

Blinn College

Master Course Syllabus

GEOLOGY 1445 - OCEANOGRAPHY

CIP #40.0601.51 03

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Prepared by:

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# GEOL 1445 OCEANOGRAPHY

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 oceanography leads students to appreciate the geological, biological, physical, and chemical nature of the world's oceans, how ocean systems couple with terrestrial and atmospheric systems to affect the planet we live on and their past, present and future significance in human affairs.

## Course Description

General principles of oceanography. Topics include the origin of the ocean basins; geologic processes in marine environments; waves, tides, and coastal processes; the ocean's role in climate variability and climate change; organisms that live in the ocean, their ecological communities and their interactions; and marine resources and human influences on the oceans.

Laboratory work includes the physics of waves currents, and tides; seawater chemistry; geological analysis of seafloor materials; bathymetric charts and maps, and marine life. Prerequisites: None. Three class hours and three laboratory hours per week. Credit: Four semester hours.

The major areas that will be covered in lecture are:

- a. The History of Oceanography
- b. Origin of Earth, Oceans, and Life
- c. Plate Tectonics and the Origin of Ocean Basins
- d. Marine Sediments
- e. Seawater
- f. Wind and Ocean Circulation
- g. Waves and Tides
- h. Marine Ecology
- i. Biological Productivity
- j. Coastal and Shoreline Processes
- k. Coastal Habitats and Biota
- l. Oceanic Habitats and Biota
- m. Ocean Resources
- n. Human Impact in the Ocean

The major areas that will be covered in lab are:

- a. Marine Maps, Charts, and Navigation
- b. Geography of the Ocean
- c. Seafloor Materials
- d. Temperature, Salinity and Seawater Density
- e. Waves, Currents and Tides
- f. Marine Ecosystems and Nutrient Cycles
- g. Marine Biota (Plankton, Nekton, and Benthos)
- h. Shoreline Processes
- i. Climate and Seasonality

This is a Core Course in the 42-Hour Core of Blinn College. As such, students will develop proficiency in the appropriate Intellectual Competencies, Exemplary Educational Objectives, and Perspectives. For more information, go to: [www.blinn.edu/corecurriculum](http://www.blinn.edu/corecurriculum)

a. Intellectual Competencies

- i. **Reading:** The ability to analyze and interpret a variety of printed materials, books, documents and articles – above the 12<sup>th</sup> grade level.
- ii. **Writing:** The ability to produce clear, correct and coherent prose adapted to purpose, occasion and audience - above the 12<sup>th</sup> grade level.
- iii. **Listening:** The ability to analyze and interpret various forms of spoken communication, possess sufficient literacy skills of writing, reading – above 12<sup>th</sup> 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 demonstrated mastery of 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 chapter/weekly quizzes given at the discretion of the Instructor. In the laboratory the student will successfully complete the exercises. The student will demonstrate in the laboratory an understanding of the exercises through analysis of materials presented in lab and being able to use these materials to solve problems and explain oceanographic processes.

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

**From Lecture:**

1. Review the major historical advances in the study of oceanography
2. Understand how plate tectonic theory accounts for the nature and origin of ocean basins
3. Learn the different types of marine sediments and their distribution on the seafloor
4. Discuss the composition of seawater and the processes that influence its composition
5. Learn the basic principles of ocean and atmospheric circulation and discuss the nature and origin of winds, waves, currents and tides
6. Learn the major types of organisms that inhabit the various zones of the ocean and their ecological relationships
7. Understand the unique processes that exist in the coastal zones of the ocean
8. Discuss human interaction with the ocean

**From Lab:**

1. Learn to interpret marine maps and charts, including bathymetric and navigational maps
2. Be able to identify the major geographical features of the oceans
3. Learn to recognize the major types of seafloor materials, including crustal rocks and sediments
4. Be able to measure and interpret the major properties of seawater and explain how they influence marine processes
5. Learn to measure, calculate and interpret the parameters for waves, currents and tides
6. Learn to identify the major types of marine organisms and their habitat
7. Be able to analyze and interpret marine ecological data
8. Learn to analyze and interpret marine climatological and/or paleoclimatological data

**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 20% 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: A comprehensive final exam covering the entire course representing 20% of the final course grade is required of all instructors.

## **Outcomes Inventory**

GEOL 1445 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 OR
    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
3. Grades of students completing the course will be compared with those who complete GEOL 1445 in the following semester.

## **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**

Week 1: History of Oceanography and Earth  
Week 2: Plate Tectonics and Marine Provinces  
Week 3: Marine Sediments and Coastal Processes  
Week 4: Seawater Composition  
Week 5: Seawater Density and Stratification  
Week 6: Oceanic Nutrient Cycling  
Week 7: Ocean circulation and Global Climate  
Week 8: Ocean Circulation - Geostrophic  
Week 9: Ocean Circulation - Thermohaline  
Week 10: Waves and Tides  
Week 11: Marine Life and Marine Environments  
Week 12: Marine Biological Productivity and Energy Transfer  
Week 13: Pelagic Organisms  
Week 14: Benthic Organisms  
Week 15: Marine Resources and Fisheries

**Week            Laboratory Topic**

Week 1: Sampling Statistics and Measurements  
Week 2: Isostasy and Rock Density  
Week 3: Bathymetry  
Week 4: Sedimentation  
Week 5: Salinity  
Week 6: Physical Factors Affecting Seawater Density  
Week 7: Radiation, Albedo and Light Transmission  
Week 8: Waves  
Week 9: Currents  
Week 10: Tides  
Week 11: Phytoplankton  
Week 12: Zooplankton  
Week 13: Nekton  
Week 14: Benthos  
Week 15: Seasonality

**Course Materials:**

**Suggested Lecture Materials:**

*Essentials of Oceanography, 8e*, Trujillo and Thurman, 2004, Prentice Hall.  
*Invitation to Oceanography*, 3<sup>rd</sup>. Pinet. Jones & Bartlett Co.

**Suggested Laboratory Materials:**

*Experiments in Oceanography*, Wormuth, J., 2004. Pearson.  
*Laboratory Experiments to Accompany Invitation to Oceanography*, 3<sup>rd</sup> ed. Chauffe & Jeffries. Jones & Bartlett Co.