



**COWLEY COLLEGE  
& Area Vocational Technical School**

**COURSE PROCEDURE FOR**

**GEOLOGY  
GEO4311 5 Credit Hours**

**Student Level:**

This course is open to students on the college level in either the freshman or sophomore year.

**Catalog Description of the Course:**

**GEO4311 GEOLOGY (5 hrs)**

**[KRSN PSI 1030]**

A study of the geologic features of the surface of the earth, and the processes which have produced them. Laboratory work includes identification of rocks and minerals and the use and preparation of geological and topographical maps utilizing the scientific method.

**Prerequisites:**

None

**Controlling Purpose:**

This course is designed to give a background in the field of geology for students planning to enter the fields of agriculture, soil mechanics, civil and mechanical engineering, architecture, earth sciences, other physical sciences, and biological sciences. In addition, it is designed to meet the needs of other students who wish to know about rocks, minerals, and geological structures and how they were formed.

**Learner Outcomes:**

Upon completion of this course students will be able to identify common rocks and minerals, to interpret and analyze the geology of an area in simpler cases, and to identify geological structures and their causes. In addition, the student will be able to use and to prepare geological and topographical maps.

**Units Outcomes and Criterion Based Evaluation Key for Core Content:**

The following defines the minimum core content not including the final examination period. Instructors may add other content as time allows.

Evaluation Key:

- A = All major and minor goals have been achieved and the achievement level is considerably above the minimum required for doing more advanced work in the same field.
- B = All major goals have been achieved, but the student has failed to achieve some of the less important goals. However, the student has progressed to the point where the goals of work at the next level can be easily achieved.

- C = All major goals have been achieved, but many of the minor goals have not been achieved. In this grade range, the minimum level of proficiency represents a person who has achieved the major goals to the minimum amount of preparation necessary for taking more advanced work in the same field, but without any major handicap of inadequacy in his background.
- D = A few of the major goals have been achieved, but the student's achievement is so limited that he is not well prepared to work at a more advanced level in the same field.
- F = Failing, will be computed in GPA and hours attempted.
- N = No instruction or training in this area.

## UNIT 1: Chapters 1-5: THE RESTLESS PLANET

Outcomes: The student will get an overview and an introduction to the earth and its place in the universe, some current ideas about stellar evolution, origin of the solar system and of the earth: rocks and minerals; atomic and crystal structure; minerals, their properties and identification, rocks their classification, properties and formation.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Summarize the tasks and responsibilities of the geologist.
						Discuss why the resources of Earth are essential for life.
						Discuss why the resources of Earth are essential for life.
						Summarize the various theories for the origin of our solar system.
						Compare and contrast current theories on the origins of life.
						Briefly describe the internal structure of Earth and how Earth's internal heat engine works.
						Relate the beginnings of the theory of plate tectonics to the scientific method.
						Name and briefly describe the three main zones of Earth's interior.
						Compare and contrast the features of the crust and mantle.
						Describe the nature of Earth's magnetic field and the magnetic poles.
						Explain the significance of the geothermal gradient and the flow of Earth's heat.
						Sketch and label a cross-section showing: continental shelf, slope, rise, abyssal plain, mid-oceanic ridge, abyssal hills, and guyots.
						Describe the formation of three major types of coral reefs.
						List the fundamental differences between continental and oceanic crusts in terms of their structure, age, and rock type.
						Explain the theory of continental drift.
						Summarize Harry Hess's theory of sea-floor spreading.
						Describe the rates of plate motion.

## UNIT 2 - CHAPTER 6-7: THE DYNAMIC EARTH

Outcomes: The student will gain an overview of Mountain building; crustal movement, vulcanism, isostasy.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe and give examples of three types of plate boundaries, including their characteristic geologic features.
						Relate plate tectonic theory to the origin and distribution of most of the world's volcanoes, earthquakes, young mountain ranges, and major sea-floor features.
						Summarize the various theories for the driving force behind plate tectonics.
						Describe the evolution of a mountain belt from its inception on the sea floor.
						Describe the ways in which continents grow.
						Distinguish among compressive, tensional, and shear stresses; and between plastic strain, elastic strain, and fracturing.
						Explain how folds are classified.
						Explain how faults are classified.
						Describe the factors that contribute to the occurrence of earthquakes.
						Discuss how the location of an earthquake is determined.
						Relate the concept of plate boundaries to the distribution of earthquakes.

### UNIT 3 - CHAPTER 10-11: THE HISTORY OF THE EARTH

Outcomes: The student will gain an overview of the Earth's history; geological time, dating, fossil records, and discussion of the various periods in geological history. Topographical maps and geological maps; their use and their preparation. Maps will be used extensively in the following units.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Discuss the importance of the concept of geologic time.
						Differentiate between the relative geologic time scale and the absolute geologic time scale.
						Describe how rock units in separate areas are correlated through the methods of physical continuity, stratigraphic position, similarity of rocks, and comparison of fossils.
						Explain the evidence for the age of Earth and why the oldest expected rocks will probably never be found.
						Discuss current theories about why life on Earth changes through geologic time.
						Describe the processes that can either destroy the remains of an organism or cause them to become fossilized.
						Discuss radiometric dating and its application to geologic time.
						Describe the basis for developing a geologic time scale.

