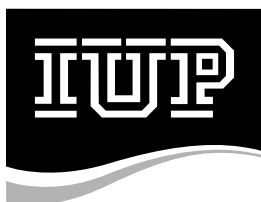


# UNDERGRADUATE CATALOG 2017–18

Department of Geoscience  
College of Natural Sciences and Mathematics  
[www.iup.edu/geoscience](http://www.iup.edu/geoscience)

This document is a direct extract from the full 2017–18 *Undergraduate Catalog*. As a result, the original page numbering will appear.

For information on other colleges at IUP, or about specific courses, please consult the full 2017–18 catalog, available at [www.iup.edu/registrar/catalog](http://www.iup.edu/registrar/catalog). Earlier catalogs are also available at this web address.



Indiana University of Pennsylvania

companies, environmental consulting firms, or federal and state regulatory agencies.

### **BS—Geology/Environmental Track**

This track is designed for students who wish to pursue careers in the environmental field. In addition to air and water quality issues, pollution often affects the subsurface in ways that are difficult to detect and remediate. Geologists therefore play a key role in dealing with complex environmental issues; the Environmental Track prepares students to solve a variety of environmental problems. Graduates from this track will be prepared for direct entry into jobs with federal or state agencies and private environmental consulting firms, as well as graduate studies.

### **BS—Geology/Energy Resources Track**

This track is designed for students who wish to pursue careers in the energy sector. As the world's energy demands continue to grow, nations face the challenge of maintaining reliable energy supplies. Conventional oil, coal, and natural gas continue as mainstays of the energy industry, but renewable and/or carbon-neutral energy sources are gaining attention in response to growing concerns about climate change and finite reserves of fossil fuels. western Pennsylvania is a historic coal and natural gas producing region with the potential for significant growth in the natural gas industry due to development of the Marcellus shale. The Energy Resources Track will prepare students for direct entry into the energy industry with a focus on the discovery and development of energy resources and geophysical exploration techniques.

### **BSEd—Earth and Space Science**

This program prepares students to become certified middle- and high-school teachers in Pennsylvania and other states. Earth and space science teachers in grades 7 to 12 teach subjects that require a broad and solid foundation in science. Course work includes study of geology, meteorology, oceanography, and astronomy. A basic understanding of the cognate sciences, biology, chemistry, and physics, and mathematics is also an essential part of the major. Courses in the foundations of education and pedagogy complement the subject matter studies. Students create and present lessons, first in their courses and then in school classrooms, culminating in the student teaching experience in the final semester.

### **Minor in Geology**

The minor in geology is designed for students who want a background in geology in conjunction with their main area of study. This minor may be particularly appropriate for students pursuing degrees in business or one of the social or physical sciences.

### **Bachelor of Science—Geology/Geology Track**

**Liberal Studies:** As outlined in Liberal Studies section with the following specifications: 46

**Mathematics:** MATH 121

**Natural Science:** CHEM 111-112 or 113-114

**Liberal Studies Elective:** 4cr, MATH 122, no courses with GEOS prefix

**Major:** 58

#### **Geoscience Core:**

GEOS 201	Foundations of Geology	4cr
GEOS 202	Quantitative Methods in the Geosciences	2cr
GEOS 203	Surficial Processes	4cr
GEOS 204	Historical Geology	4cr
GEOS 301	Mineralogy	4cr
GEOS 470	Research Methods in the Geosciences	2cr
GEOS 480	Geoscience Seminar	2cr
One course from the following: GEOS 303, 401-402, 403-404, 405-406, 407-408 (1)		4cr

#### **Geology Track:**

Select two courses from the following: GEOS 302, 345, 362	8cr
Select two courses from the following: GEOS 352, 353, 354, 355	8cr

