

GEOBIOLOGY, B.S.

Begin Campus: Any Penn State Campus

End Campus: University Park

Program Description

Geobiology is the interdisciplinary study of the Earth and its biosphere. It embraces the history of life and its interactions with the Earth over geologic time; it also includes study of interactions between living organisms and physical and chemical processes in the modern environment on Earth, and possibly elsewhere in the universe. Thus, geobiology encompasses the fields of paleobiology and paleontology, biogeochemistry, geomicrobiology, and astrobiology. The degree program provides students with a strong background in general science and especially in geosciences and biology, with core selections from both disciplines. Students gain practical field experience in the study of the physical environment and ecological properties. The senior thesis provides students with hands-on research experience, as well as an emphasis on data synthesis and the written expression of scientific observations and ideas. Students will be well prepared for advanced studies in this emerging discipline, and for careers in the environmental sciences. Geobiology is critical to the study of environmental quality, global change, and environmental-human health interactions, all of which have profound importance in legal, economic, and policy arenas.

What is Geobiology?

Geobiology is the study of the interactions that occur between the biosphere (living organisms and their products) and the geosphere (solid part of the Earth). Geobiologists apply the principles and tools of biology to study the Earth and construct a picture of life through time. Geobiologists search for clues of how changes to the Earth in the past, such as periods of increased carbon dioxide or decreased temperature, have affected life on Earth and vice versa. By studying key aspects of the environment, geobiologists seek an understanding of how stressors affect entire populations, evolution, and extinctions. The study can involve field work such as collecting fossils or organic matter, or it can involve laboratory work using cutting-edge analytical instrumentation. By building a more detailed picture of how environmental changes affect life, geobiologists can help understand how predicted future environmental changes might impact life on Earth.

You Might Like This Program If...

- You want to understand the complexity of environmental factors that led to the origin and evolution of life on Earth and contributed to past mass extinctions.
- You like to do field work outdoors, such as searching for fossils.
- You are analytical and like to piece together clues to paint a picture of past life.
- You like thinking about the big picture of evolution within Earth's geologic constraints.

Entrance to Major

In order to be eligible for entrance to this major, a student must:

1. attain at least a C (2.00) cumulative grade-point average for all courses taken at the University; and

2. have third-semester classification (<http://www.registrar.psu.edu/enrollment/semester-classification.cfm>).

READ SENATE POLICY 37-30: ENTRANCE TO AND CHANGES IN MAJOR PROGRAMS OF STUDY (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/37-00-entrance-to-a-college-or-major/>)

Degree Requirements

For the Bachelor of Science degree in Geobiology, a minimum of 121 credits is required:

Requirement	Credits
General Education	45
Requirements for the Major	97

21 of the 45 credits for General Education are included in the Requirements for the Major. This includes: 9 credits of GN courses, 6 credits of GQ courses, 6 credits of GWS courses.

General Education

Connecting career and curiosity, the General Education curriculum provides the opportunity for students to acquire transferable skills necessary to be successful in the future and to thrive while living in interconnected contexts. General Education aids students in developing intellectual curiosity, a strengthened ability to think, and a deeper sense of aesthetic appreciation. These are requirements for all baccalaureate students and are often partially incorporated into the requirements of a program. For additional information, see the General Education Requirements (<http://bulletins.psu.edu/undergraduate/general-education/baccalaureate-degree-general-education-program/>) section of the Bulletin and consult your academic adviser.

The keystone symbol appears next to the title of any course that is designated as a General Education course. Program requirements may also satisfy General Education requirements and vary for each program.

Foundations (grade of C or better is required.)

- **Quantification (GQ):** 6 credits
- **Writing and Speaking (GWS):** 9 credits

Knowledge Domains

- **Arts (GA):** 6 credits
- **Health and Wellness (GHW):** 3 credits
- **Humanities (GH):** 6 credits
- **Social and Behavioral Sciences (GS):** 6 credits
- **Natural Sciences (GN):** 9 credits

Integrative Studies (may also complete a Knowledge Domain requirement)

- **Inter-Domain or Approved Linked Courses:** 6 credits

University Degree Requirements

First Year Engagement

All students enrolled in a college or the Division of Undergraduate Studies at University Park, and the World Campus are required to take 1 to 3 credits of the First-Year Seminar, as specified by their college First-Year Engagement Plan.

