

March 31, 2009

## **DEGREE REQUIREMENTS** **2009-2011 Catalog**

Bachelor of Science - Geology  
Bachelor of Science - Earth Science  
Bachelor of Arts - Earth Science

### **INTRODUCTION**

The Department of Geological and Atmospheric Sciences offers the Bachelor of Science degree in geology and the Bachelor of Science and Bachelor of Arts degrees in Earth science. The B.S. in geology focuses on traditional geology and environmental geology/hydrogeology, while laying a solid foundation for further graduate study. The B.S. in Earth science provides a broader overview of geology and supporting sciences. The B.A. in Earth science is designed primarily for careers in secondary education.

### **GEOLOGY PROGRAM**

The B.S. degree is the only degree offered in the geology program and is designed to acquaint the student with the broad discipline of geology and its supporting sciences. The degree includes two options, one that emphasizes traditional geology (Option A) and the other environmental geology/hydrogeology (Option B). Students must declare their option prior to the end of their sophomore year. Sufficient depth of coursework is provided in both options so that the student may pursue graduate study. Forty-four credits of geology are required for Option A, including Geol 100, 100L, 102, 102L, 302, 315X, 315L, 316X, 356, 365, 368, 479 and 9 credits of geology electives (Table 1a). Required geology courses for Option B (45 credits) are Geol 100, 100L, 102, 102L, 302, 315X, 315L, 316X, 356, 368, 411, 419 or 426 or 434, 479 and 6 credits of geology electives (Table 1b). Only up to 2 credits of 100-level elective courses can be taken in either option. Required supporting courses for both options include Chem 177, 177L, 178, 178L; Phys 111 and 112; Math 165, 166 or 181, 182; Engl 302 or Engl 314 or JI MC 347, and at least 6 additional credits from an approved departmental list of courses in the science, engineering, or mathematical disciplines outside of geology. Students with senior standing may use graduate geology courses (500 level or above) to fulfill the elective requirement; however, they should be aware that courses taken at the

graduate level and counted toward the B.S. degree cannot be applied again toward a graduate degree at Iowa State University.

Geology courses generally have prerequisites in geology or in mathematics, chemistry, or physics. Prerequisites require that courses be taken in a prescribed sequence; however, because of differences in the preparation and background of each student, there is not a unique way to proceed through the B.S. program. Possible sequences of courses that will allow the student to complete a degree within four years are shown in Table 4. Students are advised to maintain frequent contact with their academic advisors so that all degree requirements are met in a timely fashion.

## **EARTH SCIENCE PROGRAMS**

Both B.A. and B.S. degrees are offered in the Earth science program. In general, these programs require fewer courses in geology and allow coursework in other disciplines such as astronomy. In instances where students are undecided about their career plans, the Earth science and geology programs (Option A) are similar enough that transfer between these programs is possible during the first two years. Of the two degrees in Earth sciences, the B.S. program emphasizes the core geology courses and the basic supporting sciences. In addition to the requirements in cognate sciences, the B.S. in Earth science requires 35 credits in geology, 3 credits in meteorology, and 8 credits of electives in supporting departments. The required core courses are Geol 100, 100L, 102, 102L, 302, 315X, 315L, 316X, 356, 365, 368, 479, and Mteor 206 (Table 2). Additional courses in geology and agronomy are strongly recommended. The required supporting courses are Chem 177, 177L, 178, 178L; Phys 111 and 112; Math 165, 166 or 181, 182, Com S 107 and Stat 101 or 104.

The B.A. program in Earth sciences provides a less rigorous course of study in geology and supporting sciences and prepares the student primarily for a career in secondary education. It requires 32 credits in geology, 3 credits in meteorology, and 6 credits in astronomy. The required courses are Geol 100, 100L, 102, 102L, 302, 315X, 315L, 316X, 356, 365, 368, 3 credits of a geology elective, Mteor 206, and Astro 120 and 150 (Table 3). Additional courses in geology and agronomy are strongly recommended. The required supporting courses include Chem 177, 177L, 178, 178L; Phys 111 and 112; Math 151 or 160 or 165 or 181; Stat 101 or 104 or Com S 107; and a course in biology. In addition to these requirements, the student must meet the requirements for teacher licensure (outlined in Table 3; see also the catalog listings under the Teacher Education Program in the ISU Catalog). Dr. Ken Windom is the Teaching Coordinator for Earth Sciences.