## **Department of Geoscience**

**Website:** [www.iup.edu/geoscience](http://www.iup.edu/geoscience)

**Steven A. Hovan, Chairperson;** Cercone, Coles, Deardorff, Farnsworth, Lewis, Mount, Warnock; and professors emeriti Clark, Hall, Park, Richardson, Sutton, Taylor

Geology is the broad science that encompasses all aspects of the Earth system. In addition to the solid Earth, this system includes the oceans and atmosphere, climate change, and most aspects of our immediate environment. Professional geologists are thus engaged in a wide range of activities, depending on their interests. Scientific questions addressed by geologists include the evolution of life, the origin of volcanic activity, the assessment of volcanic and earthquake hazards, the evolution of our planetary neighbors, climate change, mineral and energy resources, and the human impact on the environment.

The Geoscience Department offers a BS degree with a major in geology that is divided into three tracks: Geology, Environmental, and Energy Resources. All tracks give students the necessary foundation to pursue a wide variety of career goals. In addition, the department offers a BSEd degree with a major in Earth and space science education for students who are interested in teaching. The degrees and courses in the program emphasize hands-on learning, including outdoor instruction, student-oriented research, and professional experiential learning opportunities. In addition to on-campus instruction and class-related field trips, the department also offers several regional geology field workshops, which take place in Newfoundland, the northern Rockies region, Florida and the Bahamas, and the American Southwest.

### **BS—Geology/Geology Track**

This track is designed for students who are interested in pursuing many of the various subdisciplines in geology, including oceanography/marine geology, climate change, volcanology, paleontology, and geophysics. There is also considerable overlap between geology and astronomy, as geologists study the evolution of other planetary bodies, such as the Moon, Mars and Venus; the curriculum reflects this link and provides the groundwork for planetary studies. The Geology Track thus provides students with the foundation needed to pursue a wide variety of careers, including research and graduate studies, or working as professional geologists for energy resource

