

# Geology (BS)

The degree of Bachelor of Science in Geology is offered in the Department of Marine, Earth and Atmospheric Sciences. Geological science — or Earth science — is a broad and interdisciplinary field that encompasses other disciplines such as biology, chemistry, math, and physics. Knowledge of Earth processes provides a critical framework for the assessment of resources, geologic hazards, and environmental stewardship. Many geologists work in the petroleum or natural gas exploration industry or in the mineral industry. Many other geoscientists find work related to natural hazards (e.g., earthquakes, volcanoes, and landslides), as geologists on some of the world's largest engineering projects (dams, tunnels, bridges, tall buildings), in the geothermal and alternative energy sectors, in the remediation of hazardous waste and groundwater pollution control, and in the field of environmental rehabilitation (e.g., stream restoration). Geoscientists work across industries — from Fortune 100 companies to small environmental consulting and law firms, state agencies and nonprofit organizations. Many others are employed in the education sector including at universities, community colleges and high schools.

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

## Contact

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## Plan Requirements

Code	Title	Hours	Counts towards
<b>Orientation/Computer Literacy</b>			
COS 100	Science of Change <sup>1</sup>	2	
Computer Science Option (p. 2)		3	
2, 6			
<b>Writing and Speaking</b>			
COM 110	Public Speaking	3	
ENG 101	Academic Writing and Research <sup>2</sup>	4	
Select one of the following:		3	
ENG 331	Communication for Engineering and Technology		
ENG 332	Communication for Business and Management		
ENG 333	Communication for Science and Research		
<b>Mathematics and Natural Sciences</b>			
MA 131	Calculus for Life and Management Sciences A <sup>2</sup>	3-4	

or MA 141	Calculus I	
MA 231	Calculus for Life and Management Sciences B <sup>2</sup>	3-4
or MA 241	Calculus II	
CH 101	Chemistry - A Molecular Science <sup>2</sup>	3
CH 102	General Chemistry Laboratory	1
CH 201	Chemistry - A Quantitative Science	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	4
or PY 211	College Physics I	
PY 208 & PY 209	Physics for Engineers and Scientists II and Physics for Engineers and Scientists II Laboratory	4
or PY 212	College Physics II	
<b>Geology Core Courses <sup>2</sup></b>		
MEA 100	Earth System Science: Exploring the Connections	4
MEA 101	Geology I: Physical <sup>3</sup>	3-4
or MEA 140	Natural Hazards and Global Change	
or MEA 150	Environmental Issues in Water Resources	
or MEA 200	Introduction to Oceanography	
MEA 110	Geology I Laboratory	1
MEA 202	Geology II: Historical	3
MEA 211	Geology II Laboratory	1
MEA 257	Visualizing Geology in 3D & 4D	1
MEA 410	Introduction to Mineralogy	3

MEA 440	Igneous and Metamorphic Petrology	3
MEA 450	Introductory Sedimentology and Stratigraphy	4
MEA 451	Structural Geology	4
MEA 465	Geologic Field Camp	4
MEA 466	Preparatory Course for Field Camp	1
MEA 495	Junior Seminar in the Marine, Earth, and Atmospheric Sciences	1
<b>Restricted Electives</b>		
Restricted Electives: <sup>2</sup>		15
MEA 300	Environmental Geology	
MEA 323	Geochemistry of Natural Waters	
MEA 369	Life on Earth: Principles of Paleontology	
MEA 411	Marine Sediment Transport	
MEA 415	Climate Dynamics	
MEA 470	Introduction to Geophysics	
MEA 471	Exploration and Engineering Geophysics	
MEA 481	Geomorphology: Earth's Dynamic Surface	
MEA 485	Introduction to Hydrogeology	
Math/Science Option (p. 3) <sup>2</sup>		6
<b>Advised Electives</b>		
Advised Electives <sup>2, 4</sup>		9
<b>GEP Courses</b>		
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> )		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> )		6

