

# Environmental Engineering (MS)

## Master of Science Degree Requirements

Students may choose from the degree tracks below to complete coursework within a focus area.

Degrees earned will be distributed as: "Master of Science" without specialization specifications.

## Environmental, Water Resources, and Coastal Engineering Specialization

Code	Title	Hours	Counts towards
<b>Required Courses</b>			
CE 607	Water Resource and Environmental Engineering Seminar	1	
CE 695	Master's Thesis Research	1-6	
<b>Total Hours</b>		<b>2-7</b>	

## Water Resources Engineering Specialization

Code	Title	Hours	Counts towards
CE 584	Hydraulics Of Ground Water	3	
CE 586	Engineering Hydrology	3	
CE 588	Water Resources Engineering	3	
CE 596	Special Topics in Water Resource and Environmental Engineering (Fluid Mechanics in Natural Environments)	1-6	
Core Electives			
Technical Electives			
<b>Total Hours</b>		<b>10-15</b>	

## Core Electives

Code	Title	Hours	Counts towards
CE 583	Engineering Aspects Of Coastal Processes	3	

CE 596	Special Topics in Water Resource and Environmental Engineering (Coastal Hydrodynamics)	1-6
CE 772	Environmental Exposure and Risk Analysis	3
CE 776	Advanced Water Management Systems	3
CE 784	Ground Water Contaminant Transport	3
CE 791	Advanced Topics in Civil Engineering Computing (Complex Adaptive Systems Analysis)	1-3
CE 796	Advanced Topics in Water Resource and Environmental Engineering (Statistical Methods)	1-3

## Technical Electives

Code	Title	Hours	Counts towards
CE 536	Introduction to Numerical Methods for Civil Engineers	3	
CE 537	Computer Methods and Applications	3	
CE 571	Physical Principles of Environmental Engineering	3	
CE 574	Chemical Principles of Environmental Engineering	3	
CE 583	Engineering Aspects Of Coastal Processes	3	

CE 596	Special Topics in Water Resource and Environmental Engineering (Introduction to Coastal and Ocean Engineering)	1-6
BAE 573	Introduction to Hydrologic and Water Quality Modeling	3
BAE 574	DRAINMOD: Theory and Application	3
BAE 575	Design of Structural Stormwater Best Management Practices	3
BAE 576	Watershed Monitoring and Assessment	3
BAE 581	Open Channel Hydraulics for Natural Systems	3
BAE 584	Introduction to Fluvial Geomorphology	3
BAE/SSC 771	Theory Of Drainage--Saturated Flow	3
FOR 784	The Practice Of Environmental Impact Assessment	4
MEA 540	Principles of Physical Oceanography	3
MEA/GIS 582	Geospatial Modeling	3
MEA 700	Environmental Fluid Mechanics	3
NR 500	Natural Resource Management	4

## Accelerated Bachelor's/Master's Degree Requirements

The Accelerated Bachelor's/Master's (ABM) degree program allows exceptional undergraduate students at NC State an opportunity to complete the requirements for both the Bachelor's and Master's degrees at an accelerated pace. These undergraduate students may double count up to 12 credits and obtain a non-thesis Master's degree in the same field within 12 months of completing the Bachelor's degree, or obtain a thesis-based Master's degree in the same field within 18 months of completing the Bachelor's degree.

This degree program also provides an opportunity for the Directors of Graduate Programs (DGPs) at NC State to recruit rising juniors in their major to their graduate programs. However, permission to pursue an ABM degree program does not guarantee admission to the Graduate School. Admission is contingent on meeting eligibility requirements at the time of entering the graduate program.

## CCEE Department ABM Admission

The CCEE department encourages excellent undergraduate students to obtain a master's degree in their chosen field of specialization within 2 to 3 semesters past BS graduation, through double counting up to 9 credit hours towards both bachelor's and master's degrees. This is referred to as the Accelerated Bachelor's/Master's (ABM) degree program. Following is the pathway for the ABM program.

