# GEOLOGY MAJOR

The Department of Geology offers three major tracks addressing key aspects of Geology - the science of Earth. In its broadest sense, geology focuses on the formation and subsequent modification of the planets, emphasizing planet Earth. Geologists study Earth’s internal and surface structure and materials and the chemical and physical processes acting within and on it, using the principles of mathematics, physics, chemistry, and biology.

Geological sciences encompass all the physical, chemical, and biological aspects of Earth. Increasingly, geologists are taking a holistic approach in the collection and interpretation of data about Earth, which means that the wider context of the geological sciences is broad and diverse. In studying Earth as a system, geologists address geology and geophysics, hydrology, oceanography and marine science, atmospheric science, planetary science, and soil science. A major in any relevant discipline can lead to a satisfying career within the geological sciences. In general, graduate training is expected for advancement to the most rewarding positions and for academic employment.

## Program Objectives

Geologists are employed by governmental, industrial, and academic organizations. They work in exploration for new mineral and energy resources, as consultants on engineering and environmental projects, as teachers and researchers in universities, and in many other challenging positions. For many, the attraction of a career in geology is the ability to divide time between work in the field, the laboratory, and the office. Although the employment outlook within geology varies with the global economic climate, the long-range outlook is good. This is because our dwindling energy, mineral, and water resources, along with increasing concerns about natural hazards and environmental issues, present new challenges for geologists.

## Program Learning Outcomes

1. The Geology program at Maryland includes a broad range of undergraduate courses to accommodate both Geology majors and students in the Environmental Science and Policy program. Geology majors are required to complete a senior research theses project under the direction of a faculty advisor. This requirement provides invaluable training in key professional skills including writing of proposals and reports; gathering, analyzing and evaluating data; and delivering results in public presentations. In addition, a Departmental Honors Program and a combined B.S./M.S. Program are available to qualified students.

## Requirements

### Professional Track

The Geology Professional Track curriculum is designed to meet the requirements of industry, graduate school, and government. For the B.S. degree, students are required to complete departmental requirements, capstones, core discipline options, an elective (58 - 62 credits), and supporting requirements (16 credits) in addition to General Education Program requirements and the completion of at least 120 credits. The department requires that to receive a degree in Geology, students must have a grade of C- or better in all required geology courses, and an average of C- or better in supporting courses.

Courses required for the Professional Track B.S. in Geology are listed below. Some courses require field trips for which students are expected to pay for room (if required) and board. Field camp is taken during the summer at institutions other than the University of Maryland, College Park, that offer camps approved by the department.

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL100</td>
<td>Physical Geology</td>
<td>3</td>
</tr>
<tr>
<td>or GEOL120</td>
<td>Environmental Geology</td>
<td></td>
</tr>
<tr>
<td>GEOL110</td>
<td>Physical Geology Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>GEOL102</td>
<td>Historical Geology</td>
<td>4</td>
</tr>
<tr>
<td>GEOL322</td>
<td>Mineralogy</td>
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<td>Structural Geology</td>
<td>4</td>
</tr>
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<td>GEOL342</td>
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<td>4</td>
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</tr>
<tr>
<td>GEOL443</td>
<td>Petrology</td>
<td>4</td>
</tr>
<tr>
<td>GEOL393</td>
<td>Geology Senior Thesis I: Proposal</td>
<td>3</td>
</tr>
<tr>
<td>GEOL394</td>
<td>Geology Senior Thesis II: Research</td>
<td>3</td>
</tr>
<tr>
<td>GEOL490</td>
<td>Geology Field Camp</td>
<td>6</td>
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</table>

**Geologic Core Discipline Options**

Select one of the following Quantitative Reasoning courses: 3
- GEOL351 Statistics for Geoscientists
- GEOL447 Observational Geophysics
- GEOL489 Special Topics (GEOL489G-Geosciences Modeling)

Select one of the following Geophysics courses: 3-4
- GEOL412 Geology of the Terrestrial Planets
- GEOL446 Geophysics
- GEOL455 Marine Geophysics
- GEOL457 Seismology

Select one of the following Geochemistry courses: 3-4
- GEOL444 Low Temperature Geochemistry
- GEOL445 High Temperature Geochemistry
- GEOL463 Economic Geology

Select one of the following Biogeoscience courses: 3-4
- GEOL331 Principles of Paleontology
- GEOL355 Environmental Geochemistry
- GEOL36 Principles of Biogeochemy
- GEOL437 Global Climate Change: Past and Present

**Geology Elective**

Select any 3-4 credit 300 – 400 level GEOL course not taken to satisfy the above requirements \(^1\) 3-4

### Supporting Courses

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<tr>
<td>CHEM131</td>
<td>Chemistry I - Fundamentals of General Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM135 General Chemistry for Engineers</td>
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</tr>
<tr>
<td>CHEM132</td>
<td>General Chemistry I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>or CHEM136 General Chemistry Laboratory for Engineers</td>
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<td></td>
</tr>
<tr>
<td>MATH140</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH141</td>
<td>Calculus II</td>
<td>4</td>
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Matriculated Geology majors are expected to take all courses on campus unless specific departmental permission is given.

**Secondary Education Track**

The Geology Secondary Education Track leads to a B. S. degree in Geology with special emphasis on course work that prepares the student for teaching at the secondary school level in a manner consistent with the UTeach Initiative and Common Core standards. Further coursework in Education (including student teaching) will be required in order to obtain Maryland State Teaching Certification. This track also prepares students for work as a geologists in government or industry, or for graduate study, although students primarily intending to attend graduate school in geology are advised to choose the Professional Track. Students seeking professional opportunities in secondary education are urged, also, to consult with advisors in the College of Education.

