

Blinn College

Master Course Syllabus

Geology 1403 – Physical Geology

CIP # 40.0601.5103

CIP Area: Physical Sciences

Fall, 2005

Prepared by:

Bryan Campus / Date

Confirmed by:

Division Chair, Brenham Campus / Date

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GEOL 1403 PHYSICAL GEOLOGY

This course is in the core curriculum.

Purpose Statement

The purpose of the natural sciences component in the core curriculum is to enable the student to understand the basic concepts in the natural sciences and to apply that understanding to the analysis of current issues in society. In particular, the study of physical geology leads students to appreciate how Earth's systems function and interact with one another and how geologic processes affect our lives on a daily basis.

Course Description

General principles of physical geology. An introduction to the origin, composition, structure and dynamics of planet Earth. Topics are explored within the general context of plate tectonic theory and include: minerals and rocks, weathering and erosion, geological time, earthquakes, volcanoes, mountain building, oceans, landforms, and natural resources. Laboratory work involves the practical application of geological principles such as rock and mineral identification, geologic and topographic map interpretation, and geological data analysis. There are no prerequisites for this course. Three class hours and three laboratory hours per week. Credit: Four semester hours.

The major areas that will be covered in lecture are:

- a. Science of the Earth System
- b. Atoms, Elements, Minerals and Rocks
- c. The Rock Record and Geologic Time
- d. Plate Tectonic Theory
- e. Earthquakes and Earth's Interior
- f. Volcanoes and Igneous Rocks
- g. Weathering and Erosion
- h. Sediments and Sedimentary Rocks
- i. Folds, Faults, and Geologic Maps
- j. Metamorphic Rocks
- k. The Rock Cycle
- l. Streams and Groundwater
- m. Oceans and Coastlines
- n. Deserts, Glaciers and Climate Change
- o. Earth Resources and the Role of Geoscientists

The major areas that will be covered in lab are:

- a. Observing and Measuring Earth Materials and Processes
- b. Plate Tectonics
- c. Mineral Properties, Uses and Identification
- d. Rock-Forming Processes and the Rock Cycle
- e. Igneous Rocks and Volcanoes
- f. Sedimentary Rocks, Processes, and Environments
- g. Metamorphic Rocks and Processes

- h. Dating of Rocks, Fossils, and Geologic Events
 - i. Topographic Maps and Aerial Photographs
 - j. Geologic Structures, Maps, and Block Diagrams
 - k. Stream Processes, Landscapes, Mass Wastage, and Flood Hazards
 - l. Groundwater Processes, Resources, and Risks
 - m. Glacial Processes, Landforms, and Indicators of Climate Change
 - n. Dryland Landforms, Hazards, and Risks
 - o. Coastal Processes, Landforms, Hazards, and Risks
 - p. Earthquake Hazards and Human Risks
1. Three lecture hours and three laboratory hours per week.
 2. GEOL 1403 earns four credit hours.
 3. Prerequisite: None.
 4. This is a Core Course in the 42-hour Core of Blinn College; more can be found at <http://www.blinn.edu/corecurriculum/>. As such, students will develop proficiency in the appropriate Intellectual Competencies, Exemplary Educational Objectives, and Perspectives, as follows:
 - a. Intellectual Competencies
 - i. **Reading:** The ability to analyze and interpret a variety of printed materials, books, documents and articles – above the 12th grade level.
 - ii. **Writing:** The ability to produce clear, correct and coherent prose adapted to purpose, occasion and audience - above the 12th grade level.
 - iii. **Listening:** The ability to analyze and interpret various forms of spoken communication, possess sufficient literacy skills of writing, reading – above 12th grade level.
 - iv. **Critical Thinking:** The ability to think and analyze at a critical level.
 - v. **Computer Literacy:** The ability to understand our technological society, use computer-based technology in communications, solving problems, acquiring information.
 - b. Exemplary Educational Objectives
 - i. To understand and apply method and appropriate technology to the study of natural sciences.
 - ii. To recognize scientific and quantitative methods and the differences between these approaches and other methods of inquiry and to communicate findings, analyses, and interpretation both orally and in writing.
 - iii. To identify and recognize the differences among competing scientific theories.
 - iv. To demonstrate knowledge of the major issues and problems facing modern science, including issues that touch upon ethics, values, and public policies.
 - v. To demonstrate knowledge of the interdependence of science and technology and their influence on, and contribution to, modern culture.
 - c. Perspectives
 - i. To develop a capacity to use knowledge of how science and technology affect their lives.
 - ii. To use logical reasoning in problem solving.
 - iii. To integrate knowledge and understand the interrelationships of the scholarly disciplines.

