

REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN GEOLOGY

COLLEGE OF EARTH AND ENERGY

THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education
Summer 2008 through Spring 2009

GENERAL REQUIREMENTS

Total Credit Hours **127•**
Total Upper-Division Credit Hours **48**
Minimum Retention/Graduation Grade Point Averages:
Minimum in OU Coursework **2.00**
Minimum in Major Coursework- Combined and OU **2.00**
Overall - Combined and OU **2.00**

Paleontology

1918B
Bachelor of Science
in Geology

OU encourages students to complete at least 32 hours of applicable coursework each year to have the opportunity to graduate in four years.

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
FRESHMAN	ENGL 1113, Principles of English Composition (Core I)	3	ENGL 1213, Principles of English Composition (Core I), or	3
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	EXPO 1213, Expository Writing (Core I)	3
	CHEM 1315, General Chemistry (Core II)	5		
	GEOL 1114, Physical Geology for Science and Engineering Majors	4	MATH 2423, Calculus & Analytic Geometry II	3
			CHEM 1415, General Chemistry (Continued)	5
			GEOL 1124, Earth History	4
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	15
SOPHOMORE	MATH 2433, Calculus & Analytic Geometry III	3	MATH 2443, Calculus & Analytic Geometry IV	3
	HIST 1483 or 1493, U.S. (Core IV)	3	PHYS 2514, General Physics for Engineering and Science Majors (Core II)	4
	GEOL 2224, Introduction to Mineral Sciences	4	GEOL 3233, Sedimentary Petrology and Sedimentology	3
	ZOO 1114, Introductory Zoology	4	P SC 1113, American Federal Government (Core III)	3
	¹ General Education Understanding Artistic Forms (Core IV)	3	ZOO 1121, Introductory Zoology Laboratory	1
	TOTAL CREDIT HOURS	17	TOTAL CREDIT HOURS	14
JUNIOR	PHYS 2524, General Physics for Engineering and Science Majors	4	GEOL 3223, Igneous and Metamorphic Petrology	3
	² ZOO 3013, Evolution	3	⁴ GEOL 4513, Evolutionary Paleobiology	3
	GEOL 3114, Structural Geology	4	⁴ GEOL 4413, Paleobotany	3
	GEOL 3513, Fundamentals of Invertebrate Paleontology	3	¹ General Education Social Science (Core III)	3
			¹ General Education Western Civilization & Culture (Core IV)	3
	TOTAL CREDIT HOURS	14	TOTAL CREDIT HOURS	15
SENIOR	ENGL 3153, Technical Writing	3	GEOL 3123, Introductory Field Geology	3
	GEOL 4113, Depositional Systems & Stratigraphy	3	GPHY 3413, Principles of Geophysics	3
	⁵ C S 1313, Programming for Non-Majors	3	² ZOO 3403, Principles of Ecology	3
	² Science Elective	3	⁴ ZOO 5204, Vertebrate Paleobiology	4
	¹ General Education Non-Western Culture (Core IV)	3	³ Free Elective	3
	TOTAL CREDIT HOURS	15	TOTAL CREDIT HOURS	16

SUMMER

GEOL 4136, Field Geology (Capstone)—6 CREDIT HOURS

- = Students who have not completed two years of the same foreign language in high school are required to take two college courses in the same foreign language. This additional coursework may add 6-10 hours to the minimum hours required for graduation.
 - ‡ = In order to progress in your curriculum, and as a specific graduation requirement, a grade of C or better is required in each major course. The requirement includes both Geology (GEOL) and Geophysics (GPHY) courses. Students must also successfully complete **major** prerequisite courses with a grade of C or better before proceeding to the next course.
 - ¹ = To be chosen from the University-Wide General Education Approved Course List. Three hours of general education must be upper-division outside the major.
 - ² = Nine hours of science electives are required; six of those hours must be upper-division (ZOO 3013 and ZOO 3403 satisfy these); three must be a faculty-adviser-approved geography, geophysics, or meteorology elective outside the major (senior year science elective can be lower-division).
 - ³ = Three hours of faculty-adviser-approved elective outside the major.
 - ⁴ = GEOL 4413, 4513 and ZOO 5204 are taught in alternate years and specific semesters. Students should plan their coursework with this in mind so that graduation problems do not arise. The order in which these courses are taken must be approved by faculty adviser.
 - ⁵ = This course fulfills the Computer Literacy Requirement for graduation as required by the Oklahoma State Regents for Higher Education.
- NOTE:** No more than 52 hours of Geology coursework may be taken to fulfill the 127 minimum total credit hours required. Students must complete 36 of the last 60 credit hours in residence.

