

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	125 •
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

Environmental Geology Option

1914G
 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 EXPO 1213, Expository Writing (Core I)	3
	MATH 1823, Calculus & Analytic Geometry I (Core I)	3	MATH 2423, Calculus & Analytic Geometry II	3
	CHEM 1315, General Chemistry (Core II)	5	CHEM 1415, General Chemistry (Continued)	5
	GEOL 1114, Physical Geology for Science and Engr. Majors	4	GEOL 1124, Earth History	4
TOTAL CREDIT HOURS		15	TOTAL CREDIT HOURS	
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 3223, Igneous and Metamorphic Petrology	3
	¹ Free Elective	3	GEOL 3233, Sedimentary Petrology and Sedimentology	3
	² General Education Understanding Artistic Forms (Core IV)	3	TOTAL CREDIT HOURS	
TOTAL CREDIT HOURS		16	TOTAL CREDIT HOURS	
JUNIOR	PHYS 2524, General Physics for Engr. & Science Majors	4	P SC 1113, American Federal Government (Core III)	3
	⁴ C S 1313, Programming for Non-Majors	3	¹ Free Elective	3
	GEOL 3114, Structural Geology	4	³ Science Elective	3
	GEOL 3513, Fundamentals of Invertebrate Paleontology	3	² General Education Social Science (Core III)	3
	TOTAL CREDIT HOURS		14	² General Education Western Civilization & Culture (Core IV)
TOTAL CREDIT HOURS		14	TOTAL CREDIT HOURS	
SENIOR	ENGL 3153, Technical Writing	3	GEOL 3123, Introductory Field Geology	3
	GEOL 4113, Depositional Systems and Stratigraphy	3	GEOL 4633, Hydrogeology	3
	GEOL 3154, Environmental Geology	4	GPHY 3413, Principles of Geophysics	3
	³ Science Elective (outside the College)	3	¹ Free Elective	3
	² General Education Non-Western Culture (Core IV)	3	³ Science Elective (outside the major)	3
TOTAL CREDIT HOURS		16	TOTAL CREDIT HOURS	
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SUMMER

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

To obtain a BS in Geology with an Environmental Geology option, a student must take the same coursework as that for a BS in Geology except for 12 hours of geology/geophysics and allied science electives which are more narrowly specified. The student must satisfy 6 hours of geology/geophysics and allied science elective requirements by taking GEOL 3154, Environmental Geology and GEOL 4633, Hydrogeology. The student must also satisfy 9 additional hours of allied science elective requirements chosen from an approved course list.

See reverse side for course listings.

- = 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 = Nine hours of faculty-adviser-approved electives. Foreign language courses taken to satisfy University-Wide Gen. Ed. requirements may be counted as lower-division free electives.
- ² = To be chosen from the University-Wide General Education Approved Course List. Three hours of General Education must be upper-division outside the major.
- ³ = A minimum of 9 hours of courses chosen from the approved course list on the reverse side of this form. Six hours must be upper-division (3000-4000-level) and three hours must be outside the College of Earth and Energy.
- ⁴ = 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 125 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) <ul style="list-style-type: none"> • 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 (8 hours, 2 courses) <ul style="list-style-type: none"> • 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) <ul style="list-style-type: none"> • One course must be P SC 1113, "American Federal Government"
Core IV	Humanities (12 hours, 4 courses) <ul style="list-style-type: none"> • 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)

Required Courses for BS in Geology—Environmental Geology Option		
Science electives taken to satisfy the remaining 9 hours of allied science electives must be chosen from the following list:		
<ul style="list-style-type: none"> • GPHY 4970, Environmental Geophysics • GEOG 4203, Geomorphology • CHEM 3012 & 3013, Organic Chemistry & Lab 	<ul style="list-style-type: none"> • CHEM 3421 & 3423, Physical Chemistry & Lab • CEES 3213, Water Resources Engineering • CEES 3243, Water & Wastewater Treatment Design • ENGR 3223, Fluid Mechanics • MATH 3083, Computer Related Math 	<ul style="list-style-type: none"> • MATH 3113, Intro. to Ordinary Differential Equations • MATH 3333, Linear Algebra I • MATH 3413, Physical Math I • MATH 4073 & 4083, Numerical Analysis I & II

COURSES IN CHEMISTRY (CHEM)

