COURSE OUTLINE

ESCI 107 Earth Science

Prepared By: Adrienne C. Rygel, Ph.D.
A. **TITLE:** Earth Science

B. **COURSE NUMBER:** ESCI 107

C. **CREDIT HOURS:** 4

D. **WRITING INTENSIVE COURSE:** This is not a writing intensive course.

E. **COURSE LENGTH:** 15 Weeks

F. **SEMESTER(S) OFFERED:** Spring (may be available for Fall/Winter/Summer)

G. **HOURS OF LECTURE, LABORATORY, RECITATION, TUTORIAL, ACTIVITY:**
   - Lecture: 3 hours
   - Laboratory: 2 hours

H. **CATALOGUE DESCRIPTION:**
   This course introduces earth processes and phenomena. The birth of the universe, our solar system, and the earth are explored. The internal composition and structure of the Earth is studied. Factors that affect the structure of the earth are examined: continental drift, plate tectonics, and crustal deformation. Students learn about common earth materials that make up the Earth. The impact of weathering, erosion, running water, and glaciers on the earth’s surface and landforms is studied. Additional topics will include, but are not limited to: earthquakes, volcanoes, mass movement, geologic time, and geologic mapping. Lecture related exercises/assignments, laboratory exercises, readings, and review questions help students learn and understand the course material. This course includes a laboratory section. Students cannot receive credit for both ESCI 107 and GEOL 101.

I. **PRE-REQUISITES/CO-COURSES:** None

J. **GOALS (STUDENT LEARNING OUTCOMES):**
   By the end of this course, the student will be able to:

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<tr>
<th>Course Objective</th>
<th>Institutional SLO</th>
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<tr>
<td>a. Sketch and describe the major layers of the Earth.</td>
<td>2. Critical Thinking</td>
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<td>b. List and explain the lines of evidence that indicate that the continents have moved through time.</td>
<td>2. Critical Thinking</td>
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<td>c. Summarize the major types of plate boundaries and the processes that occur at each.</td>
<td>2. Critical Thinking</td>
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<td>d. Use Bowen’s Reaction Series as a conceptual framework for understanding patterns in mineral chemistry, temperature of crystallization/melting, igneous rocks composition, and volcanic activity.</td>
<td>2. Critical Thinking</td>
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<td>e. Identify common minerals in hand sample and use appropriate terminology to describe mineral properties.</td>
<td>2. Critical Thinking</td>
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<td>f. Identify common igneous, sedimentary, and metamorphic rocks in hand sample and use their physical characteristics to interpret important processes during their formation.</td>
<td>2. Critical Thinking</td>
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<td>g. Use seismographs to determine the location of an earthquake epicenter.</td>
<td>2. Critical Thinking</td>
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<td>h. Use the appropriate terminology to describe faults and folds and be able to identify these features in geologic maps and cross-sections.</td>
<td>2. Critical Thinking</td>
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<td>i. Describe the different types of mass movement and their impact on the Earth’s surface.</td>
<td>2. Critical Thinking</td>
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<td>j. Explain how streams cause erosion, transport sediment, and deposit sediment.</td>
<td>2. Critical Thinking</td>
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<td>k. Discuss problems associated with groundwater usage; such as overuse and contamination.</td>
<td>2. Critical Thinking</td>
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<td>l. Discuss how climate change has impacted glaciers and the implications this will have globally on such things as water supply, ecosystems, and the oceans.</td>
<td>2. Critical Thinking</td>
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<td>m. Use and interpret topographic maps and profiles.</td>
<td>2. Critical Thinking</td>
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K. TEXTS:
- Rock and Mineral Kit, Dr. Adrienne Rygel, SUNY Canton Textbook Center. A custom-made, three box kit of rock and mineral specimens is to be rented from the SUNY Canton Textbook Center. These kits are required to complete the rock and mineral identification laboratories.