University-Wide General Education Requirements (minimum 40 hours)

Courses designated as Core I, II, III, IV, or Capstone are part of the General Education curriculum. Students must complete a minimum of 40 hours of General Education courses, chosen from the approved list, including at least one upper-division Gen. Ed. course outside of the student's major. Courses graded S/U or P/NP will not apply.

Core I	Symbolic and Oral Communication (9–19 hours, 3–5 courses) • English Composition—6 hours, 2 courses • Mathematics—3 hours, 1 course • Foreign Language—0–10 hours, 2 courses in the same language, (can be met by successfully completing 2 years of the same foreign language in high school) • Other (courses such as communication, logic or public speaking)
Core II	Natural Science (7 hours, 2 courses) • Courses must be taken from different disciplines in the biological and/or physical sciences; one of which must include a laboratory.
Core III	Social Science (6 hours, 2 courses) • One course must be P SC 1113, "American Federal Government"
Core IV	Humanities (12 hours, 4 courses) • Understanding Artistic Forms—3 hours, 1 course • Western Civilization and Culture—6 hours, 2 courses, including HIST 1483 or HIST 1493 • Non-Western Cultures—3 hours, 1 course
Senior Capstone Experience (3 hours, 1 course)	

COURSES IN COMPUTER SCIENCE (C S)

1313 Programming for Nonmajors. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer programs. Emphasis on problem solving. (F, Sp)

COURSES IN GEOLOGY (GEOL)

1114 Physical Geology for Science and Engineering Majors. Prerequisite: equivalent knowledge of high school chemistry, algebra and trigonometry. Laboratory included. Plate tectonics, the makeup of continents and mountain building. Heat flow, magnetism, gravity, rock deformation, earthquakes and the earth's interior. Surface processes including weathering, erosion, transport and deposition. Landforms, rivers, groundwater, glaciers, ocean processes, and volcanoes. Minerals and rocks. Application of geology to land-use, groundwater, mineral and fossil fuel exploration. **Laboratory** (F, Sp) [I-LAB]

1124 Earth History. Prerequisite: none; 1114 helpful but not required. Laboratory included; field trip. Physical history of the earth from its origin as a planet through the Great Ice age. Origin and growth of continents and ocean basins. Systematic survey of the history of continents with emphasis on North America: growth and leveling of mountain chains, rift valleys, transgressions and regressions of seas; continental fragmentation, assembly and relative motions. Plate tectonics, particularly as it relates to continent history. Climate and evolutionary changes through geologic time. Principles and methods used to interpret earth history and date rocks. Geologic time. Laboratory includes historical studies of specific regions; study of maps and fossils. **Laboratory** (F, Sp)

2224 Introduction to Mineral Sciences. Prerequisite: 1114 or permission; Chemistry 1415 or concurrent enrollment. Crystallography, crystal chemistry, optical properties and identification of minerals utilizing the petrographic microscope; an introduction to the rock-forming minerals and their relationships within igneous, metamorphic, and sedimentary rocks. **Laboratory** (F)

3114 Structural Geology. Prerequisite: 2224, Physics 2524 or concurrent enrollment. An introduction to the concepts of stress, strain, the mechanisms of rock deformation, the mechanics of folding and fracturing, and description of structural styles in various tectonic settings. **Laboratory** (F)

