### REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN GEOLOGY

#### COLLEGE OF EARTH AND ENERGY

THE UNIVERSITY OF OKLAHOMA

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#### 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

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### For Students Entering the Oklahoma State System for Higher Education

**Summer 2008 through Spring 2009**

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<table>
<thead>
<tr>
<th>Year</th>
<th>FIRST SEMESTER</th>
<th>Hours</th>
<th>SECOND SEMESTER</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRESHMAN</td>
<td>ENGL 1113, Principles of English Composition (Core I)</td>
<td>3</td>
<td>ENGL 1213, Principles of English Composition (Core I), or</td>
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<td></td>
<td>MATH 1823, Calculus &amp; Analytic Geometry I (Core I)</td>
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<td>MATH 1213, Expository Writing (Core I)</td>
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<td></td>
<td>CHEM 1315, General Chemistry (Core II)</td>
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<td></td>
<td>GEOL 1114, Physical Geology for Science and Engr. Majors</td>
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<td></td>
<td><strong>TOTAL CREDIT HOURS</strong></td>
<td>15</td>
<td><strong>TOTAL CREDIT HOURS</strong></td>
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<tr>
<td>SOPHOMORE</td>
<td>MATH 2433, Calculus &amp; Analytic Geometry III</td>
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<td>MATH 2443, Calculus &amp; Analytic Geometry IV</td>
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<td></td>
<td>HIST 1483 or 1493, U.S. (Core IV)</td>
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<td>PHYS 2514, General Physics for Engineering and Science Majors (Core II)</td>
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<tr>
<td></td>
<td>GEOL 2224, Introduction to Mineral Sciences</td>
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<td></td>
<td>Free Elective</td>
<td>3</td>
<td>GEOL 3223, Igneous and Metamorphic Petrology</td>
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<td></td>
<td>General Education Understanding Artistic Forms (Core IV)</td>
<td>3</td>
<td>GEOL 3233, Sedimentary Petrology and Sedimentology</td>
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<td><strong>TOTAL CREDIT HOURS</strong></td>
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<td><strong>TOTAL CREDIT HOURS</strong></td>
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<tr>
<td>JUNIOR</td>
<td>PHYS 2324, General Physics for Engr. &amp; Science Majors</td>
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<td>PS 1113, American Federal Government (Core III)</td>
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<td>C S 1313, Programming for Non-Majors</td>
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<td>Free Elective</td>
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<td>GEOL 3114, Structural Geology</td>
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<td>Science Elective</td>
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<tr>
<td></td>
<td>GEOL 3513, Fundamentals of Invertebrate Paleontology</td>
<td>3</td>
<td>General Education Social Science (Core III)</td>
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<td><strong>TOTAL CREDIT HOURS</strong></td>
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<td><strong>TOTAL CREDIT HOURS</strong></td>
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<td>SENIOR</td>
<td>ENGL 3133, Technical Writing</td>
<td>3</td>
<td>GEOL 3123, Introductory Field Geology</td>
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<td>GEOL 4113, Depositional Systems and Stratigraphy</td>
<td>3</td>
<td>GEOL 4633, Hydrogeology</td>
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<td>GEOL 3514, Environmental Geology</td>
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<td>GPHY 3413, Principles of Geophysics</td>
<td>3</td>
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<td>Science Elective (outside the College)</td>
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<td>Free Elective</td>
<td>3</td>
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<tr>
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<td>General Education Non-Western Culture (Core IV)</td>
<td>3</td>
<td>Science Elective (outside the major)</td>
<td>3</td>
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<td><strong>TOTAL CREDIT HOURS</strong></td>
<td>16</td>
<td><strong>TOTAL CREDIT HOURS</strong></td>
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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.

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### 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 (8 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)**
Environmental Geology—1914G—Page 2

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:

• GE 4970, Environmental Geophysics
• GEOG-2030, Geomorphology
• CHEM 3012 or 3013, Organic Chemistry & Lab

COURSES IN CHEMISTRY (CHEM)

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

3025 Organic Chemistry, Part 1: Alcohols, phenols, amines, and aldehydes and ketones. 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, Part 1: 1815 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 of water and hydraulics are also considered. (F, Sp, Su)

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)

2223 Fluid Mechanics, Prerequisite: 2213, Mathematics 2433; concurrent enrollment in 2113 and Mathematics 2137. Conservation of the fundamentals of fluid statics and dynamics of formulation of the equation of fluid flow, i.e., Navier-Stokes equations, Euler 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, glacial, glacial, mass-wasting, volcanic and tectonic agents. Emphasis is placed on spatial aspects of the interactions at the interfaces of land, air and water. (Irreg.)

G4212 Intro to Geomorphology, Prerequisite: 1114, or comparable work in earth sciences, junior standing. Development and modification of land-surface form by atmospheric, glacial, glacial, mass-wasting, volcanic and tectonic agents. Emphasis is placed on spatial aspects of the interactions at the interfaces of land, air and water. (Irreg.)

G4113 Depositional Systems and Stratigraphy, Prerequisite: 3233 or permission of instructor. Basic stratigraphic principles as well as reconstruction of ancient depositional systems. The controls on deposition of stratigraphic sequences, completeness of the rock record, biostratigraphy, magnetostratigraphy, and seismic stratigraphy. Field trips; 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 majors 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 log, 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)

1144 Field Geology, Prerequisite: 3123; senior standing or permission. A six-week summer course held at the Okanagan Geology Camp at Canons Cloth, Colorado. Applications of field techniques, including use of aerial photographs, construction of geological maps and earth materials, to the recognition and interpretation of geological phenomena. (Su [V])

†G6133 Intro to Ordinary Differential Equations, Prerequisite: 2524, senior standing in geology, physics 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 and alteration. The effects of migration, faulting, and earthquake; earthquake physics. Darcy's law, Hubbert's fluid potential, equations of groundwater flow. 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) [I-M]

†G6232 Calculus and Analytic Geometry II, Prerequisite: 1823. Integration and its applications; the technique 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]

3233 Calculus and Analytic Geometry III, Prerequisite: 2423. Polar coordinates, parametric equations, sequences, infinite series, scalar vector analysis. (F, Sp, Su)

3443 Calculus and Analytic Geometry IV, Prerequisite: 2423. 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)

†G6333 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)

†G6343 Linear Algebra II, 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)

†G6431 Vector Calculus, 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 Vector Calculus, 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 analysis of error, and the sensing of oscillations. (F)

G4083 Numerical Analysis II, Prerequisite: 3113 or 3413; 4073 or Electrical Engineering 3793; 3333 or 4173 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 application of functional analysis. (All. 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)