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 Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )	3
GEP Global Knowledge ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/gep-global-knowledge/</a> ) (verify requirement)	
World Language Proficiency ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/world-language-proficiency/</a> ) (verify requirement)	
<b>Free Electives</b>	
Free Electives (12 Hr S/U Lmt) <sup>5</sup>	3
<b>Total Hours</b>	<b>120</b>

- <sup>1</sup> COS 100 is for new freshmen only. Transfer students will need to select a course from the GEP Interdisciplinary Perspectives course list.
- <sup>2</sup> A grade of a C- or higher is required. No more than one D will be allowed in Geology Core Courses, Restricted Electives, and Advised Electives. No more than one D will be allowed in other math and natural science courses.
- <sup>3</sup> Transfer students who have completed MEA 140, MEA 150, or MEA 200 can use those credits in lieu of MEA 101. All students must complete MEA 110.
- <sup>4</sup> Advised Electives are in the geosciences and related fields and are to be selected with the advice and consent of the advisor to meet the student's career objective.
- <sup>5</sup> Free electives may not be MA 100, MA 101, MA 103, MA 107, MA 108, or MA 111.
- <sup>6</sup> GIS 280 or MEA 217 is recommended.

## Computer Science Option

Code	Title	Hours	Counts towards
GIS 280	Introduction to GIS <sup>6</sup>	3	
or MEA 217	Introduction to Computing in the Geosciences		
or MA 116	Introduction to Scientific Programming (Math)		
or CSC 111	Introduction to Computing: Python		
or CSC 112	Introduction to Computing-FORTRAN		
or CSC 113	Introduction to Computing - MATLAB		
or CSC 116	Introduction to Computing - Java		

## Restricted Electives

Code	Title	Hours	Counts towards
MEA 300	Environmental Geology	4	

MEA 323	Geochemistry of Natural Waters	3
MEA 369	Life on Earth: Principles of Paleontology	3
MEA 411	Marine Sediment Transport	3
MEA 415	Climate Dynamics	3
MEA 470	Introduction to Geophysics	3
MEA 471	Exploration and Engineering Geophysics	3
MEA 481	Geomorphology: Earth's Dynamic Surface	3
MEA 485	Introduction to Hydrogeology	3

### Math/Science Option

Code	Title	Hours	Counts towards
BIO 181	Introductory Biology: Ecology, Evolution, and Biodiversity	4	
BIO 183	Introductory Biology: Cellular and Molecular Biology	4	
BIO 310	Quantitative Approaches to Biological Problems	3	
BIO 315	General Parasitology	3	
BIO 325	Paleontological Field Methods	4	
BIO 330	Evolutionary Biology	3	
BIO 361	Developmental Biology	3	
BIO 370	Developmental Anatomy of the Vertebrates	3	
BIO 375	Developmental Anatomy Laboratory	2	
BIO 405	Functional Histology	3	
BIO 414	Cell Biology	3	
BIO 416	Cancer Cell Biology	3	
BIO 418	Cell Biology Research Lab	2	
BIO 424	Endocrinology	3	

BIO 432	Evolutionary Medicine	3
BIO 434	Hormones and Behavior	3
BIO 440	The Human Animal: An Evolutionary Perspective	3
BIO 444	The Biology of Love and Sex	3
BIO 481	Senior Capstone Project	1
BIO 482	Capstone Course in Molecular, Cellular, and Developmental Biology	3
BIO 483	Capstone Course in Integrative Physiology and Neurobiology	3
BIO 484	Capstone Course in Human Biology	3
BIO 485	Capstone Course in Ecology, Evolution, and Conservation Biology	3
BIO 488	Neurobiology	3
BIO 498		3
BIO 499		3
BSC 492	Professional Experience	1-3
BSC 493	Research Experience	1-3
BSC 495	Special Topics in Biological Sciences	1-6
CH 220	Introductory Organic Chemistry	3
CH 221	Organic Chemistry I	3
CH 222	Organic Chemistry I Lab	1
CH 315	Quantitative Analysis	3
CH 316	Quantitative Analysis Laboratory	1
CH 331	Introductory Physical Chemistry	4
CH/PSE 335	Principles of Green Chemistry	4
CH 345	Chemistry and War	3