## UNIT 4 - CHAPTERS 12-18: THE MATERIALS OF THE EARTH

Outcomes: Students will gain an overview of other topics: continental drift; paleomagnetism; paleoclimatology; ore deposits; coal, oil and gas; environmental geology, the "geology" of the moon and of other planets, etc.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Distinguish among rocks, minerals, and chemical elements.
						Explain what constitutes an atom and how atoms of various elements differ.
						Name the eight most abundant elements in Earth's crust and relate these elements to the composition of most common minerals.
						Describe the properties and structures of the most common rock forming minerals.
						Contrast the beneficial and catastrophic effects of volcanism on humans.
						Compare the three major types of volcanoes in terms of their size, shape, and composition and give examples of each.
						Recognize the characteristics of volcanic domes.
						Explain how the texture of an igneous rock gives clues about its origin.
						Describe how igneous rocks are classified, including mineralogical and chemical distinctions among granite, diorite, gabbro, and ultramafic rocks.
						Describe how differentiation, assimilation, and partial melting may account for variations in the composition of igneous rocks.
						Relate plate tectonic theory to the distribution of various types of igneous rocks and to various kinds of intrusive and volcanic activity.
						Compare and contrast mechanical and chemical weathering.
						Describe three processes that account for most of the mechanical weathering of rock.
						Describe how atmospheric gases and water decompose rock.
						Describe the characteristics of each major soil type, and explain how the parent rock, time, and slope affect the soil profile.
						Explain the influence of weathering on the composition of sedimentary rocks.
						Differentiate among clastic, chemical, and organic sedimentary rocks.
						Recognize the origins and characteristics of conglomerate, sandstone, shale, limestone, chert, and evaporites.

## UNIT 4 - CHAPTERS 12-18: THE MATERIALS OF THE EARTH

Outcomes: Students will gain an overview of other topics: continental drift; paleomagnetism; paleoclimatology; ore deposits; coal, oil and gas; environmental geology, the "geology" of the moon and of other planets, etc.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Give examples of sedimentary rocks that are considered valuable and the ways in which they are used.
						Relate the origin of petroleum, natural gas, coal, and other resources to sedimentary rocks.
						Describe the roles of temperature, pressure, and fluids in metamorphism.
						Recognize how metamorphic rocks are named and classified.
						Compare the two most common types of metamorphism - contact (thermal) metamorphism and regional (dynamo thermal) metamorphism and the rocks that result from each.

## UNIT 5 - CHAPTERS 19-24: THE EVOLUTION OF LAND

Outcomes: Students will gain an overview of Erosion, sedimentation and soil formation. Topographical maps and geological maps; their use and their preparation. Maps will be used extensively in the following units.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Distinguish between the tectonic and hydrologic cycle.
						Recognize the relationship between stream velocity and the erosion, transportation, and deposition of sediment.
						Describe how sediment is transported as bed load, suspended load, and dissolved load.
						Describe the various features created through repeated cycles of river erosion and deposition, including potholes, bars, braided and meandering streams, flood plains, deltas, and alluvial fans.
						Describe how the tectonic and hydrologic cycle work together to shape the land.
						Indicate how streams shape their valleys by down cutting, lateral erosion, headward erosion, and sediment deposition.
						Recognize the factors that affect slope erosion.

## UNIT 5 - CHAPTERS 19-24: THE EVOLUTION OF LAND

Outcomes: Students will gain an overview of Erosion, sedimentation and soil formation. Topographical maps and geological maps; their use and their preparation. Maps will be used extensively in the following units.

A	B	C	D	F	N	Specific Competencies
						Demonstrate the ability to:
						Describe the relationship between the drainage pattern that a river and its tributaries develop and the nature and structure of underlying rocks.
						Distinguish between porosity and permeability and indicate how these factors influence ground water.
						Recognize the relationships among springs, streams (gaining and losing), and ground water.
						Explain why certain rock types make good aquifers.
						Indicate where deserts are typically located and give some reasons for their geographic distribution.
						Contrast the characteristics of arid regions to humid regions in terms of drainage, base level, and landscape.
						Compare wind and water as agents of erosion and deposition.
						Discuss how glaciation has influenced landscapes in many parts of the world.
						Indicate how glaciers form, grow, move, and shrink.
						Contrast the erosional and depositional features of both continental and alpine glaciers.
						Describe the ways in which waves erode.
						Sketch and label a cross section of a typical coastal beach.
						Understand why coastlines are retreating in many areas of the world.
						Explain the importance of river sediment and submarine canyons to beach sand supply.

### **Projects Required:**

Each student will complete at least one project. The nature of the project is open to the student, subject to the approval of the instructor. It is anticipated that most students will make a collection of rocks and minerals, although some may choose to report on current geological developments, make a collection of photographs of an area of geological interest, etc.

**Textbook:**

Contact Bookstore for current textbook.

**Materials/Equipment Used:**

Collection of rock and mineral specimens.

Microscopes

Electronic Balances

Computer

**Attendance Policy:**

Students should adhere to the attendance policy outlined by the instructor in the course syllabus.

**Grading Policy:**

The grading policy will be outlined by the instructor in the course syllabus.

**Maximum class size:**

Based on classroom occupancy

**Course Time Frame:**

The U.S. Department of Education, Higher Learning Commission and the Kansas Board of Regents define credit hour and have specific regulations that the college must follow when developing, teaching and assessing the educational aspects of the college. A credit hour is an amount of work represented in intended learning outcomes and verified by evidence of student achievement that is an institutionally-established equivalency that reasonably approximates not less than one hour of classroom or direct faculty instruction and a minimum of two hours of out-of-class student work for approximately fifteen weeks for one semester hour of credit or an equivalent amount of work over a different amount of time, The number of semester hours of credit allowed for each distance education or blended hybrid courses shall be assigned by the college based on the amount of time needed to achieve the same course outcomes in a purely face-to-face format.

**Refer to the following policies:**

[402.00 Academic Code of Conduct](#)

[263.00 Student Appeal of Course Grades](#)

[403.00 Student Code of Conduct](#)

**Disability Services Program:**

Cowley College, in recognition of state and federal laws, will accommodate a student with a documented disability. If a student has a disability which may impact work in this class which requires accommodations, contact the Disability Services Coordinator.