

Civil Engineering (BS)

To see more about what you will learn in this program, visit the Learning Outcomes website (<https://apps.oirp.ncsu.edu/pgas/>)!

Civil Engineering Degree

The Civil Engineering curriculum provides academic discipline in mathematics, the physical sciences, and the technical aspects of civil engineering. Upon mastering the fundamental principles of engineering mechanics, the student builds additional breadth in several of the civil engineering disciplines such as coastal and water resources, computing and systems, construction, environmental, geotechnical, materials, structural, and transportation engineering. Students learn to include principles of sustainability in civil infrastructure designs and develop skills in communication, leadership, and professional ethics.

Specific curriculum requirements are available on the Office of Undergraduate Courses and Curricula website.

Educational Objectives in Civil Engineering

Within a few years of graduation, alumni of the Civil Engineering program will:

1. Function successfully in a professional environment by utilizing and enhancing their leadership, technical, critical thinking, and communication skills.
2. Develop lifelong learning skills through graduate or other professional education and obtaining licensure where appropriate.
3. Function in team-oriented, multidisciplinary open-ended engineering activities considering the societal, economic, public health, and environmental impacts of engineering decisions, and the professional and ethical responsibilities of civil engineers.
4. Promote organizational success with consideration of cost and time management while practicing and promoting ethical behavior and stewardship of a sustainable environment.

Plan Requirements

First Year

Fall Semester		Hours
CH 101	Chemistry - A Molecular Science ¹	3
CH 102	General Chemistry Laboratory ¹	1
E 101	Introduction to Engineering & Problem Solving ²	1
E 115	Introduction to Computing Environments	1
MA 141	Calculus I ¹	4
ENG 101	Academic Writing and Research ²	4
Hours		14
Spring Semester		
MA 241	Calculus II ¹	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4
Select one of the following Economics Courses:		3
ARE 201	Introduction to Agricultural & Resource Economics	

ARE 201A	Introduction to Agricultural & Resource Economics	
EC 201	Principles of Microeconomics	
EC 205	Fundamentals of Economics	
E 102	Engineering in the 21st Century	2
Hours		13

Second Year

Fall Semester

CE 214	Engineering Mechanics-Statics ²	3
CE 250	Introduction to Sustainable Infrastructure ²	3
TDE 220	Civil Engineering Graphics	3
MA 242	Calculus III	4
CSC 111	Introduction to Computing: Python	3
Hours		16

Spring Semester

CE 225	Mechanics of Solids ²	3
CE 282	Hydraulics ²	3
MA 305 or MA 341	Introductory Linear Algebra and Matrices or Applied Differential Equations I	3
MSE 200	Mechanical Properties of Structural Materials	3
PY 208	Physics for Engineers and Scientists II	3
PY 209	Physics for Engineers and Scientists II Laboratory	1
Hours		16

Third Year

Fall Semester

CE 332 or CE 342	Civil Engineering Materials or Engineering Behavior of Soils and Foundations	4
Select one of the following:		3
CE 305	Introduction to Transportation Engineering	
CE 327	Reinforced Concrete Design	
CE 339	Civil Engineering Systems	
CE 383	Hydrology and Urban Water Systems	
CE Junior Elective (p. 2)		3
ST 370	Probability and Statistics for Engineers	3
Hours		13

Spring Semester

CE 332 or CE 342	Civil Engineering Materials or Engineering Behavior of Soils and Foundations	4
Select one of the following:		3
CE 305	Introduction to Transportation Engineering	
CE 327	Reinforced Concrete Design	
CE 339	Civil Engineering Systems	
CE 383	Hydrology and Urban Water Systems	
CE Junior Elective (p. 2)		3
Basic Science Elective (p. 2)		3
Select one of the following Engineering Science Electives:		3
ECE 331	Principles of Electrical Engineering	
MAE 201	Engineering Thermodynamics I	

MAE 208	Engineering Dynamics	
Hours		16
Fourth Year		
Fall Semester		
CE Senior Elective (p. 3)		3
CE Senior Elective (p. 3)		3
Senior Elective (p. 3)		3
COM 110 or ENG 331	Public Speaking or Communication for Engineering and Technology	3
Hours		12
Spring Semester		
CE Senior Elective (p. 3)		3
CE Senior Elective (p. 3)		3
CE 420 or CE 450	Structural Engineering Project or Civil Engineering Project	3
Hours		9
Total Hours		109

¹ A grade of C or higher is required.

² A grade of C- or higher is required.