<b>Ancillary Sciences:</b>	6cr	GEOG 314, 335, 341, 343, 415, 419 MATH 216 or 217 (4), 341 PHYS 121 or 141, 122 or 142, 342 COSC 110, 210, 250, 310, 362
Select two courses from the following: PHYS 111 or 131, PHYS 112 or 132, MATH 216		
<b>Controlled Electives:</b> Select 10cr from the following: (2)	10cr	
One 100-level GEOS course (3)		
Any 300-level GEOS course		
Any 400-level GEOS course		
Foreign Language Intermediate Level		
BIOL 201, 202		
CHEM 231, 232, 325, 326, 341		
GEOG 314, 335, 341, 343, 415, 419		
MATH 216 or 217 (4), 341		
PHYS 121 or 141, 122 or 142, 342		
COSC 110, 210, 250, 310, 362		
<b>Free Electives:</b>	16	
<b>Total Degree Requirements:</b>	120	
(1) Up to 4cr of a summer field camp, internship, field study, or independent study, if approved by the department, may substitute for GEOS 303 or a Geoscience Field Workshop.		
(2) Any course not applied to the Geology Track may count as a controlled elective if taken in addition to track requirements. Only one Geoscience Field Workshop (including prerequisite 1cr Seminar) may be applied toward controlled electives. Six credits of foreign language may count toward controlled elective provided intermediate level is successfully obtained.		
(3) When taken before declaring the major or when specially recommended during freshman orientation/transfer advising for students who must take remedial math courses before enrolling in GEOS 201 and 202		
(4) Cannot be counted as a controlled elective if MATH 216 is applied toward ancillary science requirements.		
<hr/>		
<b>Bachelor of Science—Geology/Environmental Track</b>		
<b>Liberal Studies:</b> As outlined in Liberal Studies section with the following specifications:	46	
<b>Mathematics:</b> MATH 121		
<b>Natural Science:</b> CHEM 111-112 or CHEM 113-114		
<b>Liberal Studies Elective:</b> 4cr, MATH 122, no courses with GEOS prefix		
<b>Major:</b>	58	
<b>Required Courses:</b>		
GEOS 201 Foundations of Geology	4cr	
GEOS 202 Quantitative Methods in the Geosciences	2cr	
GEOS 203 Surficial Processes	4cr	
GEOS 204 Historical Geology	4cr	
GEOS 301 Mineralogy	4cr	
GEOS 470 Research Methods in the Geosciences	2cr	
GEOS 480 Geoscience Seminar	2cr	
One course from the following: GEOS 303, 401-402, 403-404, 405-406, 407-408 (1)	4cr	
<b>Environmental Track:</b>		
Select two courses from the following:	8cr	
GEOS 345 Igneous and Metamorphic Petrology		
GEOS 352 Stratigraphy		
GEOS 356 Coastal Geology and Processes		
Select two courses from the following:	8cr	
GEOS 310, 311, 312, 323		
<b>Ancillary Sciences:</b>	6cr	
Select two courses from the following: PHYS 111 or 131, PHYS 112 or 132, MATH 216		
<b>Controlled Electives:</b> Select 10cr from the following: (2)	10cr	
One 100-level GEOS course (3)		
Any 300-level GEOS course		
Any 400-level GEOS course		
Foreign Language Intermediate Level		
BIOL 201, 202		
CHEM 231, 232, 325, 326, 341		
GEOG 314, 335, 341, 343, 415, 419		
MATH 216 or 217 (4), 341		
PHYS 121 or 141, 122 or 142, 342		
COSC 110, 210, 250, 310, 362		
<b>Free Electives:</b>	16	
<b>Total Degree Requirements:</b>	120	
(1) Up to 4cr of a summer field camp, internship, field research study, or independent study, all of which must be approved by the department, may substitute for GEOS 303 or a Geoscience Field Workshop.		
(2) Any course not applied to the Energy Resources Track may count as a controlled elective if taken in addition to track requirements. Only one Geoscience Field Workshop (including prerequisite 1cr Seminar) may		
<hr/>		
<b>Bachelor of Science—Geology/Energy Resources Track</b>		
<b>Liberal Studies:</b> As outlined in Liberal Studies section with the following specifications:	46	
<b>Mathematics:</b> MATH 121		
<b>Natural Science:</b> CHEM 111-112 or CHEM 113-114		
<b>Liberal Studies Elective:</b> 4cr, MATH 122, no courses with GEOS prefix		
<b>Major:</b>	58	
<b>Required Courses:</b>		
GEOS 201 Foundations of Geology	4cr	
GEOS 202 Quantitative Methods in the Geosciences	2cr	
GEOS 203 Surficial Processes	4cr	
GEOS 204 Historical Geology	4cr	
GEOS 301 Mineralogy	4cr	
GEOS 470 Research Methods in the Geosciences	2cr	
GEOS 480 Geoscience Seminar	2cr	
One course from the following: GEOS 303, 401-402, 403-404, 405-406, 407-408 (1)	4cr	
<b>Energy Resources Track:</b>		
Two courses from the following: GEOS 302, 323, 324	8cr	
Two courses from the following: GEOS 352, 353, 355, 362	8cr	
<b>Ancillary Sciences:</b>	6cr	
Select two courses from the following: PHYS 111 or 131, PHYS 112 or 132, MATH 216		
<b>Controlled Electives:</b> Select 10cr from the following: (2)	10cr	
One 100-level GEOS course (3)		
Any 300-level GEOS course		
Any 400-level GEOS course		
Foreign Language Intermediate Level		
BIOL 201, 202		
CHEM 231, 232, 325, 326, 341		
GEOG 314, 335, 341, 343, 415, 419		
MATH 216 or 217 (4), 341		
PHYS 121 or 141, 122 or 142, 342		
COSC 110, 210, 250, 310, 362		
<b>Free Electives:</b>	16	
<b>Total Degree Requirements:</b>	120	
(1) Up to 4cr of a summer field camp, internship, field study, or independent study, if approved by the department, may substitute for GEOS 303 or a Geoscience Field Workshop.		
(2) Any course not applied to the Environmental Track may count as a controlled elective if taken in addition to track requirements. Only one Geoscience Field Workshop (including prerequisite 1cr Seminar) may		

be applied toward controlled electives. Six credits of foreign language may count toward controlled elective provided intermediate level is successfully obtained.