3012 Organic Chemistry Laboratory. Prerequisite: 3013 or concurrent enrollment. (F)

3013 Organic Chemistry. Prerequisite: 1415 or 1425. Structure and reaction of both aliphatic and aromatic compounds. Reaction mechanism and modern structural theory. (F)

†G3421 Physical Chemistry Laboratory. Prerequisite: 3423 or concurrent enrollment. Physicochemical measurements and calculations. (F, Sp, Su)

†G3423 Physical Chemistry I. Prerequisite: 1415 or 1425; Mathematics 2423 or concurrent enrollment. States of matter, chemical thermodynamics, equilibria, etc. (F, Sp, Su)

COURSES IN CIVIL ENGINEERING AND ENVIRONMENTAL SCIENCE (CEES)

3213 Water Resources Engineering. Prerequisite: 2223 or permission of instructor. Municipal water demands, surface water hydrology, ground water hydrology, water distribution systems, pump design, wastewater collection systems, storm water management, water law. (F)

3243 Water and Wastewater Treatment Design. Prerequisite: 2223 and 2313. Design of municipal water and wastewater treatment plants. Emphasis is placed on the characterization of water and wastewater and physical, chemical and biological treatment methods. Sludge processing advanced treatment methods and treatment plant hydraulics are also considered. (Sp)

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 ENGINEERING (ENGR)

3223 Fluid Mechanics. Prerequisite: 2213, Mathematics 2433; concurrent enrollment in 2113 and Mathematics 3113. Coverage of the fundamentals of fluid statics and dynamics. Formulation of the equation of fluid flow, i.e., Navier-Stokes Equations, Eulers Equations, Bernoulli Equations, etc. and their application. Examples of ideal fluid flow and viscous fluid flow, such as flow in open and closed conduits. (F, Sp, Su)

COURSES IN GEOGRAPHY (GEOG)

G4203 Geomorphology. Prerequisite: 1114, or comparable work in earth sciences, junior standing. Development and modification of land-surface form by atmospheric, fluvial, glacial, mass-wasting, volcanic and tectonic agents. Emphasis is placed on spatial aspects of the interactions at the interfaces of land, air and water. (Irrreg.)

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) [III-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)

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)

G4133 Petroleum Geology for Geoscientists. Prerequisite: 1104 or 1114; or senior standing. Lectures will integrate at a quantitative level several fields of geology with geophysics, geochemistry and engineering that comprise the science of petroleum geology. The history of the petroleum industry, the location and amount of major reserves of oil and gas, and the potential for development of unconventional hydrocarbon resources will be covered. Labs will cover the types of data acquired during the drilling and testing of wells and the interpretation of these data, the analysis of well logs, use of logs and other subsurface data for correlation and mapping manually and using computer software. Recent tools and technological developments will be covered. **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]

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)

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) [II-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) [II-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)

†G3113 Introduction to Ordinary Differential Equations. Prerequisite: 2423. Duplicates two hours of 3413. first order ordinary differential equations, linear differential equations with constant coefficients, two-by-two linear systems, Laplace transforms, phase planes and stability. (F, Sp, Su)

†G3333 Linear Algebra I. Prerequisite: 2433 or permission of instructor. Systems of linear equations, determinants, finite dimensional vector spaces, linear transformations and matrices, characteristic values and vectors. (F, Sp, Su)

†G3413 Physical Mathematics I. Prerequisite: 2443 or concurrent enrollment. Complex numbers and functions. Fourier series, solution methods for ordinary differential equations and partial differential equations, Laplace transforms, series solutions, Legendre's equation. Duplicates two hours of 3113. (F)

G4073 Numerical Analysis I. Prerequisite: 3113 or 3413. Solution of linear and nonlinear equations, approximation of functions, numerical integration and differentiation, introduction to analysis of convergence and errors, pitfalls in automatic computation, one-step methods in the solutions of ordinary differential equations. (F)

G4083 Numerical Analysis II. Prerequisite: 3113 or 3413; 4073 or Electrical Engineering 3793; 3333 or 4373 or Biostatistics and Epidemiology 5563. Matrix inversion and related topics; numerical solution of ordinary differential equations, partial differential equations, integral equations and functional equations; numerical solution of eigenvalue problems and applications of functional analysis. (Alt. Sp)

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)