3123 Introductory Field Geology. Prerequisite: 3114 or concurrent enrollment; or permission. Laboratory included. Field trips; students will be charged transportation costs. Techniques of geologic fieldwork. Use of Brunton compass, alidade and plane table and topographic maps. Field examination of common geologic situations. Field exercises. **Laboratory** (Sp)

†G3154 Environmental Geology. Prerequisite: college algebra and permission of instructor; completion of one college level science course recommended. Designed for students who are wanting to know to relationship between earth materials and environmental issues. Topics include minerals, rocks, depositional environments, porosity, permeability, water occurrence and chemistry, petroleum, natural gas, tar sands, oil shales, land subsidence, and earthquakes. Laboratory includes the study of minerals, rocks, maps, and well cuttings. **Laboratory** (F)

3223 Igneous and Metamorphic Petrology. Prerequisite: 2224 or permission. Laboratory included. Field trip; students will be charged transportation costs. Generation, emplacement and crystallization of magma; phase chemistry; principles of igneous rock classification; the relationship of magma types to geologic setting. Principles of metamorphic petrology; phase chemistry and metamorphic reactions; concepts of metamorphic grade, P-T regimes and relationships to geologic environments; concepts of protoliths and provenance. Laboratory study of the textures, structures and mineral assemblages of igneous and metamorphic rocks utilizing hand specimens and thin sections. **Laboratory** (Sp)

3233 Sedimentary Petrology and Sedimentology. Prerequisite: 2224 or permission. Laboratory included. Field trip; students will be charged transportation costs. Origin, evolution and interpretation of sedimentary rocks with an emphasis on terrigenous systems; interpretation of mineralogy, textures and structures of terrigenous clastic and carbonate rocks in hand specimen and thin section. **Laboratory** (Sp)

3513 Fundamentals of Invertebrate Paleontology. Prerequisite: 1124 or permission. Laboratory included. Field trip; students will be charged transportation costs. A systematic approach to the animal invertebrate phyla, emphasizing fossil forms as they occur in the geologic record. Paleontologic principles and methods with emphasis on evolutionary paleontology, paleoecology and stratigraphic paleontology. Brief treatments of biogeochemistry and paleobiogeography. **Laboratory** (F)

3633 Introduction to Oceanography. General survey of the scientific framework of the four specializations of the oceanographic study—biological, chemical, geological/geophysical and physical oceanography. Applications of ocean research to social and economic problems; interrelations between the ocean disciplines and other fields of study. (Sp) [II-NL]

4113 Depositional Systems and Stratigraphy (Slashlisted with 5113). Prerequisite: 3114, 3233 or permission. Basic stratigraphic principles as well as reconstruction of ancient depositional systems. The controls on deposition of stratigraphic sequences, completeness of the rock record, biostratigraphy, magneto stratigraphy, and seismic stratigraphy. Field trip; students will be charged transportation costs. **Laboratory** (F)

4136 Field Geology. Prerequisite: 3123; senior standing or permission. A six-week summer course held at the Oklahoma Geology Camp at Canon City, Colorado. Applications of field techniques, including use of aerial photographs, construction of geological maps and geophysical methods, to the recognition and interpretation of geologic phenomena. (Su) [V]

4413 Paleobotany (Crosslisted with Botany 4413; Slashlisted with 5413). Prerequisite: permission of instructor. Introduction to the fossil record of terrestrial plants from algae to flowering plants. Lectures will address anatomy, morphology, taphonomy and paleoecology, including climate and plant-animal interactions. Laboratories will put lecture topics into practice using fossil plants from the Oklahoma Museum of Natural History collection and from fieldwork. Field trips. No student may earn credit for both 4413 and 5413. **Laboratory** (Sp, even-numbered years)

4513 Evolutionary Paleobiology (Slashlisted with 5513). Prerequisite: 3513. Evolutionary patterns in the fossil record. Time resolution and bias in fossil assemblages. Taxonomic diversity and community replacement over geologic time. Mass extinctions and evolutionary radiations. Heterochrony and evolution. Application of methods in biosystematics to fossils, including computer-based techniques. No student may earn credit for both 4513 and 5513. (Alt. Sp)