Other Penn State colleges and campuses may require the First-Year Seminar; colleges and campuses that do not require a First-Year Seminar provide students with a first-year engagement experience.

First-year baccalaureate students entering Penn State should consult their academic adviser for these requirements.

Cultures Requirement

6 credits are required and may satisfy other requirements

- United States Cultures: 3 credits
- International Cultures: 3 credits

Writing Across the Curriculum

3 credits required from the college of graduation and likely prescribed as part of major requirements.

Total Minimum Credits

A minimum of 120 degree credits must be earned for a baccalaureate degree. The requirements for some programs may exceed 120 credits. Students should consult with their college or department adviser for information on specific credit requirements.

Quality of Work

Candidates must complete the degree requirements for their major and earn at least a 2.00 grade-point average for all courses completed within their degree program.

Limitations on Source and Time for Credit Acquisition

The college dean or campus chancellor and program faculty may require up to 24 credits of course work in the major to be taken at the location or in the college or program where the degree is earned. Credit used toward degree programs may need to be earned from a particular source or within time constraints (see Senate Policy 83-80 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#83-80>)). For more information, check the Suggested Academic Plan for your intended program.

Requirements for the Major

To graduate, a student enrolled in the major must earn a grade of C or better in each course designated by the major as a C-required course, as specified by Senate Policy 82-44 (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/82-00-and-83-00-degree-requirements/#82-44>).

Code	Title	Credits
Prescribed Courses		
CHEM 110	Chemical Principles I	3
CHEM 111	Experimental Chemistry I	1
CHEM 112	Chemical Principles II	3
CHEM 113	Experimental Chemistry II	1
EMSC 100S	Earth and Mineral Sciences First-Year Seminar ¹	3
GEOSC 1	Physical Geology ²	3
GEOSC 201	Earth Materials	4
GEOSC 494W	Senior Thesis	3
GEOSC 496	Independent Studies	3
MATH 140	Calculus With Analytic Geometry I	4
MATH 141	Calculus with Analytic Geometry II	4
PHYS 211	General Physics: Mechanics	4
PHYS 213	General Physics: Fluids and Thermal Physics	2
<i>Prescribed Courses: Require a grade of C or better</i>		
BIOL 110	Biology: Basic Concepts and Biodiversity	4
BIOL 220W	Biology: Populations and Communities	4
GEOSC 204	Geobiology	4

GEOSC 310	Earth History	4
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Additional Courses

BIOL 444	Field Ecology	3
	or GEOSC 472A Field Geology I (Introduction to Field Methods)	
ENGL 15	Rhetoric and Composition	3
	or ENGL 30H Honors Rhetoric and Composition	
GEOSC 202	Chemical Processes in Geology	4
	or GEOSC 203 Physical Processes in Geology	
Select 3-4 credits of the following:		3-4
BIOL 230W	Biology: Molecules and Cells	
BIOL 240W	Biology: Function and Development of Organisms	
MICRB 201	Introductory Microbiology	

Supporting Courses and Related Areas

Select 17-18 credits, in consultation with adviser, supportive of the student's interest ³ 17-18

Select 12 credits, at least 3 credits from each category, from the approved list of evolution, paleobiology and geology courses and biogeochemistry courses 12

¹ The following substitutions are allowed for students attending campuses where the indicated course is not offered: CAS 100 or ENGL 202C can be substituted for EMSC 100S.

² If GEOSC 1 is not available, GEOSC 20 may be substituted.

³ Students may apply 6 credits of ROTC.

Academic Advising

The objectives of the university's academic advising program are to help advisees identify and achieve their academic goals, to promote their intellectual discovery, and to encourage students to take advantage of both in-and out-of class educational opportunities in order that they become self-directed learners and decision makers.

Both advisers and advisees share responsibility for making the advising relationship succeed. By encouraging their advisees to become engaged in their education, to meet their educational goals, and to develop the habit of learning, advisers assume a significant educational role. The advisee's unit of enrollment will provide each advisee with a primary academic adviser, the information needed to plan the chosen program of study, and referrals to other specialized resources.

