

Marine Sciences (BS): Geology Concentration

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

The degree of Bachelor of Science in Marine Science may be obtained by selecting one of five concentrations: Biological Oceanography, Chemistry, Geology, Meteorology, or Physics.

The degree of Bachelor of Science in Natural Resources is available with a concentration in Marine and Coastal Resources.

Marine scientists explore all aspects of the seas and coastal regions, seeking to understand how the oceans, their biological communities, the solid earth and the atmosphere interact. As professionals with interdisciplinary training, marine scientists are needed to advise business, industry and governments on the potential impact of human activities and the wise use of marine resources. Marine scientists work for consulting firms; regulatory agencies; the mass media; business and industry; federal, state and local governments; academic laboratories; research and education organizations; and nonprofit environmental watchdog groups.

Contact

For more information about our marine science programs, visit our website (<https://meas.sciences.ncsu.edu/undergraduate/programs/marine-science/>) or contact:

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Plan Requirements

Code	Title	Hours	Counts towards
Core Courses/Marine Science			
MEA 100	Earth System Science: Exploring the Connections	4	
MEA 200	Introduction to Oceanography	3	
MEA 210	Oceanography Lab	1	
MEA 250	Introduction to Coastal Environments	3	
MEA 459	Field Investigation of Coastal Processes	5	
MEA 460	Principles of Physical Oceanography	3	

MEA 462	Observational Methods and Data Analysis in Marine Physics	3
MEA 495	Junior Seminar in the Marine, Earth, and Atmospheric Sciences	1
Geology Concentration		
MEA 101	Geology I: Physical	3
MEA 110	Geology I Laboratory	1
MEA 202	Geology II: Historical	3
MEA 211	Geology II Laboratory	1
MEA 251	Introduction to Coastal Environments Laboratory	1
MEA 410	Introduction to Mineralogy and Petrology	4
MEA 411	Marine Sediment Transport	3
MEA 450	Introductory Sedimentology and Stratigraphy	4
MEA 451	Structural Geology	4
MEA 570	Geological Oceanography	3
MEA 470	Introduction to Geophysics	3
	or MEA 471 Exploration and Engineering Geophysics	
Advised Elective (p. 2)		4
Select one of the following		3
Restricted Electives:		
MEA 449	Principles of Biological Oceanography	
MEA 467	Marine Meteorology	
MEA 473	Principles of Chemical Oceanography	
MEA 549	Principles of Biological Oceanography	
MEA 573	Principles of Chemical Oceanography	

Basic Math & Sciences

CH 101	Chemistry - A Molecular Science ¹	3
CH 102	General Chemistry Laboratory	1
CH 201	Chemistry - A Quantitative Science ¹	3
CH 202	Quantitative Chemistry Laboratory	1
PY 205 & PY 206	Physics for Engineers and Scientists I and Physics for Engineers and Scientists I Laboratory ¹	4
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
MA 141	Calculus I ¹	4
MA 241	Calculus II ¹	4
MA 242	Calculus III	4
	Statistics Elective (p. 5)	3
	Select one of the following Computer Science electives:	3
CSC 111	Introduction to Computing: Python	
CSC 112	Introduction to Computing-FORTRAN	
CSC 113	Introduction to Computing - MATLAB	
CSC 116	Introduction to Computing - Java	
GIS 280	Introduction to GIS	
PY 251	Introduction to Scientific Computing	
College Requirements		
COS 100	Science of Change ³	2
ENG 101	Academic Writing and Research ¹	4
	Select one of the following Advanced Writing courses:	3
ENG 331	Communication for Engineering and Technology	

ENG 332	Communication for Business and Management	
ENG 333	Communication for Science and Research	

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/)		6
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		2
GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)		3
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**

- ¹ A grade of C- or higher is required.
- ² Students should consult their academic advisors to determine which courses fill this requirement.
- ³ COS 100 is for new freshmen only. Transfer students will need to select a course from the GEP Interdisciplinary Perspectives course list.