### Step 1 – Verify your eligibility for applying to the ABM program

- You must have completed at least 75 credit hours (this typically means junior standing)
  - If you are a transfer student, you must have completed at least two semesters at NCSU, earning a minimum of 24 credit hours
- You must not have already received a BS degree
- You must have an overall GPA # 3.5 and major GPA # 3.25

### Step 2 – Apply for ABM by following the steps below

- Determine your area of interest from the list of graduate specialty areas on the next page.
- Talk to the ABM advisor in the specialty area (provided below), and agree on a tentative ABM Plan of Work (POW) that would suit your interests and satisfy the ABM requirements. A finalized ABM POW must be in place before completion of the BS degree.
- Submit an application at [go.ncsu.edu/ccee-abm](https://go.ncsu.edu/ccee-abm) (<https://applygrad.ncsu.edu/register/?id=4d63529c-6ad8-4680-9655-e4e49554ac56>), which includes the tentative ABM POW.
  - The application will first be reviewed by the ABM advisor and a recommendation will be made to the department. The final determination will be made after a joint review by the directors of undergraduate and graduate programs, after which you will be notified.

### Step 3 – While in the ABM program, maintain status by following the steps below:

- With the specialty area ABM advisor's help, prepare a tentative Graduate POW, that complements the Undergraduate POW.
  - Up to 9 credit hours can be double counted, they must be at the 500 level, and they must be selected from the approved list of courses in the specialty area (provided in the subsequent pages).
  - The (tentative) Graduate POW must be formally approved by the ABM advisor.
- It is your responsibility to ensure that both the Graduate POW and Undergraduate POW satisfy the respective master's and undergraduate degree requirements
- You must maintain an overall GPA # 3.5 and a major GPA # 3.25 until you enter the master's program.
- Only graduate courses with a grade # B can be double counted. Courses with a grade # B- cannot be counted towards the master's degree.

- Towards the end of your bachelor’s program, you must formally apply to the master’s program, per deadlines published by the graduate school. Note that the GRE may be waived for ABM students – consult with your ABM advisor. The application must include a completed and signed ABM Plan of Work (<https://grad.ncsu.edu/wp-content/uploads/2015/11/abm-plan-of-work.pdf>).
- You must complete the master’s degree within a time limit (12 months if MCE/MENE, 18 months if MSCE/MSENE), to take advantage of the double counting associated with the ABM. If you do not graduate within this time, you will be considered a regular master’s student needing to take the full 30/31 graduate credits solely towards your master’s degree.

### Graduate Specialty Areas for ABM

Degrees earned will be distributed as: "Master of Civil Engineering" without specialization specifications.

- Computing and Systems
- Construction Engineering
- EWC – Air
- EWC – Environmental Process Engineering
- EWC – Water Resource and Coastal Engineering
- Geotechnical Engineering
- Structural Engineering and Mechanics
- Transportation Materials
- Transportation Systems

### Allowable Courses by Specialty Area

#### COMPUTING SYSTEMS

Code	Title	Hours	Counts towards
CE 536	Introduction to Numerical Methods for Civil Engineers		
CE 537	Computer Methods and Applications		
CE 538	Information Technology and Modeling		
CE 590	Special Topics In Civil Engineering (Civil Engineering Systems)		

#### CONSTRUCTION ENGINEERING

Code	Title	Hours	Counts towards
CE 561	Construction Project Management		
CE 562	Lean Construction Concepts and Methods		
CE 564	Legal Aspects of Contracting		

CE 565	Construction Safety Management		
CE 567	Risk and Financial Management in Construction		
CE 592	Special Topics in Construction Engineering		

Other courses may selected and approved in conjunction with the academic committee, examples include but are not subject to:

CE 515	Advanced Strength of Materials		
CE 522	Theory and Design Of Prestressed Concrete		
CE 523	Theory and Behavior Of Steel Structures		
CE 524	Analysis and Design Of Masonry Structures		
CE 548	Engineering Properties Of Soils I		

#### EWC – AIR

Code	Title	Hours	Counts towards
CE 576	Engineering Principles Of Air Pollution Control *		
CE 578	Energy and Climate *		
CE 579	Principles of Air Quality Engineering *		

#### EWC – ENVIRONMENTAL PROCESS ENGINEERING

Code	Title	Hours	Counts towards
CE 571	Physical Principles of Environmental Engineering		
CE 573	Biological Principles of Environmental Engineering		