The English requirements for the Earth Science programs are the same as for the Geology programs.

## **MINOR IN GEOLOGY**

A minor in geology may be completed by taking Geology 100 and 100L (or 201), 102 and 102L, and additional credits at the 300 level or above for a total of 15 credits. A total of 9 credits must be unique to the minor and cannot be counted for both the major and the minor field of study. The minor will appear on the undergraduate transcript. Although it does not provide adequate preparation for a career in geology, the minor will provide a core experience that can augment a professional degree in environmental science or any field of physical science, agronomy, or engineering.

**Table 1a.** Requirements for B.S. in geology (Option A: Traditional geology)**Required courses**

Dept.	No.	Title	Credit	Semester
Geol	100	The Earth*	3	F/S/SS
Geol	100L	The Earth – Lab*	1	F/S
Geol	102	History of the Earth	3	S
Geol	102L	History of the Earth – Lab	1	S
Geol	302	Summer Field Studies	6	SS
Geol	315X	Mineralogy and Earth Materials	3	F
Geol	315L	Mineralogy and Earth Materials – Lab	1	F
Geol	316X	Optical Mineralogy	2	F
Geol	356	Structural Geology	5	S
Geol	365	Igneous and Metamorphic Petrology	3	S
Geol	368	Stratigraphy and Sedimentation	4	F
Geol	479	Surficial Processes	3	F

\* Geol 201 may be substituted for Geol 100, 100L

**Required supporting courses**

Dept.	No.	Title	Credit	Semester
Math	165	Calculus I	4	F/S/SS
	166	Calculus II	4	F/S/SS
<i>OR</i>				
Math	181	Calc. and Math. Mod. for the Life Sci.	4	F/S
	182	Calc. and Math. Mod. for the Life Sci.	4	S
Chem	177	General Chemistry I	4	F/S/SS
	178	General Chemistry II	3	F/S
Chem	177L	General Chemistry I Lab	1	F/S/SS
	178L	General Chemistry II Lab	1	F/S
Phys	111	General Physics	4	F/S/SS
	112	General Physics	4	F/S/SS
Engl	314 or 302	Technical Comm. or Business Comm.	3	F/S/SS
<i>OR</i>				
Jl MC	347	Science Comm.	3	S

**9 credits of geology electives**

Dept.	No.	Title	Credit	Semester
Geol	105X	Gems and Gemstones	1	F
Geol	109X	Exploring Iowa Geology	1-2	F
Geol	306	Geology Field Trip	1-2	F/S
Geol	402	Watershed Hydrology	4	F
Geol	409	Field Methods in Hydrogeology	2	Alt. SS (10)
Geol	411	Hydrogeology	4	F
Geol	414	Applied Groundwater Flow Modeling	3	Alt. S (10)
Geol	415	Paleoclimatology	3	Alt. S (11)
Geol	416X	Hydrologic Modeling and Analysis	3	Alt. S (11)
Geol	419	Environmental Geochemistry	3	F
Geol	420X	Mineral Resources	3	Alt. F (10)
Geol	426	Stable Isotopes in the Environment	3	Alt. F (09)
Geol	434	Contaminant Hydrogeology	3	S
Geol	451	Applied & Environmental Geophysics	3	S
Geol	452	GIS for Geoscientists	3	F
Geol	457	Exploration Seismology	3	Alt. F (10)
Geol	474	Glacial and Quaternary Geology	3	Alt. S (11)
Geol	507	Midwestern Geology Field Trip	1-4	F
Geol	588X	GIS for Geoscientists II	3	S

**Required supporting courses**

**Dept. No. (credit)**  
 At least 6 additional credits from an approved departm. list of courses in the science, engineering, or mathematical disciplines outside of geology, which may include but are not limited to:

Math	265(4), 266(3), 267(4), 307(3), 385(3)
Stat	101(4), 104(3)
Com S	107(3), 207(3)
CE	360(3)
Agron	360(3), 463(4)