Course Objectives and Student Learning Outcomes

Upon completion of the course, the student will have an overall average of $\geq 60\%$ of the combined lecture and laboratory components of the course. This includes at least 3 to 4 major exams and quizzes given at the discretion of the Instructor. In the laboratory, the student will demonstrate an understanding of the lab activity through analysis of materials presented in lab and through being able to use these materials to solve problems and explain geological processes.

These learning outcomes will include the student showing competence in the course objectives that are listed below:

From Lecture:

1. Factors which distinguish the sciences from other fields of knowledge and methods of learning
2. How and why geology differs from other sciences
3. Processes involved in cycling matter and energy through the various Earth Systems
4. Vocabulary and basic concepts of geology
5. Plate tectonic theory and its significance to geology
6. Nature of the Earth's interior structure
7. Occurrences of rocks and minerals
8. Geologic time and the rock record
9. Surficial processes and resulting landforms
10. Occurrences of mineral resources
11. How geology currently affects us and has influenced human affairs

From Lab:

1. The use of the scientific method in developing and testing geological hypotheses
2. Identification and interpretation of rocks and minerals
3. Determination of relative and absolute age of rock formations and geological events
4. Calculation of rates and direction of tectonic plate motion
5. Assessment of geohazard risk (earthquake, volcanic eruption, flood, etc.)
6. Analysis of geologic maps and structures
7. Identification and interpretation of landforms based on topographic map data and remote imagery

Course Requirements

1. The student should do each of the following:
 - a. Read the assigned chapters in the textbook and laboratory manual.
 - b. Attend all lectures and laboratory classes.
 - c. Take notes in class.
 - d. Participate in class discussions.
 - e. Complete assigned outside reading material and homework.
 - f. View audiovisual materials on selected topics.
 - g. Use the computer software in the lab and/or classroom as it is assigned.
 - h. Complete the exams on the assigned dates; the exams may include essay questions.

2. For laboratory the student should:
 - a. Read and comprehend each exercise assigned in the laboratory manual.
 - b. Successfully complete each exercise.
 - c. Learn to use and/or analyze geological material and maps as needed to complete the exercises.

Grading System

The following areas will be clearly outlined by the Instructor in the Course Information Sheet given to the students in the first week of the semester:

1. Major Exams: Three or four major exams covering the lecture material, evenly distributed throughout the semester.
2. Laboratory: May be included on major exams or the instructor may give quizzes covering lab material or a laboratory final exam. Represents a minimum of 25% of the grade for the class.
3. Minor Exams/Quizzes/Homework: Given at the discretion of the instructor.
4. Additional Reports or projects: Given at the discretion of the instructor.
5. Final Exam: Comprehensive exam covering the entire course required of all instructors.

Outcomes Inventory

GEOL 1403 will be evaluated through the following methods:

1. A pre- and post-test instrument is used to determine the extent of improvement the class has gained during the semester.
2. Each Intellectual Competency listed above will be evaluated to measure its attainment:
 - a. To measure reading:
 1. Pre- and post-test or exam or quiz over assigned textbook readings
AND
 2. Lab assignment or exam or quiz over lab book readings OR
 3. Written assignment or exam over assigned journal articles.
 - b. To measure writing:
 1. Written assignment on internet or journal research OR
 2. Term paper AND
 3. Essay question(s) on exam.
 - c. To measure listening:
 1. Pre- and post-test or exam or quiz over lecture material OR
 2. Quiz over audiovisual material presented in class.
 - d. To measure critical thinking:
 1. Lab assignment or exam or quiz involving problem solving.
 - e. To measure computer literacy:
 1. Quiz over Internet/CD-Rom/DVD activities OR
 2. Writing assignments submitted online OR
 3. Presentation using computer technology.
3. Grades of students completing the course will be compared with those who complete GEOL 1403 in other semesters.