Advised Elective

Code	Title	Hours	Counts towards
AEC 360	Ecology	4	
AEC 380	Water Resources: Global Issues in Ecology, Policy, Management, and Advocacy	3	
AEC 400	Applied Ecology	3	

AEC 419	Freshwater Ecology	4	BIO 444	The Biology of Love and Sex	
AEC 420	Introduction to Fisheries Science	3	BIO 488/588	Neurobiology	
AEC 423	Introduction to Fisheries Sciences Laboratory	1	BIT 410	Manipulation of Recombinant DNA	
AEC 424	Marine Fisheries Ecology	3	BIT 462	Gene Expression Analysis: Microarrays	
AEC 441	Biology of Fishes	3	BIT 462/562	Gene Expression Analysis: Microarrays	
AEC 442	Biology of Fishes Laboratory	1	BIT 464	Protein Purification	
AEC 460	Field Ecology and Methods	4	BIT 465	Real-time PCR Techniques	
ANS 330	Laboratory Animal Science	3	BIT 466	Animal Cell Culture Techniques	
ANS 415	Comparative Nutrition	3	BIT 467	PCR and DNA Fingerprinting	
ANS 454/554	Lactation, Milk and Nutrition	3	BIT 468	Genome Mapping	
ANT 371	Human Variation	3	BIT 471	RNA Interference and Model Organisms	
BCH 351	General Biochemistry		BIT 473	Protein Interactions	
BCH 452	Introductory Biochemistry Laboratory		BIT 474/574	Plant Genetic Engineering	
BCH 453/553	Biochemistry of Gene Expression		BIT 476	Applied Bioinformatics	
BCH 454	Advanced Biochemistry Laboratory		BIT 481	Plant Tissue Culture and Transformation	
BCH 455/555	Proteins and Molecular Mechanisms		BSC 478	Research Fundamentals in Biological Sciences	3
BIO 315	General Parasitology		COM 436	Environmental Communication	3
BIO 330	Evolutionary Biology		CS 430	Advanced Agroecology	4
BIO 361	Developmental Biology		ENT 305	Introduction to Forensic Entomology	3
BIO 370	Developmental Anatomy of the Vertebrates		ENT 402	Forest Entomology	3
BIO 405	Functional Histology		ENT 425	General Entomology	3
BIO 414	Cell Biology		ES 300	Energy and Environment	3
BIO 424	Endocrinology		ES 400	Analysis of Environmental Issues	3
BIO 432	Evolutionary Medicine		FOR 402	Forest Entomology	3
BIO 434	Hormones and Behavior				
BIO 440	The Human Animal: An Evolutionary Perspective				

FS 301	Introduction to Human Nutrition	3	MB 405/505	Food Microbiology
FS 401/501	Advanced Nutrition and Metabolism	3	MB 406/506	Food Microbiology Lab
FS 405/505	Food Microbiology	3	MB 411	Medical Microbiology
FS 406/506	Food Microbiology Lab	1	MB 412	Medical Microbiology Laboratory
FW 444/544	Mammalogy		MB 414	Microbial Metabolic Regulation
FW 465/565	African Ecology and Conservation		MB 420/520	Fundamentals of Microbial Cell Biotransformations
GN 301	Genetics in Human Affairs		MB 435/535	Bacterial Pathogenesis
GN 311	Principles of Genetics		MB 441	Immunology
GN 312	Elementary Genetics Laboratory		MB 451	Microbial Diversity
GN 421/521	Molecular Genetics		MB 452	Microbial Diversity Lab
GN 423	Population, Quantitative and Evolutionary Genetics		MB 455	Microbial Biotechnology
GN 425	Advanced Genetics Laboratory		MB 461	Molecular Virology
GN 427	Introductory Bioinformatics		MB 470	Emerging and Re-emerging Infectious Diseases
GN 434	Genes and Development		MEA 300	Environmental Geology
GN 441/541	Human and Biomedical Genetics		MEA 369	Life on Earth: Principles of Paleontology
GN 451	Genome Science		NR 303	Humans and the Environment
GN 456	Epigenetics, Development, and Disease		NR 406	Conservation of Biological Diversity
GN 461	Advanced Bioinformatics		NTR 301	Introduction to Human Nutrition
IDS 303	Humans and the Environment		NTR 401/501	Advanced Nutrition and Metabolism
MA 331	Differential Equations for the Life Sciences		NTR 410/510	Maternal and Infant Nutrition
MA 432	Mathematical Models in Life Sciences		NTR 415/515	Comparative Nutrition
MB 351	General Microbiology		NTR 419	Human Nutrition and Chronic Disease
MB 352	General Microbiology Laboratory		NTR 421/521	Life Cycle Nutrition
MB 354	Inquiry-Guided Microbiology Lab		NTR 454	Lactation, Milk and Nutrition