**Table 1b.** Requirements for B.S. in geology (Option B: Environmental geology/hydrogeology)

<b>Required courses</b>					<b>6 credits of geology electives</b>				
<b>Dept.</b>	<b>No.</b>	<b>Title</b>	<b>Credit</b>	<b>Semester</b>	<b>Dept.</b>	<b>No.</b>	<b>Title</b>	<b>Credit</b>	<b>Semester</b>
Geol	100	The Earth*	3	F/S/SS	Geol	105X	Gems and Gemstones	1	F
Geol	100L	The Earth – Lab*	1	F/S	Geol	109X	Exploring Iowa Geology	1-2	F
Geol	102	History of the Earth	3	S	Geol	306	Geology Field Trip	1-2	F/S
Geol	102L	History of the Earth – Lab	1	S	Geol	402	Watershed Hydrology	4	F
Geol	302	Summer Field Studies	6	SS	Geol	409	Field Methods in Hydrogeology	2	Alt. SS (10)
Geol	315X	Mineralogy and Earth Materials	3	F	Geol	414	Applied Groundwater Flow Modeling	3	Alt. S (10)
Geol	315L	Mineralogy and Earth Materials – Lab	1	F	Geol	415	Paleoclimatology	3	Alt. S (11)
Geol	316X	Optical Mineralogy	2	F	Geol	416X	Hydrologic Modeling and Analysis	3	Alt. S (11)
Geol	356	Structural Geology	5	S	Geol	420X	Mineral Resources	3	Alt. F (10)
Geol	368	Stratigraphy and Sedimentation	4	F	Geol	426	Stable Isotopes in the Environment	3	Alt. F (09)
Geol	411	Hydrogeology	4	F	Geol	434	Contaminant Hydrogeology	3	S
Geol	419	Environmental Geochemistry	3	F	Geol	451	Applied & Environmental Geophysics	3	S
<i>OR</i>					Geol	452	GIS for Geoscientists	3	F
Geol	426	Stable Isotopes in the Environment	3	Alt. F (09)	Geol	457	Exploration Seismology	3	Alt. F (10)
<i>OR</i>					Geol	474	Glacial and Quaternary Geology	3	Alt. S (11)
Geol	434	Contaminant Hydrogeology	3	S	Geol	507	Midwestern Geology Field Trip	1-4	F
Geol	479	Surficial Processes	3	F	Geol	588X	GIS for Geoscientists II	3	S

\* Geol 201 may be substituted for Geol 100, 100L

<b>Required supporting courses</b>					<b>Required supporting courses</b>	
<b>Dept.</b>	<b>No.</b>	<b>Title</b>	<b>Credit</b>	<b>Semester</b>	<b>Dept.</b>	<b>No. (credit)</b>
Math	165	Calculus I	4	F/S/SS	At least 6 additional credits from an approved departm. list of courses in the science, engineering, or mathematical disciplines outside of geology, which may include but are not limited to:	
	166	Calculus II	4	F/S/SS		
<i>OR</i>					Math	265(4), 266(3), 267(4), 307(3), 385(3)
Math	181	Calc. and Math. Mod. for the Life Sci.	4	F/S	Stat	101(4), 104(3)
	182	Calc. and Math. Mod. for the Life Sci.	4	S	Com S	107(3), 207(3)
Chem	177	General Chemistry I	4	F/S/SS	CE	360(3)
	178	General Chemistry II	3	F/S	Agron	360(3), 463(4)
Chem	177L	General Chemistry I Lab	1	F/S/SS		
	178L	General Chemistry II Lab	1	F/S		
Phys	111	General Physics	4	F/S/SS		
	112	General Physics	4	F/S/SS		
Engl	314 or 302	Technical Comm. or Business Comm.	3	F/S/SS		
<i>OR</i>						
Jl MC	347	Science Comm.	3	S		

**Table 2.** Requirements for B.S. in Earth science**Required courses**

Dept.	No.	Title	Credit	Semester
Geol	100	The Earth*	3	F/S/SS
Geol	100L	The Earth – Lab*	1	F/S
Geol	102	History of the Earth	3	S
Geol	102L	History of the Earth - Lab	1	S
Geol	302	Summer Field Studies	6	SS
Geol	315X	Mineralogy and Earth Materials	3	F
Geol	315L	Mineralogy and Earth Materials – Lab	1	F
Geol	316X	Optical Mineralogy	2	F
Geol	356	Structural Geology	5	S
Geol	365	Igneous and Metamorphic Petrology	3	S
Geol	368	Stratigraphy and Sedimentation	4	F
Geol	479	Surficial Processes	3	F
Mteor	206	Introduction to Meteorology	3	F/S

