

# Science Education (BS): Earth Science Concentration

The Science Education: Earth & Environmental Science concentration (BS) degree is one of five undergraduate degree options in the Science Education program in the Department of STEM Education.

This degree program prepares teacher-leaders to have a deep understanding of the pedagogical strategies to teach high school Earth and Environmental Science. Students complete courses focused on Earth and Environmental Sciences and Science education, obtain relevant pedagogical experiences while immersed in rich field experiences in science classrooms, and emphasize teaching science with technology. Upon successful completion of the program, students are recommended for an initial North Carolina teaching license in grades 9-12. They will be able to seek employment opportunities in education and make a positive difference in their communities.

The goals and objectives of the BS degree in Science Education are:

- To enable and ensure that each prospective teacher enriches his/her life through a comprehensive university education
- To develop the professional qualities and academic background needed to teach science to all student levels in the grade for which the teacher is certified
- To develop a general knowledge foundation upon which specialized professional knowledge is built, and upon which a well-rounded university education is the base

Coursework for the degree is divided into four types of knowledge:

- General pedagogical knowledge — the nature of learners and general principles of instruction
- Content-area knowledge — knowledge of the natural sciences
- Pedagogical content knowledge — principles of curriculum, instruction and assessment directly related to the natural sciences
- Context knowledge — understanding the culture of the school, community and society in which educational institutions exist and function

Students in this program also have the opportunity to participate in:

- Undergraduate research
- The student chapter of the NC Science Teachers Association (NSTA), and other high impact experiences such as Passport to Success, SAY Village, and study abroad
- Outreach and tutoring in local schools

For more information about this program, visit our website (<https://ced.ncsu.edu/programs/science-education-middle-school-or-secondary-bachelor/>).

## Contact

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## Plan Requirements

Code	Title	Hours	Counts towards
<b>Orientation</b>			
ED 100	Intro to Education 1	2	
	or ED 150/151 Students Advocating for Youth I		
<b>Communication/Advanced Writing</b>			
Choose from:		3	
COM 110	Public Speaking		
COM 112	Interpersonal Communication		
COM 211	Argumentation and Advocacy		
COM 289	Science Communication and Public Engagement		
ENG 232	Literature and Medicine		
ENG 425	Analysis of Scientific and Technical Writing		
<b>Mathematics</b>			
Choose from:		3-4	
MA 121	Elements of Calculus		
MA 131	Calculus for Life and Management Sciences A		
MA 141	Calculus I		
Note: MA 131 or MA 141 are recommended, but not required, as they are prerequisites for many 300/400 Level Earth and Environmental Science courses.			
Choose from:		3-4	

MA 231	Calculus for Life and Management Sciences B	
MA 241	Calculus II	
ST 311	Introduction to Statistics	
<b>Sciences</b>		
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity <sup>2</sup>	4
BIO 183	Introductory Biology: Cellular and Molecular Biology <sup>2</sup>	4
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory <sup>2</sup>	4
PY 131	Conceptual Physics <sup>2</sup>	4
or PY 211	College Physics I	
MEA 101 & MEA 110	Geology I: Physical and Geology I Laboratory <sup>2</sup>	4
MEA 130	Introduction to Weather and Climate <sup>2</sup>	3
MEA 200	Introduction to Oceanography <sup>2</sup>	3
MEA 202	Geology II: Historical <sup>2</sup>	3
PY 123	Stellar and Galactic Astronomy <sup>2</sup>	3
or PY 124	Solar System Astronomy	
or MEA 240	The Planets of Our Solar System	
Earth and Environmental Science Electives (p. 3) <sup>2</sup>		3
Earth and Environmental Science 300/400 Level Electives (p. ) <sup>2</sup>		7
Earth Science Lab Electives (Choose Two) (p. 5) <sup>2</sup>		2
Advised Science Electives (p. 5) <sup>2</sup>		6
<b>Science Education</b>		
EMS 205	Introduction to Teaching Science <sup>3</sup>	2
EMS 373	Instructional Materials in Science <sup>1</sup>	3