PB 321	Introduction to Whole Plant Physiology	
PB 360	Ecology	
PB 403/503	Systematic Botany	
PB 421	Plant Physiology	
PB 480/580	Introduction to Plant Biotechnology	
PB 481	Plant Tissue Culture and Transformation	
PO 404/404	Avian Anatomy and Physiology	
PO 415/515	Comparative Nutrition	
PO 466/566	Animal Cell Culture Techniques	
PP 315	Principles of Plant Pathology	4
SSC 332	Environmental Soil Microbiology	
TOX 401/501	Principles of Toxicology	
TOX 415	Environmental Toxicology and Chemistry	
ZO 317	Primate Ecology and Evolution	
ZO 333	Captive Animal Biology	
ZO 350	Animal Phylogeny and Diversity	
ZO 402	Invertebrate Biology	
ZO 410	Introduction to Animal Behavior	

Statistics Electives

Code	Title	Hours	Counts towards
BUS 350	Economics and Business Statistics	3	
EC 351	Econometrics I	3	
ST 305	Statistical Methods	4	
ST 307	Introduction to Statistical Programming-SAS	1	
ST 308	Introduction to Statistical Programming - R	1	

ST 311	Introduction to Statistics	3
ST 312	Introduction to Statistics II	3
ST 350	Economics and Business Statistics	3
ST 370	Probability and Statistics for Engineers	3
ST 371	Introduction to Probability and Distribution Theory	3
ST 372	Introduction to Statistical Inference and Regression	3
ST 380	Probability and Statistics for the Physical Sciences	3

Semester Sequence

Critical Path Courses – Identify using the code (CP) which courses are considered critical path courses which represent specific major requirements that are predictive of student success in a given program/plan. Place the (CP) next to the credit hours for the course.

This is a sample.

First Year

Fall Semester		Hours
COS 100	Science of Change	2
MA 141	Calculus I (CP) ¹	4
MEA 100	Earth System Science: Exploring the Connections ²	4
MEA 101	Geology I: Physical (CP) ²	3
MEA 110	Geology I Laboratory (CP) ²	1
Hours		14

Spring Semester

CH 101	Chemistry - A Molecular Science (CP) ¹	3
CH 102	General Chemistry Laboratory ³	1
ENG 101	Academic Writing and Research ¹	4
MA 241	Calculus II ¹	4
MEA 202	Geology II: Historical ²	3
MEA 211	Geology II Laboratory ²	1
Hours		16

Second Year

Fall Semester		Hours
CH 201	Chemistry - A Quantitative Science ¹	3
CH 202	Quantitative Chemistry Laboratory ³	1
MA 242	Calculus III ³	4
MEA 200	Introduction to Oceanography (CP) ²	3
MEA 210	Oceanography Lab ²	1