**8 credits in agronomy, astronomy, & environmental science**

Dept.	No.	Title	Credit	Semester
Agron	154	Fundamentals of Soil Science	3	F/S
Agron	260	Soils and Environmental Quality	3	F/S
Agron	406	World Climates	3	F
Agron	463	Soil Formation and Landscape Rel.	4	S
Astro	120	The Sky and the Solar System	3	F/S/SS
Astro	150	Stars, Galaxies, and Cosmology	3	F/S
EnSci	402	Watershed Hydrology	4	F
EnSci	409	Field Methods in Hydrogeology	2	Alt. SS (10)
EnSci	411	Hydrogeology	4	F
EnSci	414	Applied Groundwater Flow Model.	3	Alt. S (10)
EnSci	415	Paleoclimatology	3	Alt. S (11)
EnSci	416X	Hydrologic Modeling and Analysis	3	Alt. S (11)
EnSci	419	Environmental Geochemistry	3	F
EnSci	426	Stable Isotopes in the Environment	3	Alt. F (09)
EnSci	434	Contaminant Hydrogeology	3	S
EnSci	451	Appl. & Environmental Geophys.	3	S

Plus 8 credits in related areas of agronomy, astronomy,  
environmental science, meteorology, and other approved areas 8

\* Geol 201 may be substituted for Geol 100,100L

**Required supporting courses**

Dept.	No.	Title	Credit	Semester
Math	165	Calculus I	4	F/S/SS
	166	Calculus II	4	F/S/SS
<i>OR</i>				
Math	181	Calc. and Math. Mod. for the Life Sci.	4	F/S
	182	Calc. and Math. Mod. for the Life Sci.	4	S
Chem	177	General Chemistry I	4	F/S/SS
	178	General Chemistry II	3	F/S
Chem	177L	General Chemistry I Lab	1	F/S/SS
	178L	General Chemistry II Lab	1	F/S
Phys	111	General Physics	4	F/S/SS
	112	General Physics	4	F/S/SS
Engl	314 or 302	Technical Comm. or Business Comm.	3	F/S/SS
<i>OR</i>				
Jl MC	347	Science Comm.	3	S

**Required supporting courses**

Dept.	No. (credit)
Com S	107(3)
Stat	104(3)
<i>OR</i>	101(4)

**Table 3.** Requirements for B.A. in Earth science**Required courses**

Dept.	No.	Title	Credit	Semester
Geol	100	The Earth*	3	F/S/SS
Geol	100L	The Earth – Lab*	1	F/S
Geol	102	History of the Earth	3	S
Geol	102L	History of the Earth - Lab	1	S
Geol	302	Summer Field Studies	6	SS
Geol	315X	Mineralogy and Earth Materials	3	F
Geol	315L	Mineralogy and Earth Materials – Lab	1	F
Geol	316X	Optical Mineralogy	2	F
Geol	356	Structural Geology	5	S
Geol	365	Igneous and Metamorphic Petrology	3	S
Geol	368	Stratigraphy and Sedimentation	4	F
Mteor	206	Introduction to Meteorology	3	F/S
Astro	120	The Sky and the Solar System	3	F/S/SS
Astro	150	Stars, Galaxies, and Cosmology	3	F/S

\* Geol 201 may be substituted for Geol 100, 100L

**Required supporting courses**

Dept.	No.	Title	Credit	Semester
Math	151 or 160 or 165 or 181	Calc. for Bus. and Soc. Sci., or Survey of Calc., or Calc. I, or Calc. and Math. Mod. for Life Sciences	3 or 4	F/S/SS
Chem	177	General Chemistry I	4	F/S/SS
	178	General Chemistry II	3	F/S
Chem	177L	General Chemistry I Lab	1	F/S/SS
	178L	General Chemistry II Lab	1	F/S
Phys	111	General Physics	4	F/S/SS
	112	General Physics	4	F/S/SS
Com S	107	Applied Computer Programming	3	F/S
<i>OR</i>				
Stat	101 or 104	Principles of Statistics, Intro. to Statistics	4,3	F/S/SS
Engl	314 or 302	Technical Comm. or Business Comm.	3	F/S/SS
<i>OR</i>				
Jl MC	347	Science Comm.	3	S
Biol.		1 course in Biology, Botany, or Zoology		