CH 401	Systematic Inorganic Chemistry I	3	MA/LOG 335	Symbolic Logic	3
CH 403	Systematic Inorganic Chemistry II	3	MA 341	Applied Differential Equations I	3
CH 415	Analytical Chemistry II	3	MA 351	Introduction to Discrete Mathematical Models	3
CH 431	Physical Chemistry I	3	MA 401	Applied Differential Equations II	3
CH 433	Physical Chemistry II	3	MA 402	Mathematics of Scientific Computing	3
CH 435	Introduction to Quantum Chemistry	3	MA 403	Introduction to Modern Algebra	3
CH 437	Physical Chemistry for Engineers	4	MA 405	Introduction to Linear Algebra	3
CH 441	Forensic Chemistry	3	MA 407	Introduction to Modern Algebra for Mathematics Majors	3
CH 442	Advanced Synthetic Techniques	4	MA 408	Foundations of Euclidean Geometry	3
CH 444	Advanced Synthetic Techniques II	4	MA 410	Theory of Numbers	3
CH 452	Advanced Measurement Techniques I	4	MA 412	Long-Term Actuarial Models	3
CH 454	Advanced Measurement Techniques II	4	MA 413	Short-Term Actuarial Models	3
CH 463/563	Molecular Origins of Life	3	MA/CSC 416	Introduction to Combinatorics	3
CH 495	Special Topics in Chemistry	1-4	MA 421	Introduction to Probability	3
CH 499	Undergraduate Research in Chemistry	1-3	MA 425	Mathematical Analysis I	3
MA 242	Calculus III	4	MA 426	Mathematical Analysis II	3
MA 302	Numerical Applications to Differential Equations	1	MA/CSC 427	Introduction to Numerical Analysis I	3
MA 303	Linear Analysis	3	MA/CSC 428	Introduction to Numerical Analysis II	3
MA 305	Introductory Linear Algebra and Matrices	3	MA 430	Mathematical Models in the Physical Sciences	3
MA/MEA 315	Mathematics Methods in Atmospheric Sciences	4	MA 432	Mathematical Models in Life Sciences	3
MA 325	Introduction to Applied Mathematics	3	MA 437	Applications of Algebra	3
MA 331	Differential Equations for the Life Sciences	3	MA 444	Problem Solving Strategies for Competitions	1

MA 450	Methods of Applied Mathematics I	3	ST 311	Introduction to Statistics	3
MA 451	Methods of Applied Mathematics II	3	ST 312	Introduction to Statistics II	3
MA 491	Reading in Honors Mathematics	1-6	ST/BUS 350	Economics and Business Statistics	3
MA 493	Special Topics in Mathematics	1-6	ST 370	Probability and Statistics for Engineers	3
MA 494	Major Paper in Mathematics	1	ST 371	Introduction to Probability and Distribution Theory	3
MA 499	Independent Research in Mathematics	1-6	ST 372	Introduction to Statistical Inference and Regression	3
PY 301	Introduction to Quantum Mechanics	3	ST 401	Experiences in Data Analysis	4
PY 328	Stellar and Galactic Astrophysics	3	ST 405	Applied Nonparametric Statistics	3
PY 341	Relativity, Gravitation and Cosmology	3	ST/GPH 404	Epidemiology and Statistics in Global Public Health	3
PY 401	Quantum Physics I	3	ST 412	Long-Term Actuarial Models	3
PY 402	Quantum Physics II	3	ST 413	Short-Term Actuarial Models	3
PY 407	Introduction to Modern Physics	3	ST 421	Introduction to Mathematical Statistics I	3
PY 411	Mechanics I	3	ST 422	Introduction to Mathematical Statistics II	3
PY 412	Mechanics II	3	ST 430	Introduction to Regression Analysis	3
PY 413	Thermal Physics	3	ST 431	Introduction to Experimental Design	3
PY 414	Electromagnetism I	3	ST 432	Introduction to Survey Sampling	3
PY 415	Electromagnetism II	3	ST 433	Applied Spatial Statistics	3
PY 452	Advanced Physics Laboratory	3	ST 434	Applied Time Series	3
PY/ECE/MSE 489	Solid State Solar and Thermal Energy Harvesting	3	ST 435	Statistical Methods for Quality and Productivity Improvement	3
PY 495	Special Topics in Physics	1-4	ST 437	Applied Multivariate and Longitudinal Data Analysis	3
PY 499	Independent Research in Physics	1-6			
ST 307	Introduction to Statistical Programming-SAS	1			
ST 308	Introduction to Statistical Programming - R	1			

