REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN GEOLOGY

COLLEGE OF GEOSCIENCES
THE UNIVERSITY OF OKLAHOMA

For Students Entering the Oklahoma State System for Higher Education: **Summer 2000 through Spring 2001**

Minimum Credit Hours and Grade Averages Required

Total Credit Hours	127
Grade Point Averages:	
Minimum in OU Coursework	2.00
Minimum in Major Coursework	2.00
Overall	2.00

Petroleum Geology Option
1914E
Bachelor of Science in Geology

Year	FIRST SEMESTER	Hours	SECOND SEMESTER	Hours
FRESHMAN	**ENGL 1113**, Principles of Composition (Core I)	3	**ENGL 1213**, Principles of English Composition (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 Engineering Majors	4	**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	**C S 1313**, Computer Programming	3
	GEOL 2232, Survey of Petroleum Exploration Technology	2	**GEOL 3223**, Igneous and Metamorphic Petrology	3
	[2]Artistic Forms Elective (Core IV)	3	**GEOL 3233**, Sedimentary Petrology and Sedimentology	3
	TOTAL CREDIT HOURS	**15**	**TOTAL CREDIT HOURS**	**16**
JUNIOR	**PHYS 2524**, General Physics for Engineering and Science Majors	4	**P SC 1113**, American Federal Government (Core III)	3
			[1]Free Elective	3
	GEOL 3114, Structural Geology	4	**GPHY 3413**, Principles of Geophysics	3
	GEOL 3513, Fundamental of Invertebrate Paleontology	3	[2]Social Sciences Elective (Core III)	3
	P E 3813, Formation Evaluation with Well Logs	3	[2]Western Civilization & Culture Elective (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	**GEOL 4233**, Subsurface Methods	3
	GEOL 4133, Fundamentals of Petroleum Geology	3	[1]Free Elective	3
	GPHY 4874, Seismic Exploration	4	[3]Science Requirement	3
	P E 3153, Petrophysics	3	[2]Non-Western Culture Elective (Core IV)	3
	TOTAL CREDIT HOURS	**16**	**TOTAL CREDIT HOURS**	**15**

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

1 =Thirteen hours of faculty-adviser-approved electives. Foreign language courses taken to satisfy University-Wide General Education Requirements may be counted as lower-division free electives. However, in order to satisfy the college requirement of 48 hours of upper-division coursework, 12 hours of free electives and/or humanities/social/sciences must be taken as upper-division.

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 faculty-adviser-approved courses in geophysics, geography, meteorology, biological sciences, chemistry, computer science, mathematics, physics, and/or engineering. Nine hours (6 must be upper-division) must include: one 3-hour geoscience elective outside the major (can be in geo physics), one 3-hour course taken outside the college, and one 3-hour geophysics or other science elective outside the major.

NOTE: No more than 48 hours may be taken in one department of the College.

University-Wide General Education Requirements (minimum 40 hours)

Courses designated as Core I, II, III or IV 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 Computer Programming. Prerequisite: Mathematics 1523 or equivalent. Introduction to the design and implementation of computer programs using procedural languages such as FORTRAN and C. Emphasis on problem solving and on scientific and engineering applications. (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)

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; or permission. An introduction to the concepts of stress, strain, the mechanisms of rock deformation, the mechanics of folding and fracturing, and plate tectonics. A description of the structure of the major provinces of North America with a discussion of their origin. **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**

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)

G4113 Depositional Systems and Stratigraphy. Prerequisite: 3114 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 and sequence stratigraphy. Field trip; students will be charged transportation costs. **Laboratory** (Sp)

†G4133 Fundamentals of Petroleum Geology. Prerequisite: 1124, junior or senior standing. Includes history of North American oil industry; drilling, completing and producing an oil well; methods used in petroleum exploration; origin, evolution, migration and trapping of hydrocarbons; application of well-logging to subsurface studies; oil producing basins of North America and Canada. Practical problems and mapping exercises included. **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 and construction of geological maps, to the recognition and interpretation of geologic phenomena. (Su)

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.

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)

G4114 Environmental and Geotechnical Geophysics I. Prerequisite: Mathematics 2434, Physics 2524, or permission of instructor. Part of a two-semester sequence covering the major geophysical tools for environmental and geotechnical problems. Focus on characterizing shallow geologic stratigraphy and structure. This geologic information is applied to geotechnical and environmental concerns such as choice of landfill site, the containment of fluid pollutants in the subsurface, and geotechnical assessment. Techniques to be covered include seismic refraction, seismic reflection, and gravity. (F)

G4124 Environmental and Geotechnical Geophysics II. Prerequisite: Mathematics 2434, Physics 2524, or permission of instructor. Part of a two-semester sequence covering the major geophysical tools for environmental and geotechnical problems. Consider techniques used to locate and identify isolated targets such as buried tanks, drums, pits, and trenches. Techniques to be covered include magnetics, resistivity, electromagnetic induction, and ground penetrating radar. (Sp)

G4874 Seismic Exploration. Prerequisite: Physics 2524; Mathematics 2434 or concurrent enrollment. Lectures and laboratory/problem sessions covering theory and applications of reflection and refraction seismic exploration methods. Emphasis is on the common-depth-point reflection method. (F)

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)

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)

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 PETROLEUM ENGINEERING (P E)

3153 Petrophysics. Prerequisite: 3123, Engineering 2313; corequisite, Engineering 3223. Porosity, structure, fluid content permeability and flow of fluids in reservoir rocks, and properties responding to well logs. **Laboratory** (F)

3813 Formation Evaluation with Well Logs. Prerequisite: 3123, 3213, and Geology 4113. Basic formation evaluation concepts, borehole environment, principles of resistivity, radiation, thermal and elastic wave measurements and measuring tools, applications to formation evaluation using commercial software package. (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)

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)