**3 credits of a geology elective**

Dept.	No.	Title	Credit	Semester
Geol	105X	Gems and Gemstones	1	F
Geol	109X	Exploring Iowa Geology	1-2	F
Geol	306	Geology Field Trip	1-2	F/S
Geol	402	Watershed Hydrology	4	F
Geol	411	Hydrogeology	4	F
Geol	415	Paleoclimatology	3	Alt. S (11)
Geol	419	Environmental Geochemistry	3	F
Geol	420X	Mineral Resources	3	Alt. F (10)
Geol	426	Stable Isotopes in the Environment	3	Alt. F (09)
Geol	434	Contaminant Hydrogeology	3	S
Geol	451	Appl. & Environmental Geophys.	3	S
Geol	452	GIS for Geoscientists	3	F
Geol	457	Exploration Seismology	3	Alt. F (10)
Geol	474	Glacial and Quaternary Geology	3	Alt. S (11)
Geol	479	Surficial Processes	3	F
Geol	507	Midwestern Geology Field Trip	1-4	F
Geol	588X	GIS for Geoscientists II	3	S

**Requirements for Teacher Certification (see catalog for complete detail)**

Dept.	Course Number
C I	202, 204, 219, 280M, 333, 347, 406, 418, 419, 426, 468J, 468K, and 417J
Engl	150 and 250
Psych	230 or HD FS 102
Lib	160
Spec. Ed.	450
	9 credits in Social Sciences*
	6 credits in Humanities
	9 credits in Communication Skills
	<i>*One course must be taken in either American History or American Government</i>
	One additional course in interpersonal or group presentation (see approved list on Teacher Ed. website)

*Note: Admission to the Teacher Ed. Program requires the PPST exam (PRAXIS)*

**Table 4.** Sequence of courses for the B.S. in geology (a. traditional geology; b. environmental geology/hydrogeology)

<b>a. Year</b>	<b>Semester</b>	<b>Geology Requirement (cr.)</b>	<b>Math - Science Requirement (cr.)</b>	<b>Geology Elective (cr.)</b>
1	Fall	100(3), 100L(1)	Math 181(4), Chem 177(4), 177L(1)	
	Spring	102(3), 102L(1)	Math 182(4), Chem 178(3), 178L(1)	
2	Fall	315X(3), 315L(1), 316X(2)	Phys 111(4)	
	Spring	365(3)	Phys 112(4)	
3	Fall	368(4), 479(3)	Six credits of req. supporting electives	105X(1) or 109X(1-2) or 306(1-2) or 402(4) or 420X(3) or 426(3) or 452(3) or (457(3) or 507(1-4)
	Spring	356(5)		414(3) or 415(3) or 416X(3) or 434(3) or 451(3) or 474(3) or 588X(3)
Summer		302(6)		
4	Fall			411(4) or 419(3)
	Spring			
<b>b. Year</b>	<b>Semester</b>	<b>Geology Requirement (cr.)</b>	<b>Math – Science Requirement (cr.)</b>	<b>Geology Elective (cr.)</b>
1	Fall	100(3), 100L(1)	Math 181(4), Chem 177(4), 177L(1)	
	Spring	102(3), 102L(1)	Math 182(4), Chem 178(3), 178L(1)	
2	Fall	315X(3), 315L(1), 316X(2)	Phys 111(4)	
	Spring		Phys 112(4)	
3	Fall	368(4), 479(3)	Six credits of req. supporting electives	105X(1) or 109X(1-2) or 306(1-2) or 402(4) or 420X(3) or 426(3) or 452(3) or 457(3) or 507(1-4)
	Spring	356(5)		414(3) or 415(3) or 416X(3) or 451(3) or 474(3) or 588X(3)
Summer		302(6)		
4	Fall	411(4), 419(3)		
	Spring			434(3)