CE 574	Chemical Principles of Environmental Engineering
CE 577	Engineering Principles Of Solid Waste Management *
CE 578	Energy and Climate *
CE 596	Special Topics in Water Resource and Environmental Engineering (Global Sanitation) *

### EWC – WATER RESOURCES, COASTAL

Code	Title	Hours	Counts towards
CE 581	Fluid Mechanics in Natural Environments		
CE 583	Engineering Aspects Of Coastal Processes		
CE 584	Hydraulics Of Ground Water		
CE 586	Engineering Hydrology		
CE 588	Water Resources Engineering *		
CE 596	Special Topics in Water Resource and Environmental Engineering (Coastal Hydrodynamics) *		
CE 596	Special Topics in Water Resource and Environmental Engineering (Coastal Modeling)		
CE 596	Special Topics in Water Resource and Environmental Engineering (Surface Water Quality Modeling)		

### GEOTECHNICAL ENGINEERING

Code	Title	Hours	Counts towards
CE 548	Engineering Properties Of Soils I		
CE 584	Hydraulics Of Ground Water		
CE 593	Special Topics in Geotechnical Engineering (Dynamics of Soils and Foundations)		
Other courses may selected and approved in conjunction with the academic committee, examples include but are not subject to:			
CE 515	Advanced Strength of Materials		
CE 526	Finite Element Method in Structural Engineering		
CE 577	Engineering Principles Of Solid Waste Management		

### STRUCTURAL ENGINEERING AND MECHANICS

Code	Title	Hours	Counts towards
CE 515	Advanced Strength of Materials		
CE 522	Theory and Design Of Prestressed Concrete		
CE 523	Theory and Behavior Of Steel Structures		
CE 524	Analysis and Design Of Masonry Structures		
CE 525	Advanced Structural Analysis		
CE 526	Finite Element Method in Structural Engineering		
CE 527	Structural Dynamics		
CE 528	Structural Design in Wood		

CE 529	FRP Strengthening and Repair of Concrete Structures
CE 530	Properties of Concrete and Advanced Cement-Based Composites

Francis Lajara De Los Reyes III  
 Joel Ducoste  
 Henry C. Frey  
 Mohammed Awad Gabr  
 Detlef R. Knappe  
 Gnanamanikam Mahinthakumar  
 Margery Frances Overton  
 Ranji Ranjithan

**TRANSPORTATION MATERIALS**

Code	Title	Hours	Counts towards
CE 515	Advanced Strength of Materials		
CE 530	Properties of Concrete and Advanced Cement-Based Composites		
CE 548	Engineering Properties Of Soils I		
CE 595	Special Topics in Transportation Engineering (A - Asphalt and Bituminous Materials)		

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**Associate Professors**

Douglas F. Call  
**Area of Research:** Environmental Engineering & Water Resources  
 Joel Casey Dietrich  
 Andrew P. Grieshop  
 Brina Mortensen Montoya  
 Daniel R. Obenour  
**Area of Research:** Environmental & Coastal Engineering  
 Benjamin Shane Underwood

**TRANSPORTATION SYSTEMS**

Code	Title	Hours	Counts towards
CE 501	Transportation Systems Engineering *		
CE 502	Traffic Operations *		
CE 503	Highway Design *		
CE 504	Airport Planning and Design		
CE 505	Railroad System Planning, Design, and Operation		
CE 509	Highway Safety		

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**Assistant Professors**

Katherine Anarde  
 Tarek Aziz  
 Fernando Garcia Menendez  
 Angela Rose Harris  
 Jordan Kern

\* This course is not a prerequisite but recommended to be completed prior to enrollment.

**Full Professors**

Sankarasubramanian Arumugam  
 Morton A. Barlaz  
 Emily Zechman Berglund  
 Joseph F. DeCarolis  
**Area of Research:** Environmental Engineering & Energy Policy

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**Practice/Research/Teaching Professors**

Florentino Banaag De La Cruz  
 Meagan Kittle Autry  
 James William Levis  
 Gregory W. Lucier  
 Elizabeth J. Sciaudone

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**Emeritus Faculty**

Robert C. Borden  
 Earl Downey Brill Jr.

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## **Adjunct Faculty**

Michael Scott Breen

Anderson Rodrigo de Queiroz

Daniel J. Findley

Alejandra C. Geiger-Ortiz