READ SENATE POLICY 32-00: ADVISING POLICY (<http://senate.psu.edu/policies-and-rules-for-undergraduate-students/32-00-advising-policy/>)

University Park

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Suggested Academic Plan

The suggested academic plan(s) listed on this page are the plan(s) that are in effect during the 2020-21 academic year. To access previous years' suggested academic plans, please visit the archive (<https://bulletins.psu.edu/undergraduate/archive/>) to view the appropriate Undergraduate Bulletin edition (*Note: the archive only contain suggested*

academic plans beginning with the 2018-19 edition of the Undergraduate Bulletin).

University Park Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
MATH 140 or 140G (GQ) ^{††}	4 MATH 141 or 141G (GQ) ^{††}	4
CHEM 110 (GN) [†]	3 CHEM 112	3
CHEM 111 (GN) [†]	1 CHEM 113	1
GEOSC 1 or 20	3 ENGL 15, 30H, or ESL 15 (GWS) [†]	3
EMSC 100S (GWS) ^{††1}	3 GEOSC 201	4
	14	15

Second Year

Fall	Credits Spring	Credits
PHYS 211 (GN) [†]	4 PHYS 213	2
BIOL 110 (GN) ^{††}	4 GEOSC 310 [*]	4
Supporting Course	3 BIOL 220W [*]	4
General Education Knowledge Domain	3 General Education Knowledge Domain	3
General Education Knowledge Domain	3 General Education Health and Wellness (GHW)	3
	17	16

Third Year

Fall	Credits Spring	Credits Summer	Credits
GEOSC 202 or 203	4 GEOSC 204 [*]	4 GEOSC 472A or BIOL 444	3
BIOL 230W, MICRB 201, or BIOL 240W	3-4 Advanced GEOBI Elective ²	3	
Advanced GEOBI Elective ²	3 Supporting Course ³	3	
General Education Knowledge Domain	3 General Education Knowledge Domain	3	
	Supporting Course ³	3	
	13-14	16	3

Fourth Year

Fall	Credits Spring	Credits
Advanced GEOBI Elective ²	3 GEOSC 494W	3
GEOSC 496	3 Advanced GEOBI Elective ²	3
General Education Foundation selection (GWS) [†]	3 Supporting Course ³	3
General Education Knowledge Domain	3 Supporting Course ³	3
Supporting Course ³	3	
	15	12
Total Credits 121-122		

* Course requires a grade of C or better for the major

† Course requires a grade of C or better for General Education

Course is an Entrance to Major requirement

† Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

US and IL are abbreviations used to designate courses that satisfy University Requirements (United States and International Cultures).

W, M, X, and Y are the suffixes at the end of a course number used to designate courses that satisfy University Writing Across the Curriculum requirement.

GWS, GQ, GHW, GN, GA, GH, and GS are abbreviations used to identify General Education program courses. General Education includes Foundations (GWS and GQ) and Knowledge Domains (GHW, GN, GA, GH, GS, and Integrative Studies). Foundations courses (GWS and GQ) require a grade of 'C' or better.

Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

All incoming Schreyer Honors College first-year students at University Park will take ENGL 137H/CAS 137H in the fall semester and ENGL 138T/CAS 138T in the spring semester. These courses carry the GWS designation and replace both ENGL 30H and CAS 100. Each course is 3 credits.

¹ Students who begin their studies at non-UP locations and/or join the college after their first year should substitute CAS 100 (GWS), CAS 100A, CAS 100B, or CAS 100C; or ENGL 202C (GWS) for EM SC 100S (GWS). EM SC 100S Earth and Mineral Sciences First year Seminar (3) is a required course only for students who begin their studies at UP in the College of Earth and Mineral Sciences.

² Advanced GEOBI elective: Select 12 credits, at least 3 credits from each category, from the approved list of evolution, paleobiology and geology courses and biogeochemistry courses. Supporting Courses should be selected in consultation with an adviser.

³ Supporting course: Select 17-18 credits, in consultation with an adviser, supportive of the student's interest. Students may apply 6 credits of ROTC.

Commonwealth Campus

The course series listed below provides **only one** of the many possible ways to move through this curriculum. The University may make changes in policies, procedures, educational offerings, and requirements at any time. This plan should be used in conjunction with your degree audit (accessible in LionPATH as either an **Academic Requirements** or **What If** report). Please consult with a Penn State academic adviser on a regular basis to develop and refine an academic plan that is appropriate for you.

