geopolitics and Sustainable Development. *Pre: none*	AAEC 3324 Environment and Sustainable Development Economics. *Pre: AAEC 1005 (MIN grade of P) or AAEC 1006 (MIN grade of P) or ECON 2005 (MIN grade of P)*
SBIO 2504 Circular Economy Analytics for Sustainable Systems. *Pre: MATH 1025 or MATH 1225 or MATH 1524 or MATH 1535 or MATH 1525*	ECON 2006 Principles of Economics. *Pre: ECON 2005*
UAP 3354 Introduction to Environmental Policy and Planning. *Pre: none*	ISE 4304 Global Issues in Industrial Management. *Pre: none (Enrollment is on a space-available basis during drop add)*
UAP 4374 Land Use and Environment. Planning and Policy. *Pre: Junior standing*	

Approved Minors. The required 6 credits of Restricted Electives can be satisfied by *completing* one of the minors listed below. Checksheets located at https://www.registrar.vt.edu/graduation-multi-brief/checksheets.html.	
Business (BUSR)	Green Engineering** (GREN)
Computer Science (CS)	Industrial Design (IDS)
Data and Decisions (DTDC)	Innovation (INNO)
Economics (ECAS)	Mathematics (MATH)
Engineering Science & Mechanics (ESM)	Professional and Technical Writing (PTW)
Entrepreneurship – New Venture Growth (ENVG)	Public and Urban Affairs (PUA)
Environmental Policy & Planning (EPP)	Real Estate (REAL)
Geographic Information Science (GIS)	Smart and Sustainable Cities (SSC)
Geosciences (GEOS)	Statistics (STAT)
	Watershed Management (WSM)

**Note: Minor electives chosen must include 6 credits of non-CEE courses that do not also satisfy BSCE degree requirements.

Change of Major Requirements: Please see https://eng.vt.edu/em

Foreign Language Requirements: Students must have completed two 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.

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 (https://www.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, CEE 2814, and CEE 2834.
- Be enrolled in at least one 3-credit CEE course each fall and spring semester.

***Prerequisites:** Some courses on this checksheet have pre-/corequisites; please consult the University Course Catalog (https://www.undergradcatalog.registrar.vt.edu), or check with your advisor for the most current pre-requisites. There are no hidden pre-requisites in the program of study.

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.

Additional Checksheet Comments: Displayed course offerings are subject to sufficient resources. Courses are taught in the term in which they appear on the checksheet. 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.

Approved by the CEE Curriculum Committee 16 November 2021