ORIGINAL COURSE IMPLEMENTATION DATE: January 2010
REVISED COURSE IMPLEMENTATION DATE: September 2017
COURSE TO BE REVIEWED: (six years after UEC approval) November 2021
Course outline form version: 09/15/14

OFFICIAL UNDERGRADUATE COURSE OUTLINE FORM

Note: The University reserves the right to amend course outlines as needed without notice.

Course Code and Number: GEOG 116	**Number of Credits:** 4 Course credit policy (105)
Course Full Title: Earth Rocks **Course Short Title (if title exceeds 30 characters):**	
Faculty: Faculty of Social Sciences	**Department (or program if no department):** Geography and the Environment

Calendar Description:

An introduction to physical geology that explores the materials that compose the Earth and the processes that operate to form the Earth and its surface. Topics include minerals, rocks, earth resources, plate tectonics, geophysical hazards, and surficial features.

Note: Field trips outside of class time will be required. Please refer to the department website for field trip scheduling information.

Prerequisites (or NONE):	None.
Corequisites (if applicable, or NONE):	
Pre/corequisites (if applicable, or NONE):	

Equivalent Courses (cannot be taken for additional credit)
Former course code/number:
Cross-listed with:
Equivalent course(s):
Note: Equivalent course(s) should be included in the calendar description by way of a note that students with credit for the equivalent course(s) cannot take this course for further credit.

Transfer Credit
Transfer credit already exists: ☒ Yes ☐ No

Transfer credit requested (OReg to submit to BCCAT):
☐ Yes ☒ No (if yes, fill in transfer credit form)

Resubmit revised outline for articulation: ☐ Yes ☒ No

To find out how this course transfers, see **bctransferguide.ca**.

Total Hours: 90

Typical structure of instructional hours:

Lecture hours	45
Seminars/tutorials/workshops	
Laboratory hours	42
Field experience hours	3
Experiential (practicum, internship, etc.)	
Online learning activities	
Other contact hours:	
Total	**90**

Special Topics
Will the course be offered with different topics?
☐ Yes ☒ No

If yes, different lettered courses may be taken for credit:
☐ No ☐ Yes, repeat(s) ☐ Yes, no limit

Note: The specific topic will be recorded when offered.

Maximum enrolment (for information only): 25

Expected frequency of course offerings (every semester, annually, every other year, etc.): Annually

Department / Program Head or Director: Steven Marsh	**Date approved:**	December 2016
Faculty Council approval	**Date approved:**	January 2017
Campus-Wide Consultation (CWC)	**Date of posting:**	March 17, 2017
Dean/Associate VP: Dr. Lucy Lee	**Date approved:**	January 2017
Undergraduate Education Committee (UEC) approval	**Date of meeting:**	March 24, 2017

Learning Outcomes

Upon successful completion of this course, students will be able to:

1. Demonstrate competence in basic geological skills including: mineral and rock identification according to their physical properties; the interpretation of topographic and geologic maps and the construction of cross-sections.
2. Explain the ethical issues faced when conducting geological science.
3. Demonstrate competence in quantitative data analysis including: the construction and reading of graphs [construction and use of spreadsheets], and analysis of topographic and geologic maps and geologic systems.
4. Describe geologic time, its major divisions, and its influence on the processes that shape the Earth.
5. Articulate the scientific theories that explain the methods through which basic geologic processes function and interact within the Earth system.
6. Apply the scientific method in the investigation of geological processes with an emphasis on the unifying theory of plate tectonics.
7. Describe the genesis and economic use of Earth resources such as fossil fuels, metals, and non-metallic minerals.
8. Explain how landscape-forming processes act on the Earth's surface (weathering and erosional forces).
9. Explain how a knowledge of geology can aid in land-use decisions and the mitigation of geophysical natural hazards.
10. Demonstrate competence in communicating geologic concepts using various scientific methods including written, numeric, graphic, and oral.
11. Critically reflect upon their learning from in-class discussion, field work, and related research.

Prior Learning Assessment and Recognition (PLAR)

☒ Yes ☐ No, PLAR cannot be awarded for this course because

Typical Instructional Methods (guest lecturers, presentations, online instruction, field trips, etc.; may vary at department's discretion)

Lectures, assigned readings, discussion groups, videos, online resources, laboratory assignments will be used in this course. Guest lectures and field trips may be used.

Grading system: Letter Grades: ☒ Credit/No Credit: ☐ Labs to be scheduled independent of lecture hours: Yes ☐ No ☒

NOTE: The following sections may vary by instructor. Please see course syllabus available from the instructor.

Typical Text(s) and Resource Materials (if more space is required, download Supplemental Texts and Resource Materials form)

	Author (surname, initials)	Title (article, book, journal, etc.)	Current ed.	Publisher	Year
1.	Tarbuck, E.J., F. K. Lutgens, C. J. Tsujita, and S. R. Hicock	Earth An Introduction to Physical Geology Fourth Canadian Edition.	☒	Pearson	2015
2.	Plummer, C., Carlson, D. and L. Hammersley	Physical Geology, 15th Edition	☒	McGraw-Hill Ryerson	2016
3.	Christiansen, E and W.K. Hamblin	Dynamic Earth, 1st edition	☒	Nelson Education	2015
4.			☒		
5.			☐		

Required Additional Supplies and Materials (software, hardware, tools, specialized clothing, etc.)