Compared to the Geology Professional Track, the Secondary Education Track, reduces by three the number of upper-level geology requirements, and adds eight credits of education courses along with requirements for an atmospheric and oceanic science and an astronomy course. To receive a degree in Geology, students must earn a grade of C- or better in required geology courses, and a C- average or better in supporting courses.

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Select two of the following:

- GEOL212 Planetary Geology
- GEOL331 Principles of Paleontology
- GEOL340 Geomorphology
- GEOL/ AOSC375 Introduction to the Blue Ocean
- GEOL444 Low Temperature Geochemistry
- GEOL445 High Temperature Geochemistry
- GEOL446 Geophysics
- GEOL451 Groundwater

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<tr>
<td>PHYS161 &amp; PHYS174</td>
<td>General Physics: Mechanics and Particle Dynamics and Physics Laboratory Introduction</td>
<td>4</td>
</tr>
<tr>
<td>PHYS171 &amp; PHYS174</td>
<td>Introductory Physics: Mechanics and Relativity and Physics Laboratory Introduction</td>
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Total Credits: 70-74

1. Or appropriate substitution with the approval of the department

**Geophysics Track**

The geophysics curriculum is designed to meet the requirements of industry, graduate school, and government. The B. S. degree requires students to complete introductory geology and physics requirements (39 credits) and upper-level requirements including depth options, context options, and breadth options (30 - 35 credits) in addition to the General Education Program requirements and the completion of at least 120 credits in total. In order to receive a degree in Geophysics, the department requires that students must have a grade of C- or better in the required geology courses.

Courses required for the B. S. in Geology are listed below. Some courses require field trips for which the students are expected to pay for room (if required) and board.

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</tr>
<tr>
<td>MATH241</td>
<td>Calculus III</td>
<td>4</td>
</tr>
<tr>
<td>PHYS161</td>
<td>General Physics: Mechanics and Particle Dynamics</td>
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</tr>
<tr>
<td>or PHYS171</td>
<td>Introductory Physics: Mechanics and Relativity</td>
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Select one of the following:

- ASTR100 Introduction to Astronomy | 3-4 |
- or ASTR101 General Astronomy | 4 |
- AOSC123 Causes and Implications of Global Change | 3 |
- or AOSC200 Weather and Climate | 3 |
- CHEM131 Chemistry I - Fundamentals of General Chemistry | 3 |
- or CHEM135 General Chemistry for Engineers | 3 |
- CHEM132 General Chemistry I Laboratory | 1 |
- or CHEM136 General Chemistry Laboratory for Engineers | 1 |
- MATH140 Calculus I | 4 |
- MATH141 Calculus II | 4 |

Select six credits of the following:

- EDCI488M - Knowing and Learning | 2 |
- EDCI488P - Project Based Instruction | 2 |
- Classroom Interactions | 1 |
- Reading | 1 |
- Perspectives Science and Math | 1 |

Total Credits: 76-79
PHYS165  Introduction to Programming in the Physical Sciences  3
PHYS174  Physics Laboratory Introduction  1
PHYS272  Introductory Physics: Fields  3
PHYS273  Introductory Physics: Waves  3
PHYS275  Experimental Physics I: Mechanics and Heat  2
PHYS276  Experimental Physics II: Electricity and Magnetism  2

Select one of the following:  6
PHYS274 & GEOL351  Mathematical Methods for Physics I and Statistics for Geoscientists
MATH240 & MATH246  Introduction to Linear Algebra and Differential Equations for Scientists and Engineers

Geophysics Upper Level Requirements
GEOL393  Geology Senior Thesis I: Proposal  3
GEOL394  Geology Senior Thesis II: Research  3
GEOL446  Geophysics  3

Depth Requirements
Select three of the following:  9
GEOL412  Geology of the Terrestrial Planets
GEOL447  Observational Geophysics
GEOL455  Marine Geophysics
GEOL456  Engineering Geology
GEOL457  Seismology
GEOL460  Field Geophysics

Context Requirement
Select two of the following:  6-8
AOSC400  Physical Meteorology of the Atmosphere
AOSC424  Remote Sensing of the Atmosphere and Ocean
AOSC431  Atmospheric Thermodynamics
AOSC432  Dynamics of the Atmosphere and Ocean
GEOL322  Mineralogy
GEOL340  Geomorphology
GEOL341  Structural Geology
GEOL342  Sedimentation and Stratigraphy
GEOL423  Optical Mineralogy
GEOL443  Petrology
GEOL451  Groundwater
GEOL463  Economic Geology
GEOL472  Tectonics

Breadth Requirement
Select two of the following:  6-8
PHYS371  Modern Physics
PHYS373  Mathematical Methods for Physics II
PHYS401  Quantum Physics I
PHYS402  Quantum Physics II
PHYS410  Classical Mechanics
PHYS411  Intermediate Electricity and Magnetism

Recommended Courses
Select one of the following:
CHEM135 & CHEM136  General Chemistry for Engineers and General Chemistry Laboratory for Engineers

Total Credits  69-73

Matriculated Geology majors are expected to take all courses on campus unless specific departmental permission is given.

Four Year Plan
Click here (https://cmns.umd.edu/undergraduate/advising-academic-planning/academic-planning/four-year-plans/four-year-plans-gened/) for roadmaps for four-year plans in the College of Computer, Mathematical, and Natural Sciences.

Additional information on developing a four-year academic plan can be found on the following pages:
• 4yearplans.umd.edu
• the Student Academic Success-Degree Completion Policy (https://academiccatalog.umd.edu/undergraduate/registration-academic-requirements-regulations.academic-advising/) section of this catalog