G4633 Hydrogeology. Prerequisite: Mathematics 2443, Physics 2524, senior standing in geology, or permission of instructor. Darcy's law, Hubbert's fluid potential, equations of groundwater flow. Physical properties of geologic materials and fluids. Free convection, compaction- and gravity-driven flow. Role of fluids in geologic phenomena, including mineralization, metamorphism, hydrocarbon migration, sedimentary diagenesis, faulting and earthquakes, paleomagnetism. Application of geologic and geophysical techniques to fluid flow problems. (F)

4983 Senior Thesis in Geology. Prerequisite: senior standing with a major in geology and permission. May not be repeated. Individual research of a geological topic selected by the student in consultation with the instructor. The project may involve fieldwork, theoretical analysis, computer modeling, and/or data analysis and interpretation, culminating in a written thesis. (F, Sp, Su)

COURSES IN GEOPHYSICS (GPHY)

3413 Principles of Geophysics. Prerequisite: Mathematics 2423; Physics 2524; or equivalent or permission. A survey of current methods of geophysical measurements and their interpretations. The earth's gravity, magnetic, seismic, mechanical and thermal properties will be discussed. (Sp)

COURSES IN MATHEMATICS (MATH)

1823 Calculus and Analytic Geometry I. Prerequisite: 1523 at OU, or satisfactory score on the placement test, or satisfactory score on the ACT/SAT. Topics covered include equations of straight lines; conic sections; functions, limits and continuity; differentiation; maximum-minimum theory and curve sketching. A student may not receive credit for this course and 1743. (F, Sp, Su) [I-M]

2423 Calculus and Analytic Geometry II. Prerequisite: 1823. Integration and its applications; the calculus of transcendental functions; techniques of integration; and the introduction to differential equations. A student may not receive credit for this course and 2123. (F, Sp, Su) [I-M]

2433 Calculus and Analytic Geometry III. Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, vector analysis. (F, Sp, Su)

2443 Calculus and Analytic Geometry IV. Prerequisite: 2433. Vector calculus; functions of several variables; partial derivatives; gradients, extreme values and differentials of multivariate functions; multiple integrals; line and surface integrals. (F, Sp, Su)

COURSES IN PHYSICS (PHYS)

2514 General Physics for Engineering and Science Majors. Prerequisite: Mathematics 1823. Not open to students with credit in 1205. Vectors, kinematics and dynamics of particles, work and energy systems of particles, rotational kinematics and dynamics, oscillations, gravitation, fluid mechanics, waves. (F, Sp, Su) [II-NL]

2524 General Physics for Engineering and Science Majors. Prerequisite: 2514 and Mathematics 2423. Not open to students with credit in 1215. Temperature, heat, thermodynamics, electricity, magnetism, optics. (F, Sp, Su)

COURSES IN ZOOLOGY (ZOO)

1114 Introductory Zoology. Major biological principles and concepts as illustrated in the structure, function and evolution of animals. Emphasis is on self-regulatory mechanisms, especially in the vertebrates, and their adaptive significance. (F, Sp, Su) [II-NL]

1121 Introductory Zoology Laboratory. Prerequisite: previous completion or concurrent enrollment in 1114. Laboratory study of structure and development of organ systems. Experiments on physiological process of selected vertebrates and invertebrates. (F, Sp, Su) [II-LAB]

†G3013 Evolution. Prerequisite: eight hours of zoology and/or botany, or five hours of zoology or botany and permission. Process of evolution. Differentiation and natural selection in populations, the nature of species, the origins of species, and evolution above the species level. (F)

†G3403 Principles of Ecology. Prerequisite: eight hours of zoology. Patterns of environments and biological communities; the processes maintaining these patterns. **Laboratory** (F, Sp)

G5204 Vertebrate Paleobiology (Crosslisted with Geology 5204; Slashlisted with 4204). Prerequisite: Zoology 1114, 1121, 2204; or permission. Systematics, relationships, zoogeography and evolutionary morphology of the major groups of vertebrates. Field trips. No student may earn credit for both 4204 and 5204. **Laboratory** (Sp)