ST 440	Applied Bayesian Analysis	3
ST/CSC 442	Introduction to Data Science	3
ST 445	Introduction to Statistical Computing and Data Management	3
ST 446	Intermediate SAS Programming with Applications	3
ST 491	Statistics in Practice	3
ST 495	Special Topics in Statistics	1-6
ST 497	Professional Experience in Statistics	1-3
ST 498	Independent Study In Statistics	1-6
ST 499	Research Experience in Statistics	1-3

## Semester Sequence

This is a sample.

### First Year

Fall Semester	Hours
MEA 100 Earth System Science: Exploring the Connections <sup>2</sup>	4
MA 141 or MA 131 Calculus I <sup>2</sup> or Calculus for Life and Management Sciences A	3-4
MEA 101 & MEA 110 Geology I: Physical and Geology I Laboratory <sup>2</sup>	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
COS 100 Science of Change <sup>1</sup>	2

**Hours 14**

### Spring Semester

CH 101 & CH 102 Chemistry - A Molecular Science and General Chemistry Laboratory <sup>2</sup>	4
ENG 101 Academic Writing and Research <sup>2</sup>	4
MA 241 or MA 231 Calculus II <sup>2</sup> or Calculus for Life and Management Sciences B	3-4
MEA 202 & MEA 211 Geology II: Historical and Geology II Laboratory <sup>2</sup>	4

**Hours 16**

### Second Year

#### Fall Semester

Math/Science Option (p. 3) <sup>2</sup>	3
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MEA 410 Introduction to Mineralogy <sup>2</sup>	3
PY 205 & PY 206 or PY 211 Physics for Engineers and Scientists I or College Physics I	4
CH 201 & CH 202 Chemistry - A Quantitative Science and Quantitative Chemistry Laboratory <sup>2</sup>	4

**Hours 14**

#### Spring Semester

Computer Science Option (p. 2) <sup>6</sup>	3
COM 110 Public Speaking	3
MEA 257 Visualizing Geology in 3D & 4D	1
MEA 440 Igneous and Metamorphic Petrology	3
PY 208 & PY 209 or PY 212 Physics for Engineers and Scientists II or College Physics II	4

**Hours 14**

### Third Year

#### Fall Semester

Math/Science Option (p. 3) <sup>2</sup>	3
MEA 451 Structural Geology <sup>2</sup>	4
Restricted Elective (p. 2) <sup>2</sup>	3
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> )	3

**Hours 13**

#### Spring Semester

Advanced Writing Elective (p. 1)	3
Advised Elective <sup>2, 4</sup>	3
MEA 450 Introductory Sedimentology and Stratigraphy <sup>2</sup>	4
MEA 466 Preparatory Course for Field Camp <sup>2</sup>	1
MEA 495 Junior Seminar in the Marine, Earth, and Atmospheric Sciences <sup>2</sup>	1
Restricted Elective (p. 2) <sup>2</sup>	3

**Hours 15**

### Summer

MEA 465 Geologic Field Camp <sup>2</sup>	4
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**Hours 4**

### Fourth Year

#### Fall Semester

Restricted Elective (p. 2) <sup>2</sup>	3
Advised Elective <sup>2, 4</sup>	3
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> )	3
GEP Elective ( <a href="http://catalog.ncsu.edu/undergraduate/gep-category-requirements/">http://catalog.ncsu.edu/undergraduate/gep-category-requirements/</a> )	3
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> )	3

**Hours 15**

#### Spring Semester

Advised Elective <sup>2, 4</sup>	3
Restricted Elective (p. 2) <sup>2</sup>	6
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> )	3

Free Elective <sup>5</sup>	3
<b>Hours</b>	<b>15</b>
<b>Total Hours</b>	<b>120</b>

<sup>1</sup> COS 100 is for new freshmen only. Transfer students will need to select a course from the GEP Interdisciplinary Perspectives course list.