EMS 375	Methods of Teaching Science I <sup>3</sup>	3
EMS 475	Methods of Teaching Science II <sup>3</sup>	3
EMS 476	Student Teaching in Science <sup>3,4</sup>	10
EMS 495	Senior Seminar in Mathematics and Science Education <sup>1,4</sup>	2
<b>General Education and Psychology</b>		
ED 204	Introduction to Teaching in Today's Schools <sup>1</sup>	2
ED 311 & ED 312	Classroom Assessment Principles and Practices and Classroom Assessment Principles and Practices Professional Learning Lab <sup>1</sup>	3
EDP 304	Educational Psychology <sup>1</sup>	3
ELP 344	School and Society <sup>1</sup>	3
ECI 416	Teaching Exceptional Students in the Mainstreamed Classroom <sup>1</sup>	3
<b>History &amp; Philosophy of Science Education Elective (p. 6)</b>		<b>3</b>
<b>Free Elective</b>		<b>3-7</b>
<b>GEP Courses</b>		
ENG 101	Academic Writing and Research <sup>2</sup>	4
GEP Humanities ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/</a> ) (verify requirement)		0-6
GEP Social Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/</a> ) (verify requirement)		0-3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		2

GEP Additional Breadth (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/>) (Humanities/Social Sciences/Visual and Performing Arts)

GEP U.S. Diversity (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-us-diversity/>) (verify requirement)

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 120**

- <sup>1</sup> A grade of C or higher is required.
- <sup>2</sup> A grade of C or higher is required for science content courses, up to two courses with a grade below a C is permitted
- <sup>3</sup> A grade of B- or higher is required.
- <sup>4</sup> Admission to the Professional Semester is required.

### Earth and Environmental Science Electives

**Code Title Hours Counts towards**

Any ES or MEA course, including additional lab courses.

ES 100	Introduction to Environmental Sciences		
ES 111	Applications of Environmental Sciences		
ES 113	Earth from Space		
ES 150	Water and the Environment		
ES 200	Climate Change and Sustainability		
ES 215	Organizing Field Work		
ES 295	Special Topics in Environmental Science		
MEA 100	Earth System Science: Exploring the Connections		
MEA 135	Introduction to Weather and Climate Laboratory		
MEA 150	Environmental Issues in Water Resources		

MEA 210	Oceanography Lab		
MEA 211	Geology II Laboratory		
MEA 215	Introduction to Atmospheric Sciences		
MEA 217	Introduction to Computing in the Geosciences		
MEA 220	Marine Biology		
MEA 240	The Planets of Our Solar System		
MEA 241	Air Pollution and Society		
MEA 250	Introduction to Coastal Environments		
MEA 251	Introduction to Coastal Environments Laboratory		
MEA 252	Biology of Marine Mammals		
MEA 260	Human Dimensions of Climate Change		
CNR 250	Diversity and Environmental Justice	3	
FOR 252	Introduction to Forest Science	3	
FOR 260	Forest Ecology	4	
FOR 261	Forest Communities	2	
FOR 264	Forest Wildlife	1	
FW 221	Conservation of Natural Resources	3	
SSC 185	Land and Life	3	
SSC 200	Soil Science	3	
SSC 201	Soil Science Laboratory	1	
SSC 455	Soils, Environmental Quality and Global Challenges	3	

Any Earth and Environmental Science 300/400 Level Elective (p. )

### Earth and Environmental Science Electives 300/400 Level

**Code Title Hours Counts towards**  
Any ES or MEA 3\*\*/4\*\* Level Course

ES 300	Energy and Environment	MEA 440	Igneous and Metamorphic Petrology
ES 400	Analysis of Environmental Issues	MEA 443	Synoptic Weather Analysis and Forecasting
ES 449	Human Dimensions of Natural Resources in Australia/New Zealand	MEA 444	Mesoscale Analysis and Forecasting
ES 450	Sustaining Natural Resources in Australia/New Zealand	MEA 449	Principles of Biological Oceanography
ES 495	Special Topics in Environmental Science	MEA 450	Introductory Sedimentology and Stratigraphy
MEA 300	Environmental Geology	MEA 451	Structural Geology
MEA 312	Atmospheric Thermodynamics	MEA 454	Marine Physical-Biological Interactions
MEA 315	Mathematics Methods in Atmospheric Sciences	MEA 455	Micrometeorology
MEA 320	Fundamentals of Air Pollution	MEA 459	Field Investigation of Coastal Processes
MEA 321	Fundamentals of Air Quality and Climate Change	MEA 460	Principles of Physical Oceanography
MEA 323	Geochemistry of Natural Waters	MEA 462	Observational Methods and Data Analysis in Marine Physics
MEA 350	Marine Conservation Biology	MEA 463	Fluid Physics
MEA 369	Life on Earth: Principles of Paleontology	MEA 464	Ocean Circulation Systems
MEA 409	Watershed Forensics	MEA 465	Geologic Field Camp
MEA 410	Introduction to Mineralogy	MEA 466	Preparatory Course for Field Camp
MEA 411	Marine Sediment Transport	MEA 467	Marine Meteorology
MEA 412	Atmospheric Physics	MEA 468	Aquatic Microbiology
MEA 415	Climate Dynamics	MEA 469	Ecology of coastal Resources
MEA 421	Atmospheric Dynamics I	MEA 470	Introduction to Geophysics
MEA 422	Atmospheric Dynamics II	MEA 471	Exploration and Engineering Geophysics
MEA 425	Introduction to Atmospheric Chemistry	MEA 473	Principles of Chemical Oceanography

