

EARTH AND MARINE SCIENCES MAJOR, B.S.

The B.S. degree program aims to prepare students for employment in the fields of Earth and Marine Sciences as well as graduate study. Students in this program will understand the processes that shaped the Earth and continue to shape it today. By studying Earth and Marine Sciences, students learn about the structure, composition, and history of the planet we live on. They will learn the importance of managing natural resources like water, minerals, and fossil fuels. Students will learn how to assess and mitigate natural hazards such as earthquakes, landslides, floods, coastal erosion, and volcanic eruptions. They will learn to identify potential hazards and develop strategies to minimize their impact. Earth and Marine Science plays a crucial role in managing our environment. Students will learn to assess the impact of human activities on the Earth and develop strategies to minimize negative effects. They will study processes like climate change that can impact ecosystems.

In addition to the goals listed above, the Geoscience concentration is designed to permit students to pursue professional licensure in geology and the Hydrology concentration is designed to permit students to pursue professional certification in hydrology. Professional licensure and certification are significant enhancements to career paths in these fields.

Please note that B.S. in Geological Sciences is available for students who started at the University prior to Fall 2023. Please see the Catalog Archives (<https://catalog.unc.edu/archives/>) for program requirements.

Student Learning Outcomes

Upon completion of the Earth and marine sciences program (B.S.), students should be able to:

- Recognize foundational concepts in earth and marine sciences and identify how these disciplines are relevant to humans and society.
- Assess real-world problems in the earth and marine sciences and apply scientific reasoning to solve them.
- Communicate clearly and effectively to a range of audiences.
- Collect, analyze and evaluate earth and marine science data from both field and laboratory settings.


















In addition to the program requirements, students must


- earn a minimum final cumulative GPA of 2.000
- complete a minimum of 45 academic credit hours earned from UNC–Chapel Hill courses
- take at least half of their major core requirements (courses and credit hours) at UNC–Chapel Hill
- earn a minimum cumulative GPA of 2.000 in the major core requirements. Some programs may require higher standards for major or specific courses.

For more information, please consult the degree requirements section of the catalog (<https://catalog.unc.edu/undergraduate/degree-requirements/>).

Students can pursue one of three concentrations, as outlined below.

Geoscience Concentration

Code	Title	Hours
Core Requirements		
EMES 200	 The Solid Earth	3
EMES 201	 Earth's Surface: Processes, Landforms, and History	3
EMES 203	 Data Analysis for Earth, Marine, and Environmental Sciences	3
Select four fundamentals courses (at least one with a lab)		13
EMES 301	Earth Materials: Minerals	
EMES 302	Structural Geology	
EMES 303	Sedimentology and Stratigraphy	
EMES 304	Petrology and Plate Tectonics	
EMES 306	 Earth Systems History	
EMES 405	 Geochemistry	
EMES 406	Introduction to Geophysics	
EMES 417	Surface Processes and Landscape Evolution	
EMES 435	Principles of Environmental Consulting: Mechanics of Groundwater Flow	
Select three EMES specialization courses numbered 300 and higher		9-12
Six credits of a capstone experience:		6
EMES 395	 Undergraduate Research in Earth, Marine, and Environmental Sciences (6 credit hours total)	
EMES 485 & EMES 486	Summer Field Course in Geology and Summer Field Course in Geology	
EMES 691H & EMES 692H	 Honors in Earth, Marine, and Environmental Sciences and  Honors in Earth, Marine, and Environmental Sciences	
Additional Requirements		
CHEM 101 & 101L	 General Descriptive Chemistry I and  Quantitative Chemistry Laboratory I ^{H, F}	4
CHEM 102 & 102L	 General Descriptive Chemistry II and Quantitative Chemistry Laboratory II ^{H, F}	4
MATH 231	 Calculus of Functions of One Variable I ^{H, F}	4
MATH 232	 Calculus of Functions of One Variable II ^{H, F}	4
PHYS 114	 General Physics I: For Students of the Life Sciences ^F	4
or PHYS 118	 Introductory Calculus-based Mechanics and Relativity	
Select two of the following options:		6-8
BIOL 101/101L or BIOL 101/102L		
COMP 110	 Introduction to Programming and Data Science ^H	
or COMP 111 (Introduction to Scientific Programming)		
Any MATH above MATH 232 or MATH 210		
STOR 120, 151, or 155		
PHYS 115	 General Physics II: For Students of the Life Sciences ^F	