MEA 410	Introduction to Mineralogy and Petrology ²	4
Hours		16
Spring Semester		
MEA 250	Introduction to Coastal Environments ²	3
MEA 251	Introduction to Coastal Environments Laboratory ²	1
MEA 450	Introductory Sedimentology and Stratigraphy ²	4
PY 205	Physics for Engineers and Scientists I ¹	3
PY 206	Physics for Engineers and Scientists I Laboratory ³	1
Hours		12
Third Year		
Fall Semester		
MEA 460	Principles of Physical Oceanography ²	3
MEA 451	Structural Geology ²	4
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
PY 208	Physics for Engineers and Scientists II ³	3
PY 209	Physics for Engineers and Scientists II Laboratory ³	1
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		3
Hours		15
Spring Semester		
Advanced Writing Elective (p. 1)		3
Computer Science Option Elective (p. 1) ³		3
GEP Health and Exercise Studies (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-health-exercise-studies/)		1
MEA 462	Observational Methods and Data Analysis in Marine Physics ²	3
Statistical Science Option Elective (p. 5) ³		3
MEA 495	Junior Seminar in the Marine, Earth, and Atmospheric Sciences	1
Hours		14
Summer		
MEA 459	Field Investigation of Coastal Processes ²	5
Hours		5
Fourth Year		
Fall Semester		
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
GEP Additional Breadth (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/) (Humanities/Social Sciences/Visual and Performing Arts)		3
MEA 411	Marine Sediment Transport ²	3
MEA 570	Geological Oceanography ²	3
MEA Restricted Elective (p. 1) ²		3
Hours		15
Spring Semester		
Advised Elective (p. 2) ²		4

MEA 470 or MEA 471	Introduction to Geophysics ² or Exploration and Engineering Geophysics	3
GEP Humanities (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-humanities/)		3
GEP Social Sciences (http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-social-sciences/)		3
Hours		13
Total Hours		120

¹ A grade of C- or higher is required.

² No more than one D will be accepted in MEA core courses and concentration courses.

³ No more than one D will be accepted in other basic math or science courses.

Career Opportunities

MEAS undergraduate degree programs provide talented students with the foundation of scientific knowledge required for careers in government, industry, or academia. Many students pursue graduate degrees and pursue careers in industry, at government agencies and in academia.

Marine Sciences graduates go on to become oceanographers, to manage our coastal resources, model air-sea interaction, and explore global climate change. They conduct basic and applied research, serving as environmental consultants for industry and governmental agencies, policy and management experts for governmental agencies, and environmental science educators. Graduates with a Natural Resources degree are versed in the fundamental processes and interdisciplinary nature of the coastal zone. As scientists, managers, administrators, and regulators, they make decisions regarding use and conservation of coastal and marine resources.

Geology graduates address society's needs for dealing effectively with earth processes, such as water resources and the stability of land forms. They work for engineering firms, permit-issuing agencies, and industries that rely on geological resources. Historical geologists are familiar with the evolution of earth through time and provide a perspective on potential long-term reactions of the earth systems to change. Those who concentrate in Environmental Geology are trained to assess and monitor geological resources such as ground water. Marine geologists are experts in the complex issues facing industry, municipalities, and residents in the dynamic and ecologically vulnerable coastal zone.

Meteorology graduates enjoy careers in weather forecasting, air quality assessment, development of weather products and services, broadcast communications, and advanced research. Marine meteorologists study ocean-generated weather systems. Their research is yielding practical benefits such as refined prediction of storm surge, which has streamlined evacuation efforts during severe storms along the Carolina coast. Meteorology graduates with an air quality emphasis work for environmental firms, regulatory agencies, and in applied research. Study of air quality and how air pollution is transported and dispersed is a rapidly expanding field in the atmospheric sciences.

MEAS graduates play a key service role for the State of North Carolina, assisting in everything from forecasting severe storms and analyzing the impact of atmospheric pollutants on agriculture and our estuaries, to determining the effects of toxic waste disposal on quality of surface and ground water.