Code	Title	Hours	Counts towards
GEP Courses			
	GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)	6	
	GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)	3	
	GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)	2	
	GEP US Diversity, Equity, and Inclusion (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-usdei/)	3	
	GEP Interdisciplinary Perspectives (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-interdisciplinary-perspectives/)	3	
	GEP Global Knowledge (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/) (verify requirement)		

Foreign Language Proficiency
(<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/foreign-language-proficiency/>) (verify requirement)

Total Hours **17**

CE Junior Electives

Code	Title	Hours	Counts towards
CE 301	Civil Engineering Surveying and Geomatics	3	
CE 305	Introduction to Transportation Engineering	3	
CE 325	Structural Analysis I	3	
CE 327	Reinforced Concrete Design	3	
CE 339	Civil Engineering Systems	3	
CE 367	Mechanical and Electrical Systems in Buildings	3	
CE 373	Fundamentals of Environmental Engineering	3	
CE 383	Hydrology and Urban Water Systems	3	

Basic Science Electives

Code	Title	Hours	Counts towards
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
FOR 260	Forest Ecology	4	
FW 221	Conservation of Natural Resources	3	
MEA 101	Geology I: Physical	3	
MEA 110	Geology I Laboratory	1	
MEA 200	Introduction to Oceanography	3	
MEA 210	Oceanography Lab	1	
SSC 200	Soil Science	3	

CE Senior Electives

Code	Title	Hours	Counts towards
CE 401	Transportation Systems Engineering	3	
CE 402	Traffic Operations	3	
CE 403	Highway Design	3	
CE 405	Railroad System Planning, Design, and Operation	3	
CE 413	Principles of Pavement Design	3	
CE 426	Structural Steel Design	3	
CE 435	Engineering Geology	3	
CE 437	Civil Engineering Computing	3	
CE 443	Seepage, Earth Embankments and Retaining Structures	3	
CE 444	An Introduction to Foundation Engineering	3	
CE 466	Building Construction Engineering	3	
CE 476	Air Pollution Control	3	
CE 477	Principles of Solid Waste Engineering	3	
CE 478	Energy and Climate	3	
CE 479	Air Quality	3	
CE 484	Water Supply and Waste Water Systems	3	
CE 487	Introduction to Coastal and Ocean Engineering	3	
CE 488	Water Resources Engineering	3	
CE 501	Transportation Systems Engineering	3	
CE 502	Traffic Operations	3	
CE 503	Highway Design	3	
CE 505	Railroad System Planning, Design, and Operation	3	
CE 578	Energy and Climate	3	

CE 588	Water Resources Engineering	3
MEA 479	Air Quality	3

Senior Electives

Code	Title	Hours	Counts towards
ARC 521	Daylighting and Passive Energy Systems for Architecture	3	
ARC 522	Building Energy Efficiency & Renewable Energy	3	
ARC 523	Building Energy Modeling and Simulation	3	
ARC 590	Special Topics in Architecture	1-6	
CE 225	Mechanics of Solids	3	
CE 282	Hydraulics	3	
CE 401	Transportation Systems Engineering	3	
CE 402	Traffic Operations	3	
CE 403	Highway Design	3	
CE 405	Railroad System Planning, Design, and Operation	3	
CE 425	Structural Analysis II	3	
CE 464	Legal Aspects of Contracting	3	
CE 468	Construction Engineering Laboratory	1	
CE 478	Energy and Climate	3	
CE 488	Water Resources Engineering	3	
CE 499	Undergraduate Research Thesis in Civil, Construction and Environmental Engineering	1-3	
CE 501	Transportation Systems Engineering	3	
CE 502	Traffic Operations	3	
CE 503	Highway Design	3	
CE 504	Airport Planning and Design	3	

CE 505	Railroad System Planning, Design, and Operation	3	CE 548	Engineering Properties Of Soils I	3
CE 506	Transportation Engineering Data Collection and Analysis	3	CE 549	Soil and Site Improvement	3
CE 507	Sensors, Instrumentation, and Data Analytics for Transportation Networks	3	CE 557	Engineering Measurement and Data Analysis	3
CE 509	Highway Safety	3	CE 561	Construction Project Management	3
CE 515	Advanced Strength of Materials	3	CE 562	Lean Construction Concepts and Methods	3
CE 522	Theory and Design Of Prestressed Concrete	3	CE 564	Legal Aspects of Contracting	3
CE 523	Theory and Behavior Of Steel Structures	3	CE 565	Construction Safety Management	3
CE 524	Analysis and Design Of Masonry Structures	3	CE 567	Risk and Financial Management in Construction	3
CE 525	Advanced Structural Analysis	3	CE 568	Building Information Modeling in Construction	1
CE 526	Finite Element Method in Structural Engineering	3	CE 571	Physical Principles of Environmental Engineering	3
CE 527	Structural Dynamics	3	CE 573	Biological Principles of Environmental Engineering	3
CE 528	Structural Design in Wood	3	CE 574	Chemical Principles of Environmental Engineering	3
CE 529	FRP Strengthening and Repair of Concrete Structures	3	CE 576	Engineering Principles Of Air Pollution Control	3
CE 530	Properties of Concrete and Advanced Cement-Based Composites	3	CE 577	Engineering Principles Of Solid Waste Management	3
CE 536	Introduction to Numerical Methods for Civil Engineers	3	CE 578	Energy and Climate	3
CE 537	Computer Methods and Applications	3	CE 579	Principles of Air Quality Engineering	3
CE 538	Information Technology and Modeling	3	CE 581	Fluid Mechanics in Natural Environments	3
			CE 582	Coastal Hydrodynamics	3