- (3) When taken before declaring the major or when specifically recommended during freshman orientation/transfer advising for student who must take remedial math courses before enrolling in GEOS 201 and 202
- (4) Cannot be counted as a controlled elective if MATH 216 is applied toward ancillary science requirements.

**Minor—Geology 18**

**Required Courses:**

GEOS 201	Foundations of Geology	4cr
GEOS 202	Quantitative Methods in the Geosciences	2cr
	12cr from the following:	12cr
GEOS 203	Surficial Processes	
	Any 300-level GEOS course	
	Any 400-level GEOS course, except GEOS 470 and 480 (1)	

- (1) Only one Geoscience Field Workshop (including prerequisite seminar) can be counted toward the minor.

**Bachelor of Science in Education—Earth and Space Science (\*)**

**Liberal Studies:** As outlined in Liberal Studies section with the following specifications: 48

**Mathematics:** MATH 121

**Natural Science:** CHEM 111-112

**Social Science:** PSYC 101

**Liberal Studies Electives:** 6cr, MATH 217, PHYS 111, no courses with GEOS prefix

**College:** 31

**Preprofessional Education Sequence:**

ACE 103	Digital Instructional Technology	3cr
EDSP 102	Educational Psychology	3cr

**Professional Education Sequence:**

EDEX 301	Education of Students with Disabilities in Inclusive Secondary Settings	2cr
EDEX 323	Instruction of English Language Learners with Special Needs	2cr
EDSP 477	Assessment of Student Learning: Design and Interpretation of Educational Measures	3cr
EDUC 242	Pre-student Teaching Clinical Experience I	1cr
EDUC 342	Pre-student Teaching Clinical Experience II	1cr
EDUC 441	Student Teaching	12cr
EDUC 442	School Law	1cr
EDUC 451	Teaching Science in the Secondary School	3cr

**Major:** 39

**Required Courses:**

BIOL 201	Principles of Ecology and Evolution	4cr
GEOS 201	Foundations of Geology	4cr
GEOS 202	Quantitative Methods in the Geosciences	2cr
GEOS 341	Planetary Geology	4cr
GEOS 342	Stellar Astronomy	4cr
GEOS 353	Paleontology	4cr
GEOS 370	Oceanography	4cr
GEOS 371	Meteorology	3cr
PHYS 121	Physics I Lab	1cr

**Controlled Electives:**

	Select 9cr from the following:	9cr
GEOS 203	Surficial Processes	
	Any 300-level GEOS course	
	Any 400-level GEOS course, except GEOS 470 and 480	
	PHYS 112, 122	

**Free Electives:** 2

**Total Degree Requirements:** 120

(\*) See requirements leading to teacher certification, titled “3-Step Process for Teacher Education,” in the College of Education and Communications section of this catalog.

**Certificate—Shale, Gas, and Energy 18**

**Required Geoscience Courses:** 6

GEOS 119	Geology of Energy Resources (1)	3cr
GEOS 409	Geology of Shale Gas Field Workshop	3cr

**Required Geography Courses:** 6

GEOG 109	Geographic Information Science and Systems for Energy Applications (1)	3cr
GEOG 409	Spatial Analysis Applications in the Energy Sectors Workshop	3cr

**Required Safety Science Courses:** 6

SAFE 104	Introduction to Safety in the Natural Gas Industry (1)	3cr
SAFE 204	Principles of Safety in the Natural Gas Industry	3cr

- (1) With departmental permission, one 100-level introductory course may be substituted by an appropriate upper-division course.