MEA 476	Worldwide River and Delta Systems: Their Evolution and Human Impacts
MEA 479	Air Quality
MEA 481	Geomorphology: Earth's Dynamic Surface
MEA 485	Introduction to Hydrogeology
MEA 488	Meteorology for Media
MEA 493	Special Topics in MEAS

Up to 4 credit hours may be selected from the following list:

AEC 360 or PB 360	Ecology Ecology
AEC 380	Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy
AEC 390	Community Ecology
AEC 400	Applied Ecology
AEC 419	Freshwater Ecology
AEC 460	Field Ecology and Methods
AEC 470	Urban Ecology
BIO 325	Paleontological Field Methods
FW 314	Coastal Ecology and Management
FW 333	Conservation Biology in Practice
FW 353	Wildlife Management
FW 403	Urban Wildlife Management
FW 404	Wildlife Habitat Management
FW 405	Tropical Wildlife Ecology
FW 453	Principles of Wildlife Science
FW 460	International Wildlife Management and Conservation
FW 465	African Ecology and Conservation

NR 303	Humans and the Environment
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### Earth Science Lab Electives

Code	Title	Hours	Counts towards
MEA 135	Introduction to Weather and Climate Laboratory	1	
MEA 210	Oceanography Lab	1	
MEA 211	Geology II Laboratory	1	
PY 125	Astronomy Laboratory	1	

### Advised Science Electives

Code	Title	Hours	Counts towards
ANY 200+	Level AEC, BIO, BCH, BSC, CH, ENT, ES, MB, MEA, PB, PY, ZO		
ANY GEP Natural Sciences ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-natural-sciences/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-natural-sciences/</a> ) course (except BIO 105/106, CH 111)			
ANS 150	Introduction to Animal Science		
ANS 205	Physiology of Domestic Animals		
ANS 206	Anatomy of Domestic Animals Lab		
ANS 220	Reproductive Physiology		
ANS 221	Reproductive Physiology Lab		
BIO 165	Introduction to Environmental Research		
CS 211	Plant Genetics		
ES 100	Introduction to Environmental Sciences		
ES 111	Applications of Environmental Sciences		
ES 150	Water and the Environment		
FOR 252	Introduction to Forest Science		
FOR 260	Forest Ecology		
FOR 261	Forest Communities		
FOR 264	Forest Wildlife		
FOR 339	Dendrology		

FW 353	Wildlife Management
FW 404	Wildlife Habitat Management
FW 405	Tropical Wildlife Ecology
FW 444	Mammalogy
FW 453	Principles of Wildlife Science
FW 460	International Wildlife Management and Conservation
NR 303	Humans and the Environment
NR 406	Conservation of Biological Diversity

### History & Philosophy of Science Education Elective

Code	Title	Hours	Counts towards
Choose from:			
ECl 305	Equity and Education		
HI 321	Scientific Revolution and European Society, 1500-1800		
HI 322	Rise of Modern Science		
HI 323	Science, American Style		
HI 341	Technology in History		
HI 481	History of the Life Sciences	3	
HI 482	Darwinism in Science and Society		
HI 483	Science and Religion in European History		
HI 484	Science in European Culture		
HI 485	History of American Technology		
PHI 340	Philosophy of Science		
PHI 440	The Scientific Method		
STS 210	Women and Gender in Science and Technology		

STS 214	Introduction to Science, Technology, and Society
STS 301	Science and Civilization
STS 302	Contemporary Science, Technology and Human Values
STS 471	Darwinism and Christianity
STS 490	Issues in Science, Technology, and Society

### Semester Sequence

This is a sample.

