**STATE UNIVERSITY OF NEW YORK !**
**COLLEGE OF TECHNOLOGY !**
**CANTON, NEW YORK !**


# MASTER SYLLABUS

## COURSE NUMBER – COURSE NAME
## ESCI 107 – Earth Science

**Created by: Adrienne C. Rygel**

**Updated by: Adrienne C. Rygel**

**Canino School of Engineering Technology !**

**Department: Civil and Construction Technology !**

**Semester/Year: Fall 2018 !**

**A.** **TITLE**: Earth Science

**B.** **COURSE NUMBER:** ESCI 107

**C.** **CREDIT HOURS: (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity)**

**# Credit Hours:** 4
**# Lecture Hours:** 3 **per week**
**# Lab Hours:** (1) two-hour lab **per week**
**Other:** **per week**

**Course Length:** 15 **Weeks**

**D.** **WRITING INTENSIVE COURSE**: Yes ☐ No ☒

**E.** **GER CATEGORY: None:** ☐ **Yes:** GER 2 Natural Sciences !
***If course satisfies more than one*:** GER !

**F.** **SEMESTER(S) OFFERED: Fall** ☐ **Spring** ☒ **Fall & Spring** ☐

**G.** **COURSE 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.

**H.** **PRE-REQUISITES: None** ☒ **Yes** ☐ **If yes, list below:**

**CO-REQUISITES: None** ☒ **Yes** ☐ **If yes, list below:**

## I. STUDENT LEARNING OUTCOMES: (*see key below*)

By the end of this course, the student will be able to:

| ***Course Student Learning Outcome [SLO]*** | ***Program Student Learning Outcome [PSLO]*** | ***GER*** *[If Applicable]* | ***ISLO & SUBSETS*** | |
|---|---|---|---|---|
| a. Sketch and describe the major layers of the Earth. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| b. List and explain the lines of evidence that indicate that the continents have moved through time; and summarize the major types of plate boundaries and the processes that occur at each. | | GER 2 | 2-Crit Think<br>ISLO<br>ISLO | PS<br>Subsets<br>Subsets<br>Subsets |
| c. 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. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| d. Identify common minerals, igneous rocks, sedimentary rocks, and metamorphic rocks in hand sample, use appropriate terminology to describe their properties, and use their physical characteristics to interpret important processes during their formation. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| e. Use seismographs to determine the location of an earthquake epicenter. | | GER 2 | 2-Crit Think<br>ISLO<br>ISLO | PS<br>Subsets<br>Subsets<br>Subsets |

| | | | | |
|---|---|---|---|---|
| f. Use the appropriate terminology to describe faults and folds and be able to identify these features in geologic maps and cross-sections. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| g. Describe the different types of mass movement and their impact on the Earth's surface | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| h. Explain how streams cause erosion, transport sediment, and deposit sediment. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| i. Discuss problems associated with groundwater usage; such as overuse and contamination. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |
| j. Discuss how climate change has impacted glaciers and the implications this will have globally on such things as water supply, ecosystems, and the oceans.<br><br>k. Use and interpret topographic maps and profiles. | | | 5-Ind, Prof, Disc, Know Skills<br>ISLO<br>ISLO | Subsets<br>Subsets<br>Subsets<br>Subsets |

| KEY | **Institutional Student Learning Outcomes [ISLO 1 – 5]** |
|---|---|
| **ISLO #** | **ISLO & Subsets** |
| **1** | **Communication Skills**<br>Oral [O], Written [W] |
| **2** | **Critical Thinking**<br>*Critical Analysis [CA] , Inquiry & Analysis [IA] , Problem Solving [PS]* |
| **3** | **Foundational Skills**<br>*Information Management [IM], Quantitative Lit,/Reasoning [QTR]* |
| **4** | **Social Responsibility**<br>*Ethical Reasoning [ER], Global Learning [GL], Intercultural Knowledge [IK], Teamwork [T]* |
| **5** | **Industry, Professional, Discipline Specific Knowledge and Skills** |

*Include program objectives if applicable. Please consult with Program Coordinator !

**J. - APPLIED LEARNING COMPONENT:** Yes ☒ No ☐

If YES, select one or more of the following categories:

☒ Classroom/Lab
☐ Internship
☐ Clinical Placement
☐ Practicum
☐ Service Learning
☐ Community Service
☐ Civic Engagement
☐ Creative Works/Senior Project
☐ Research
☐ Entrepreneurship (program, class, project)

**K. - TEXTS:**

• ! Marshak, Stephen (2018). Earth Portrait of a Planet, 6th edition. New York, New York: W.W. Norton and Company.

• ! 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:**

Allan Ludman and Stephen Marshak (2015). Laboratory Manual for Introductory Geology, 3rd edition. New York, New York: W.W. Norton and Company.

Abbott, Patrick L. (2009). Natural Disasters, 7th edition. New York, New York: McGraw Hill.

Marshak, Stephen (2009). Essentials of Geology, 3rd edition. New York, New York: W.W. Norton and Company.

Skinner, Brian J., Porter, Stephen C., and Park, Jeffery (2004). Dynamic Earth: An Introduction to Physical Geology, 5th edition. Hoboken, New Jersey: John Wiley & Sons, Inc..

Tarbuck, Edward J. and Lutgens, Frederick K. (2008). The Earth, 9th edition. Upper Saddle River, New Jersey: Pearson Prentice Hall.

**M. - EQUIPMENT: None ☐ Needed:** Instructional needs include:
• ! Technology Enhanced Classroom
• ! Laboratory space
• ! mineral sample kits
• ! sedimentary rock kits
• ! igneous rock kits
• ! metamorphic rock kits

**N. - GRADING METHOD:** A-F

**O. - SUGGESTED MEASUREMENT CRITERIA/METHODS:**

- **Examinations**
- **Laboratory exercises**
- **Homework assignments/Exercises**
- **Review Questions**

**P. <u>DETAILED COURSE OUTLINE</u>:**

**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. <u>LABORATORY OUTLINE</u>: None ☐ Yes ☒**

**1. Topographic Maps**

2. **Map Scale**
3. **Plate Tectonics**
4. **Mineral Identification**
5. **Igneous Rock Identification**
6. **Sedimentary Rock Identification**
7. **Metamorphic Rock Identification**
8. **Structures Lab**
9. **Earthquake Lab**
10. **Relative and Absolute Age Dating**
11. **Landslide Lab**
12. **Stream Lab**
13. **Water Lab**
14. **Glacial Retreat Lab**