PHYSICAL GEOLOGY
COURSE OUTLINE

Course Prefix and Number:

GOL 105 Credits: 4

Course Description:

Introducing the science of physical geology through a comprehensive system-based examination of Earth's structure, composition, rocks and minerals, landforms, geomorphology, and agents responsible for shaping and modifying its environments. Explores the origin and evolution of Earth's topographic and bathymetric features, geologic phenomena, and geologic hazards, resulting from plate tectonics. This is a Passport and UCGS transfer course.
Lecture 3 hours. Laboratory 3 hours. Total 6 hours per week. 4 credits

General Course Purpose:

GOL 105 provides students with an understanding of Earth's structure, composition, geologic features and geomorphology. This course offers a comprehensive examination of the physical and natural world. Students will enhance their observational and critical thinking skills through the analysis and interpretation of physical and graphical data. This course introduces geologic concepts to broaden students' general knowledge and exposes students to future opportunities in this area of study.

Course Prerequisites:

None

Student Learning Outcomes:

Upon completing the course, the student will be able to

- **Quantitative Literacy**

1. Interpret numerical data to identify topographic and bathymetric features, grain size, degree of sorting, and angle of repose
2. Interpret numerical data to construct a topographic profile, calculate gradient and local relief, and to classify rocks and minerals

- **Scientific Literacy**

1. Explain the importance of science in developing an understanding of the natural world and making informed and objective decisions concerning the environment
2. Describe the scientific method and its application in the natural sciences

- **Civic Engagement**

1. Identify and describe geologic hazards, land use planning, water and soil conservation, coastal processes and management, and environmental issues
2. Critical Thinking
3. Analyze topographic data, geologic features, soil characteristics, rock type, tectonic setting, and climate conditions to identify areas susceptible to geologic hazards, such as earthquakes, landslides, flash floods, and volcanic eruptions

- **Scientific Method**

1. List and describe the steps of the scientific method
2. Explain the difference between a hypothesis and scientific theory.
3. Analyze the elements of the scientific method and explain how these principles
4. apply to the study of the Eart, Earth Systems
5. Identify and describe the Earth's principle systems - the lithosphere, hydrosphere, biosphere, atmosphere, mantle, and core
6. Explain the interactions and feedback loops between the principle systems
7. Define and explain the Earth's internal and external heat engines.
8. Describe the hydrologic cycle and its impact on the lithosphere, streams, glaciers, and groundwater
9. Describe the rock cycle

- **Plate Tectonics**

1. Explain the theory of plate tectonics and why it is the unifying theory for geology
2. Describe the formation of continental crust and the creation and destruction of oceanic crust

3. Explain the driving force and mechanism responsible for plate tectonics
4. Identify and describe the tectonic processes responsible for shaping Earth's surface and environments
5. Identify and describe the different plate boundaries and their associated features, such as volcanoes, earthquakes, and mountains
6. Describe the relationship between the lithosphere and asthenosphere, and their role in plate tectonics

- **Minerals and Rocks**

1. Identify and describe the criteria used to define a mineral
2. Explain the different types of chemical bonds and their influence on mineral structure and physical characteristics
3. Identify the most abundant elements of the Earth's crust and the influence of their abundance on mineral and rock composition
4. Describe silicate minerals and their atomic structures
5. Explain how crystalline rocks are classified according to their mineralogy
6. Identify the different rock groups and explain their origin
7. Explain the role of rocks in the creation of sediment, soils, and energy production
8. Discuss the role of sedimentary rocks in the release and sequestration of atmospheric gases, such as carbon dioxide
9. Discuss the economic uses of rocks and minerals

- **Volcanism and Volcanoes**

1. Discuss how volcanism is related to plate tectonics
2. Explain the origin of magma, lava, and pyroclastic material
3. Identify and describe shallow intrusive structures and lava flows
4. Describe the geologic hazards resulting from volcanic eruptions
5. Explain how volcanic eruptions can impact global climate.
6. Identify and describe the different types of volcanoes and their explosive potential
7. Explain the significance of Bowen's Reaction Series
8. Describe the different types of magma and how they are classified
9. Explain the origin of volcanic hotspots, and their role in the creation of islands and super volcanoes
10. Discuss volcano monitoring and eruption forecasting