Calendar

The instructor will ensure that the course content is covered in a manner that fulfills the course objectives. The instructor will also provide Course Information Sheets to the students and the administration during the first week of the semester. Important details including tentative examination dates and due dates for assignments are provided. The following is a suggested calendar of lecture and laboratory topics for the semester:

Week	Lecture Topic
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1. Science of the Earth System
2. Atoms, Elements, Minerals and Rocks
3. The Rock Record and Geologic Time
4. Plate Tectonic Theory
5. Earthquakes and Earth's Interior
6. Volcanoes and Igneous Rocks
7. Weathering and Erosion
8. Sediments and Sedimentary Rocks
9. Folds, Faults, and Geologic Maps
10. Metamorphic Rocks
11. The Rock Cycle
12. Streams and Groundwater
13. Oceans and Coastlines
14. Deserts, Glaciers and Climate Change
15. Earth Resources and the Role of Geoscientists

Week	Laboratory Topic
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1. Observing and Measuring Earth Materials and Processes
2. Plate Tectonics
3. Mineral Properties, Uses and Identification
4. Rock-Forming Processes and the Rock Cycle
5. Igneous Rocks and Volcanoes
6. Sedimentary Rocks, Processes, and Environments
7. Metamorphic Rocks, Processes
8. Dating of Rocks, Fossils, and Geologic Events
9. Topographic Maps, Geologic Structures, Geologic Maps, and Block Diagrams
10. Stream Processes, Landscapes, Mass Wastage, and Flood Hazards
11. Groundwater Processes, Resources, and Risks
12. Glacial Processes, Landforms, and Indicators of Climate Change
13. Dryland Landforms, Hazards, and Rocks
14. Coastal Processes, Landforms, Hazards, and Risks
15. Earthquake Hazards and Human Risks

Materials Required

Suggested Lecture Materials:

Geology Today: Understanding our Planet by Murck and Skinner (Wiley, 1999)

GeoSystems Today by Ford and Hipple (Wiley, 1999)

Suggested Laboratory Materials:

Laboratory Manual in Physical Geology SIXTH EDITION by AGI/NAGT OR

Geology from Experience by E. Kirsten Peters and Larry E. Davis, (W.H. Freeman, 2001)

Addendum for Internet Courses

Course Requirements

1. The student should do each of the following:
 - a. Have access to a computer with a reliable Internet connection.
 - b. Effectively use the computer software and tools for the online classroom including navigating the web using an Internet browser such as Netscape or Internet Explorer.
 - c. Download and upload files from the Internet and attach and save files associated with e-mail.
 - d. Read the assigned chapters in the textbook and laboratory manual.
 - e. Take notes on the assigned reading materials.
 - f. Complete assigned reading material and homework.
 - g. View audiovisual materials on selected topics.
 - h. Complete and submit quizzes online.
 - i. Complete major exams on the assigned dates at an Instructor approved proctored testing facility; exams may include essay questions.
 - j. Participate in online class discussions.
 - k. Participate in optional online tutorial sessions.

2. For laboratory the student should:
 - a. Read and comprehend exercises assigned from the laboratory manual or from files available in the online classroom.
 - b. Successfully complete each exercise and submit using the online software.
 - c. View audiovisual materials on selected topics.
 - d. Learn to use and/or analyze geological material and maps as needed to complete the exercises.
 - e. Attend scheduled Saturday lab exams.

Materials Required

Lecture Materials:

Earth: Intro. Physical Geology, 7th., 2003. Tarbuck. Pearson Co.

Austin Sheet Map (GA 0003). 2003. Proctor. Bureau of Economic Geology.

Bryan East Quadrangle. 1st. US Geological Survey

Laboratory Materials:

Laboratory Manual in Physical Geology 6th., 2003.AGI. Pearson Co.

Geology Laboratory Manual for Distance Learning by Ruhle (Kendall/Hunt, 2002). Includes rock samples, maps, videos and other tools for at home labs.

Geological Highway Map of Texas (AAPG, 1979)