CE 583	Engineering Aspects Of Coastal Processes	3
CE 584	Hydraulics Of Ground Water	3
CE 585	Principles of Surface Water Quality Modeling	3
CE 586	Engineering Hydrology	3
CE 588	Water Resources Engineering	3
CE 590	Special Topics In Civil Engineering	1-6
CE 591	Special Topics in Civil Engineering Computing	1-6
CE 592	Special Topics in Construction Engineering	1-6
CE 593	Special Topics in Geotechnical Engineering	1-3
CE 594	Special Topics in Structures and Mechanics	1-6
CE 595	Special Topics in Transportation Engineering	1-6
CE 596	Special Topics in Water Resource and Environmental Engineering	1-6
FB 528	Structural Design in Wood	3
MA 302	Numerical Applications to Differential Equations	1
MA 305	Introductory Linear Algebra and Matrices	3
MA 315	Mathematics Methods in Atmospheric Sciences	4
MA 351	Introduction to Discrete Mathematical Models	3
MAE 440	Non-Destructive Testing and Evaluation	3

Semester Sequence

This is a sample.

First Year

Fall Semester		Hours
CH 101	Chemistry - A Molecular Science ¹	3
CH 102	General Chemistry Laboratory ¹	1
E 101	Introduction to Engineering & Problem Solving ²	1
E 115	Introduction to Computing Environments	1
ENG 101	Academic Writing and Research ²	4
MA 141	Calculus I ¹	4
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1

Hours **15**

Spring Semester

EC 205	Fundamentals of Economics	3
MA 241	Calculus II ¹	4
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4
E 102	Engineering in the 21st Century	2
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)		3

Hours **16**

Second Year

Fall Semester

CE 214	Engineering Mechanics-Statics ²	3
CE 250	Introduction to Sustainable Infrastructure ²	3
CSC 111	Introduction to Computing: Python	3
TDE 220	Civil Engineering Graphics	3
MA 242	Calculus III	4

Hours **16**

Spring Semester

CE 225	Mechanics of Solids ²	3
CE 282	Hydraulics ²	3
PY 208	Physics for Engineers and Scientists II	3
PY 209	Physics for Engineers and Scientists II Laboratory	1
MA 341 or MA 305	Applied Differential Equations I or Introductory Linear Algebra and Matrices	3
MSE 200	Mechanical Properties of Structural Materials	3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1

Hours **17**

Third Year

Fall Semester

CE 332 or CE 342	Civil Engineering Materials or Engineering Behavior of Soils and Foundations	4
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CE Core Course – Elective I	3
CE Junior Elective I (p. 2)	3
ST 370 Probability and Statistics for Engineers	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
Hours	16
Spring Semester	
CE 332/342 Civil Engineering Materials	4
CE Core Course – Elective II	3
CE Junior Elective (p. 2)	3
Basic Science Elective (p. 2)	3
Select one of the following Engineering Science Electives:	3
ECE 331 Principles of Electrical Engineering	
MAE 201 Engineering Thermodynamics I	
MAE 208 Engineering Dynamics	
Hours	16
Fourth Year	
Fall Semester	
CE Senior Elective I (p. 3)	3
CE Senior Elective II (p. 3)	3
Senior Elective (p. 3)	3
COM 110 Public Speaking	3
or ENG 331 or Communication for Engineering and Technology	
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
Hours	15
Spring Semester	
CE Senior Elective III (p. 3)	3
CE Senior Elective IV (p. 3)	3
Select one of the following CE Senior Design courses:	3
CE 420 Structural Engineering Project	
CE 450 Civil Engineering Project	
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
GEP Requirement (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/)	3
Hours	15
Total Hours	126

Careers in either professional practice or teaching and research are common for many graduates who complete advanced degrees.

¹ C or better grade required

² C- or better grade required

Career Opportunities

Society will always need constructed facilities to live, work, and sustain their lives and environment, and civil, construction, and environmental engineers will always be needed to plan, design, and construct these facilities. Civil, construction, and environmental engineering comprise such diversified fields that graduates have a wide choice in types and locations of employment. Jobs range from federal, state, or municipal agencies to a variety of manufacturing and processing industries, consulting firms or construction companies. The work may be performed partially or wholly in an office or in the field and may be located in a small community, a big city, an industrial center, or even in a foreign country.