L. REFERENCES:

M. EQUIPMENT:
Instructional needs include:
- Technology Enhanced Classroom
- Laboratory space
- mineral sample kits
- sedimentary rock kits
- igneous rock kits
- metamorphic rock kits
N. **GRADING METHOD:** (P/F, A-F, etc.)
   A-F

O. **MEASUREMENT CRITERIA/METHODS:**
   - Examinations
   - Laboratory exercises
   - Homework assignments/Exercises
   - Review Questions
   - Attendance

P. **DETAILED COURSE OUTLINE:**
   I. Course Introduction and Orientation
      a. Course Logistics
      b. The Field of Earth Science and Geologists
      c. The Scientific Method
   II. Cosmology and Birth of the Earth
      a. The Big Bang
      b. Expansion of the Universe and the Doppler Effect
      c. Formation of Our Solar System
      d. Formation of Earth and the Moon
   III. Composition of the Earth
      a. Crust, Mantle, and Core
      b. Lithosphere and Asthenosphere
   IV. Continental Drift
      a. Alfred Wegener and the Concept of Continental Drift
      b. Evidence of Continental Drift
   V. Sea-Floor Spreading
      a. Paleomagnetism
      b. Sea-Floor Bathymetry and Sea-Floor Features
      c. The Concept of Sea-Floor Spreading
      d. Evidence of Sea-Floor Spreading
   VI. Plate Tectonics
      a. The Theory of Plate Tectonics
      b. Divergent Plate Boundaries
      c. Convergent Plate Boundaries
      d. Transverse Plate Boundaries
      e. How Plates Move
   VII. Minerals
      a. Chemistry and Structure
      b. Bowen’s Reaction Series
      c. Properties and Identification
      d. Classification
   VIII. Igneous Rocks and Volcanoes
      a. Magma versus Lava
      b. Intrusive versus Extrusive
      c. Composition of Magma
      d. Movement of Magma and Lava
      e. Transformation of Magma and Lava into a Rock
      f. Igneous Rock Textures
      g. Classification of Igneous Rocks
h. Volcanic Eruptions
i. Architecture of Volcanoes
j. Earth and Human Impact

IX. Sedimentary Rocks
   a. Weathering
   b. Soils
   c. Clastic Sedimentary Rocks
   d. Chemical Sedimentary Rocks
   e. Biochemical Sedimentary Rocks
   f. Organic Sedimentary Rocks
   g. Sedimentary Structures
   h. Depositional Environments

X. Metamorphic Rocks
   a. Causes of Metamorphism
   b. Metamorphic Grade
   c. Classification and Identification of Metamorphic Rocks

XI. Crustal Deformation
   a. Why and How Rocks Break
   b. Orientation of Geologic Structures
   c. Brittle Deformation
   d. Ductile Deformation

XII. Earthquakes
   a. Cause
   b. Measuring Earthquakes
   c. Location of Earthquakes
   d. Impact of Earthquakes

XIII. Geologic Time
   a. Geologic Column
   b. Relative Age Dating
   c. Absolute Age Dating

XIV. Mass Movement
   a. Types of Mass Movement
   b. Causes
   c. Impact on Landscapes and Humans

XV. Streams
   a. Drainage Basins
   b. Streams and River Patterns
   c. Flow of Water
   d. Sediment Load
   e. Flood Analyses

XVI. Groundwater
   a. Aquifer systems
   b. Groundwater flow
   c. Pumping and use of groundwater
   d. Groundwater resources issues: overpumping and contamination

XVII. Glaciers
   a. Structure
   b. Movement
   c. Sediment Load
   d. Impact on Landscapes
   e. Impact of climate change on glaciers
f. Impact of glacial melt on water supplies, ecosystems, and oceans

Q. LABORATORY OUTLINE:
   1. Topographic Maps
   2. Plate Tectonics
   3. Mineral Identification
   4. Igneous Rock Identification
   5. Sedimentary Rock Identification
   6. Metamorphic Rock Identification
   7. Drainage Basin Delineation
   8. Stream Order
   9. Flood Analyses
  10. Geologic Maps and Structures
  11. Earthquakes
  12. Relative and Absolute Age Dating