or PHYS 119  Introductory Calculus-based Electromagnetism and Quanta

Total Hours **63-68**











H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

¹ Must be pre-approved by the Director of Undergraduate Studies.











² This course may also be used to satisfy one of the required GEOL courses numbered above 300

Hydrology Concentration

Code	Title	Hours
Core Requirements		
EMES 201	 Earth's Surface: Processes, Landforms, and History	3
EMES 203	 Data Analysis for Earth, Marine, and Environmental Sciences	3
Select one of the following options:		3
EMES 200	 The Solid Earth	
EMES 103 & 103L	 The Marine Environment and  The Marine Environment Laboratory	
EMES 401	Oceanography	
Select four fundamentals courses (at least one with a lab)		13
EMES 303	Sedimentology and Stratigraphy	
EMES 324 & 324L	 Water in Our World: Introduction to Hydrologic Science and Environmental Problems and  Water in Our World Laboratory	
EMES 414	Flood Hydrology: Models and Data Analysis	
EMES 417	Surface Processes and Landscape Evolution	
EMES 433	Wetland Hydrology	
EMES 435	Principles of Environmental Consulting: Mechanics of Groundwater Flow	
EMES 436	Geochemistry of Natural Waters	
EMES 460	Fluid Dynamics of the Environment	
EMES 483	Geologic and Oceanographic Applications of Geographical Information Systems	
Select three EMES specialization courses numbered 300 and higher		9-12
Six credits of a capstone experience:		6
EMES 395	 Undergraduate Research in Earth, Marine, and Environmental Sciences (6 credit hours total)	
EMES 485 & EMES 486	Summer Field Course in Geology and Summer Field Course in Geology	
EMES 691H & EMES 692H	 Honors in Earth, Marine, and Environmental Sciences and  Honors in Earth, Marine, and Environmental Sciences	

ENEC 698 Capstone: Analysis and Solution of Environmental Problems (with approval based on topic)

Additional Requirements






CHEM 101 & 101L	 General Descriptive Chemistry I and  Quantitative Chemistry Laboratory I ^{H, F}	4
CHEM 102 & 102L	 General Descriptive Chemistry II and Quantitative Chemistry Laboratory II ^{H, F}	4
MATH 231	 Calculus of Functions of One Variable I ^{H, F}	4
MATH 232	 Calculus of Functions of One Variable II ^{H, F}	4
PHYS 114	 General Physics I: For Students of the Life Sciences ^F	4
or PHYS 118	 Introductory Calculus-based Mechanics and Relativity	
Select two of the following options:		6-8
BIOL 101/101L or BIOL 101/102L		
COMP 110	 Introduction to Programming and Data Science ^H	
or COMP 116 Introduction to Scientific Programming		
Any MATH above MATH 232 or MATH 210		
STOR 120, 151, or 155		
PHYS 115	 General Physics II: For Students of the Life Sciences ^F	
or PHYS 119	 Introductory Calculus-based Electromagnetism and Quanta	

Total Hours **63-68**

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Marine Biology and Ecology Concentration









Code	Title	Hours
Core Requirements		
EMES 103 & 103L	 The Marine Environment and  The Marine Environment Laboratory	3-4
or EMES 401	Oceanography	
EMES 203	 Data Analysis for Earth, Marine, and Environmental Sciences	3
EMES 204	 The Microbial World: Foundations in Structure, Metabolism, and Ecology	3-4
or BIOL 201	Ecology and Evolution	
or BIOL 202	 Molecular Biology and Genetics	
Select four fundamentals courses (at least one with a lab)		13
EMES 320	Marine Life in a Fluid World	
EMES 436	Geochemistry of Natural Waters	
EMES 441	Marine Physiological Ecology	