First Year		Hours
Fall Semester		
ED 100	Intro to Education	2
MEA 101	Geology I: Physical <sup>2</sup>	3
MEA 110	Geology I Laboratory <sup>2</sup>	1
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity <sup>2</sup>	4
MA 131 or MA 141 or MA 121	Calculus for Life and Management Sciences A or Calculus I or Elements of Calculus	3-4
ENG 101	Academic Writing and Research	4
<b>Hours</b>		<b>17</b>
Spring Semester		
MEA 202	Geology II: Historical <sup>2</sup>	3
MEA 211	Geology II Laboratory <sup>2</sup>	1
BIO 183	Introductory Biology: Cellular and Molecular Biology <sup>2</sup>	4
MA 231 or MA 241 or ST 311	Calculus for Life and Management Sciences B or Calculus II or Introduction to Statistics	3-4
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
Communication/Advanced Writing Requirement		3
Choose from:		
COM 110	Public Speaking	
COM 112	Interpersonal Communication	
COM 211	Argumentation and Advocacy	
COM 289	Science Communication and Public Engagement	
ENG 232	Literature and Medicine	
<b>Hours</b>		<b>15</b>

**Second Year**

**Fall Semester**

MEA 130	Introduction to Weather and Climate <sup>2</sup>	3
MEA 135	Introduction to Weather and Climate Laboratory <sup>2</sup>	1
CH 101 & CH 102	Chemistry - A Molecular Science and General Chemistry Laboratory <sup>2</sup>	4
Advised Science Elective (p. 5)		3
GEP Health and Exercise Studies ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/</a> )		1
Free Elective		4

**Hours 16**

**Spring Semester**

ED 204	Introduction to Teaching in Today's Schools <sup>1</sup>	2
EMS 205	Introduction to Teaching Science <sup>3</sup>	2
EDP 304	Educational Psychology <sup>1</sup>	3
PY 131 or PY 211	Conceptual Physics <sup>2</sup> or College Physics I	4
GEP Additional Breadth ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> ) (Humanities/Social Sciences/Visual and Performing Arts)		3

**Hours 14**

**Third Year**

**Fall Semester**

EMS 373	Instructional Materials in Science <sup>1</sup>	3
ELP 344	School and Society <sup>1</sup>	3
MEA 200	Introduction to Oceanography <sup>2</sup>	3
History and Philosophy of Science Education Elective (p. 6)		3
Earth and Environmental Science Electives (p. 3) <sup>2</sup>		3

**Hours 15**

**Spring Semester**

ED 311 & ED 312	Classroom Assessment Principles and Practices and Classroom Assessment Principles and Practices Professional Learning Lab <sup>1</sup>	3
EMS 375	Methods of Teaching Science I <sup>3</sup>	3
PY 124 or PY 125 or MEA 240	Solar System Astronomy <sup>2</sup> or Astronomy Laboratory or The Planets of Our Solar System	3

Earth & Environmental Science Electives 300/400 Level (p. ) <sup>2</sup> 4

Free Elective 3

**Hours 16**

**Fourth Year**

**Fall Semester**

EMS 475	Methods of Teaching Science II <sup>3</sup>	3
ECI 416	Teaching Exceptional Students in the Mainstreamed Classroom <sup>1</sup>	3
Earth & Environmental Science Electives 300/400 Level (p. ) <sup>2</sup>		3
Advised Science Elective (p. 5) <sup>2</sup>		3

GEP Humanities (<http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/>) 3

**Hours 15**

**Spring Semester**

EMS 476	Student Teaching in Science <sup>3, 4</sup>	10
EMS 495	Senior Seminar in Mathematics and Science Education <sup>1, 4</sup>	2

**Hours 12**

**Total Hours 120**

- <sup>1</sup> A grade of C or higher is required.
- <sup>2</sup> A grade of C or higher is required for science content courses, up to two courses with a grade below a C is permitted
- <sup>3</sup> A grade of B- or higher is required.
- <sup>4</sup> Prior admission to the Professional Semester is required.