Typical Evaluation Methods and Weighting

Final exam:	25%	Assignments:	10%	Midterm exam:	15%	Practicum:	%
Quizzes/tests:	**20**%	Lab work:	20%	Field experience:	%	Shop work:	%
Reflection:	10%	Other:	%	Other:	%	Total:	100%

Details (if necessary):

Typical Course Content and Topics

Lectures

1. Introduction to the Field of Geology and the Scientific Method. Introduces the scientific method and the terminology used in geological science. Includes a first look at Planet Earth, its origins, systems and tectonics.
2. Mineral Classification and Physical Properties. What is a mineral? Introduces mineral structure and composition and how to identify minerals. Focus on rock forming silicate minerals and economic use of minerals.
3. Origins and Properties of Igneous Rocks. How and where are igneous rocks formed. How are they are identified and classified including igneous rock formations within the earth. What is the economic value of igneous rocks?
4. Nature of Volcanoes and Volcanic Hazards. Introduction to the types of volcanoes and where they occur. Relationship of plate tectonics to volcanism and the type of eruptions. Regions at risk in western North America.

5. Weathering and the Formation of Sedimentary Rocks. Introduction to the mechanical and chemical weathering of rocks. Introduction to lithification and how sedimentary rocks are formed. Types of sedimentary rocks and the depositional environments associated with them. Economic uses of sedimentary rocks.
6. Metamorphism and Metamorphic Rocks. What drives the different types of metamorphism? What is the relationship to the parent rock for metamorphic rocks? Introduction to the hazards posed by metamorphic rocks in our daily lives.
7. Geologic Time and its Major Divisions. Discussion of the geologic principles used in relative dating. How do we determine numerical ages for rocks and structures? Introduction to the geologic time scale, its divisions and extinction events of the past and their implications.
8. Plate Tectonics and the Earth's Interior Structure. What is the interior structure of the Earth? How have seismic waves allowed us to determine the interior structure? What is the magnetic field and how has it varied over geologic time? An overview of the plate tectonic theory and how continents and ocean basins form, the types of plate boundaries and the topography associated with each type of boundary. How is plate velocity determined – using hotspots to track plate movements over time. What are the driving forces behind plate movement and how are mountains formed?
9. Earthquakes, Seismology and Impact on Humans. The effect that stress and strain has on rocks and how they are deformed. Classification of folds and faults and how the knowledge of subsurface structures can assist in the search for fossil fuels and other deposits. What causes earthquakes and what are seismic waves? How can one earthquake have one magnitude but many intensities? What are the hazards posed by earthquakes to communities especially in the Pacific Northwest. How are earthquakes predicted?
10. Mass Wasting Processes. What causes the mass movement of materials downslope? How are mass movements classified and what are the different types of movements? How can we predict mass movements? What methods are used to prevent mass movements and to avoid mass movements?
11. Genesis of Earth Resources. Overview of resources and reserves of both renewable and non-renewable resources. Introduction to fossils fuels and other energy resources and their environmental impact and effect on human society. Use of mineral resources and the future needs for the global population.
12. Landscapes formed by water and ice. Introduction to the geological work done by flowing water and flowing ice. How does ice and water erode, transport and deposit sediments? How are floods controlled? Discussion on the landforms created by fluvial action. Discussion of the landforms created by continental and alpine glaciers. Introduction to the causes behind past glaciations.
13. Landscapes formed by waves and wind. Discussion of the erosional processes at work along coasts and in deserts. How are sediments transported and deposited in desert and coastal environments? Discussion the the impact of desertification in locations such as the Sahara and the American Midwest.

Labs

1. Mineral Properties, Use, and Identification. Specific Technical Skills: Identification of common rock forming minerals according to physical properties.
2. Rock Forming Processes and the Rock Cycle. Specific Technical Skills: Description of rock forming processes and their relationship to the rock cycle conceptual model.
3. Igneous Rocks and Volcanic Hazards. Specific Technical Skills: Describe the textural and compositional features of igneous rocks and from that infer the origin of igneous rock. Classify igneous rock samples and describe hazards associated with volcanoes.
4. Sedimentary Rocks, Processes, and Environments. Specific Technical Skills: Describe the textural and compositional features of sedimentary rocks. Identify and infer the origin of sedimentary rocks based upon their texture, composition and structure.
5. Metamorphic Rocks, Processes, and Resources. Specific Technical Skills: Describe the textural and compositional features of metamorphic rocks. Identify metamorphic rocks and determine the parent rocks and uses of metamorphic rocks based on their textures and mineralogical compositions.
6. Dating of Rocks, Fossils, and Geologic Events. Specific Technical Skills: Apply relative dating principles to the dating of earth materials and events. Apply relative and absolute dating techniques to infer geologic history.
7. Topographic Maps, Aerial Photographs, and Satellite Images. Specific Technical Skills: Locate features on topographic maps using grid systems. Interpret contour lines so as to calculate gradients and relief and to identify surficial features. Construct topographic profiles and calculate their vertical exaggeration. Use aerial photographs to identify features in three dimensions.
8. Geologic Structures, Maps, and Block Diagrams. Specific Technical Skills: Identify common geologic structures in three dimensional block diagrams. Read and interpret geologic maps and construct geologic cross sections.
9. Earthquake Hazards and Human Risks. Specific Technical Hazards: Graph seismic data to construct and evaluate travel time curves for P-waves, S-waves and L-waves. Use seismographs and travel time curves to determine the epicentres of earthquakes. Describe hazards associated with seismic activity.