First Year

Fall	Credits Spring	Credits
MATH 140 (GQ) [‡]	4 MATH 141 (GQ) [‡]	4
CHEM 110 (GN) [†]	3 CHEM 112	3
CHEM 111 (GN) [†]	1 CHEM 113	1
ENGL 15, 30H, or ESL 15 (GWS) ^{††}	3 General Education Foundation selection (GWS) ^{†1}	3
General Education knowledge domain	3 General Education knowledge domain	3
14		14

Second Year

Fall	Credits Spring	Credits
PHYS 211 (GN) [†]	4 PHYS 213	2
BIOL 110 (GN) ^{*†}	4 BIOL 220W [*]	4
General Education Knowledge Domain	3 General Education Foundation selection (GWS) ^{†1}	3
General Education Health and Wellness (GHW)	1.5 General Education Knowledge Domain	3
General Education Knowledge Domain	3 General Education Health and Wellness (GHW)	1.5
	General Education Knowledge domain	3
15.5		16.5

Third Year

Fall	Credits Spring	Credits Summer	Credits
BIOL 230W, MICRB 201, or BIOL 240W	3-4 GEOSC 204 [*]	4 GEOSC 472A or BIOL 444	3

GEOSC 1 or 20	3 GEOSC 310 [*]	4
GEOSC 201	4 Advanced GEOBI Elective ²	3
Advanced GEOBI Elective ²	3 Supporting Course ³	3
	Supporting Course ³	3
13-14		17
		3

Fourth Year

Fall	Credits Spring	Credits
GEOSC 202 or 203	4 GEOSC 494W	3
Supporting Course ³	3 Advanced GEOBI Elective ²	3
GEOSC 496	3 Supporting Course ³	3
Advanced GEOBI Elective ²	3 Supporting Course ³	3
Supporting Course ³	3	
16		12

Total Credits 121-122

- * Course requires a grade of C or better for the major
- ‡ Course requires a grade of C or better for General Education
- # Course is an Entrance to Major requirement
- † Course satisfies General Education and degree requirement

University Requirements and General Education Notes:

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Integrative Studies courses are required for the General Education program. N is the suffix at the end of a course number used to designate an Inter-Domain course and Z is the suffix at the end of a course number used to designate a Linked course.

- ¹ Students who begin their studies at non-UP locations and/or join the college after their first year should substitute CAS 100 (GWS), CAS 100A, CAS 100B, or CAS 100C; or ENGL 202C (GWS) for EM SC 100S (GWS). EM SC 100S Earth and Mineral Sciences First year Seminar (3) is a required course only for students who begin their studies at UP in the College of Earth and Mineral Sciences.
- ² Advanced GEOBI elective: Select 12 credits, at least 3 credits from each category, from the approved list of evolution, paleobiology and geology courses and biogeochemistry courses. Supporting Courses should be selected in consultation with an adviser.

³ Supporting course: Select 17-18 credits, in consultation with an adviser, supportive of the student's interest. Students may apply 6 credits of ROTC.

Career Paths

Because geobiology is an interdisciplinary field, it can help students prepare for a range of collaborative careers or opportunities for graduate studies.

Careers

This degree is ideal for students who wish to pursue careers in environmental geology, geochemistry, environmental microbiology, museum paleontology, and even medicine.

MORE INFORMATION ABOUT POTENTIAL CAREER OPTIONS FOR GRADUATES OF THE GEOBIOLOGY PROGRAM (<http://www.geosc.psu.edu/careers/>)

Opportunities for Graduate Studies

Students obtaining a bachelor's degree in geobiology are prepared for graduate degrees in environmental sciences, including geosciences, environmental sciences, or the biological sciences. Some students continue to medical school.

MORE INFORMATION ABOUT OPPORTUNITIES FOR GRADUATE STUDIES (<http://www.geosc.psu.edu/graduates/>)

Professional Resources

- Geosciences Club (<https://www.facebook.com/groups/46384419817/>)
- Association for Women Geoscientists (<https://sites.psu.edu/awgpennstate/>)

Contact

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