<sup>2</sup> A grade of a C- or higher is required. No more than one D will be allowed in Geology Core Courses, Restricted Electives, and Advised Electives. No more than one D will be allowed in other math and natural science courses.

<sup>3</sup> Transfer students who have completed MEA 140, MEA 150, or MEA 200 can use those credits in lieu of MEA 101. All students must complete MEA 110.

<sup>4</sup> Advised Electives are in the geosciences and related fields and are to be selected with the advice and consent of the advisor to meet the student’s career objective.

<sup>5</sup> Free electives may not be MA 100, MA 101, MA 103, MA 107, MA 108, or MA 111.

<sup>6</sup> GIS 280 or MEA 217 is recommended.

## 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 after completion of an MEAS undergraduate degree.

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.

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.

## Career Titles

- Agricultural Engineer
- Architect
- Astronomer
- Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
- Cartographer and Photogrammetrists
- Environmental Compliance Inspector
- Environmental Engineer
- Environmental Planner
- Environmental Research Analyst
- Geographer
- Geological Data Technicians
- Geological Technicians, Except Hydrologic Technicians
- Geologist

- Geophysicist
- Geothermal Production Manager
- Hazardous Waste Management Analyst
- Hydrographer
- Hydrologist
- Industrial Waste Inspector
- Irrigation Engineer
- Landscape Architect
- Materials Scientist
- Meteorologist
- Mining Engineer
- Oceanographer
- Paleontologist
- Park Naturalist
- Petroleum Engineer
- Petroleum Geologist
- Petroleum Laboratory Assistant
- Petroleum Technician
- Seismologist
- Soil Conservation Technician
- Soil Conservationist
- Soil Engineer
- Soil Scientist
- Urban and Regional Planner
- Water Pollution Control Inspector
- Water Resource Specialists
- Weather Forecaster

## Learn More About Careers

NCcareers.org (<https://nccareers.org/>)

Explore North Carolina’s central online resource for students, parents, educators, job seekers and career counselors looking for high quality job and career information.

Occupational Outlook Handbook (<https://www.bls.gov/ooh/>)

Browse the Occupational Outlook Handbook published by the Bureau of Labor Statistics to view state and area employment and wage statistics. You can also identify and compare similar occupations based on your interests.

Career One Stop Videos (<https://www.careeronestop.org/>)

View videos that provide career details and information on wages, employment trends, skills needed, and more for any occupation. Sponsored by the U.S. Department of Labor.

Focus 2 Career Assessment (<https://careers.dasa.ncsu.edu/explore-careers/career-assessments/>) (NC State student email address required)

This career, major and education planning system is available to current NC State students to learn about how your values, interests, competencies, and personality fit into the NC State majors and your future career. An NC State email address is required to create an account. Make an appointment with your career counselor (<https://careers.dasa.ncsu.edu/about/hours-appointments/>) to discuss the results.

Focus 2 Apply Assessment (<https://www.focus2career.com/Portal/Register.cfm?SID=1929>) (Available to prospective students)

A career assessment tool designed to support prospective students in exploring and choosing the right major and career path based on your

unique personality, interests, skills and values. Get started with Focus 2 Apply and see how it can guide your journey at NC State.

The Geological Society of America (<https://www.geosociety.org/>)

American Geosciences Institute (<https://www.americangeosciences.org/>)

Geology.com - Geology Jobs, Earth Science Jobs, Oil and Gas Jobs  
(<http://geology.com/jobs/>)