- **Weathering, Erosion, sediment, and Soil**

1. Explain the origin of soil
2. Describe the soil profile and its different horizons
3. Explain what properties of soil make it productive
4. Explain why rocks weather at different rates
5. Discuss how soils are classified

6. Identify the different types of weathering and their products
7. Identify and describe the natural agents of erosion, transport, and deposition
8. Explain how sediment becomes a sedimentary rock
9. Identify and describe sedimentary structures
10. Explain the economic value of sedimentary rocks and their use in energy production

- **Depositional Environments**

1. Identify and describe the continental, transitional, and marine depositional environments
2. Identify and describe the features associated with the most common depositional environments
3. Explain the dominant processes or agents responsible for shaping and modifying a particular depositional environment

- **Crustal Deformation and Mountain Building**

1. Identify and explain the origin of structural features, such as folds, faults, and the tectonic stresses involved
2. Describe how structural features are mapped using strike and dip
3. Explain the origin of mountains
4. Explain the principle of Isostasy and isostatic rebound

- **Earthquakes and Seismic Waves**

1. Explain the origin of earthquakes or the elastic rebound theory
2. Describe how earthquake location, intensity, and magnitude is calculated
3. Identify and describe the different types of seismic waves created by earthquakes, and how they are used to study the Earth's interior
4. Discuss the geologic hazards associated with earthquakes and practices to mitigate their destructive potential
5. Describe the characteristics of a tsunami and how they are created.
6. Discuss how earthquakes can be predicted

- **Streams and Rivers**

1. Explain how streams are classified
2. Identify and describe the erosional and depositional features associated with streams
3. Calculate stream gradient and discuss its impact of stream characteristics
4. Explain the origin of floods, how they are classified, and practices used to control their effects
5. Discuss the erosion, transport, and deposition of sediment by streams
6. Explain how urbanization increases discharge, and its impact of flood intensity

- **Groundwater**

1. Describe the role of permeability and porosity in groundwater characteristics
2. Explain the factors controlling groundwater movement
3. Identify and describe the different types of aquifers and their environmental implications
4. Discuss how anthropogenic activities modify the groundwater system
5. Identify and describe the origin of karst features
6. Identify and describe the elements of the groundwater system, such as the unsaturated and saturated zones, and the water table
7. Identify and explain the origin of hydrothermal features, such as hot springs angeysers

• **Mass Wasting**

1. Identify the different types of mass wasting events
2. Identify the most common triggers for mass wasting
3. Explain the environmental factors controlling the susceptible of an area to mass wasting
4. Describe the hazards associated with mass wasting and practices to mitigatethese hazards
5. Identify landscape features resulting from mass wasting

• **Oceans, Coasts, and Shoreline Processes**

1. Explain seawater and oceanic circulation and its impact on global climate
2. Identify and describe shoreline processes responsible for erosion, transport, and deposition of sediment along the coast
3. Explain how coasts are classified relative to sea level or the dominant process responsible for shaping its shoreline and coastal features
4. Identify and describe features of erosional and depositional coasts
5. Identify and describe features of submergent and emergent coasts
6. Describe the hazards of living near the shore
7. Identify poor coastal management practices
8. Identify and describe the artificial structures built to protect or modify the shoreline
9. Explain the effects of tides, waves, and nearshore current on shoreline morphology
10. Identify and describe seafloor features and deposits

• Climate Change

1. Explain how the rock cycle is connected to climate change
2. Discuss the implications of burning fossils fuels
3. Explain the Greenhouse Effect and the impact of anthropogenic activities
4. Explain the role of the ocean is sequestration of atmospheric gases, such as carbon dioxide
5. Describe how glacial ice cores and rock record can be used to investigate climate change in the past and future

ADA Statement (PDF)
Title IX Statement (PDF)