EMES 443	Marine Microbiology
EMES 448	Coastal and Estuarine Ecology
EMES 450	Biogeochemical Processes
EMES 471	Human Impacts on Estuarine Ecosystems
BIOL 462/ MASC 440	Marine Ecology
ENVR 419	Chemical Equilibria in Natural Waters




Select three EMES specialization courses numbered 300 and higher 9-12
Six credits of a capstone experience: 6

EMES 395	 Undergraduate Research in Earth, Marine, and Environmental Sciences (6 credit hours total)
EMES 691H & EMES 692H	 Honors in Earth, Marine, and Environmental Sciences and  Honors in Earth, Marine, and Environmental Sciences
ENEC 698	Capstone: Analysis and Solution of Environmental Problems (with permission based on topic)

Additional Requirements

CHEM 101 & 101L	 General Descriptive Chemistry I and  Quantitative Chemistry Laboratory I ^{H, F}	4
CHEM 102 & 102L	 General Descriptive Chemistry II and  Quantitative Chemistry Laboratory II ^{H, F}	4
MATH 231	 Calculus of Functions of One Variable I ^{H, F}	4
MATH 232	 Calculus of Functions of One Variable II ^{H, F}	4
PHYS 114	 General Physics I: For Students of the Life Sciences ^F	4
or PHYS 118	 Introductory Calculus-based Mechanics and Relativity	

Select two of the following options: 6-8

BIOL 101/101L or BIOL 101/102L	
COMP 110	 Introduction to Programming and Data Science ^H
or COMP 111 Introduction to Scientific Programming	
Any MATH above MATH 232 or MATH 210	
STOR 120, 151, or 155	
PHYS 115	 General Physics II: For Students of the Life Sciences ^F
or PHYS 119	 Introductory Calculus-based Electromagnetism and Quanta

Total Hours 63-70

^H Honors version available. An honors course fulfills the same requirements as the nonhonors version of that course. Enrollment and GPA restrictions may apply.

^F FY-Launch class sections may be available. A FY-Launch section fulfills the same requirements as a standard section of that course, but also fulfills the FY-SEMINAR/FY-LAUNCH First-Year Foundations requirement. Students can search for FY-Launch sections in ConnectCarolina using the FY-LAUNCH attribute.

Department Programs

Majors

- Geological Sciences Major, B.A.—Earth Science (<https://catalog.unc.edu/undergraduate/programs-study/geological-sciences-major-ba-earth-science-concentration/>)
- Earth and Marine Sciences Major, B.S. (p. 1)

Minors

- Environmental Microbiology Minor (<https://catalog.unc.edu/undergraduate/programs-study/environmental-microbiology-minor/>)
- Geological Sciences Minor (<https://catalog.unc.edu/undergraduate/programs-study/geological-sciences-minor/>)
- Marine Sciences Minor (<https://catalog.unc.edu/undergraduate/programs-study/marine-sciences-minor/>)

Graduate Programs

- M.S. in Geological Sciences (<https://catalog.unc.edu/graduate/schools-departments/geological-sciences/>)
- M.S. in Marine Sciences (<https://catalog.unc.edu/graduate/schools-departments/marine-sciences/>)
- Ph.D. in Geological Sciences (<https://catalog.unc.edu/graduate/schools-departments/geological-sciences/>)
- Ph.D. in Marine Sciences (<https://catalog.unc.edu/graduate/schools-departments/marine-sciences/>) (<https://catalog.unc.edu/graduate/schools-departments/geological-sciences/>)

Contact Information

Department of Earth, Marine, and Environmental Sciences

Visit Program Website (<https://emes.unc.edu/>)

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