College of Science and Health
ENVIRONMENTAL SCIENCE
INTRODUCTION TO OCEANOGRAPHY

1. COURSE NUMBER AND TITLE: ENV 2160 - Introduction to Oceanography

2. OFFERED BY: Department of Environmental Science and Geography

3. PREPARED BY: Richard Pardi, Michael Griffiths

4. CREDIT HOURS: 3 credits

5. REASONS FOR OFFERING This course is intended as an elective for primarily science majors who may interested in obtaining an introduction to physical, chemical and biological oceanography. The prerequisites would also allow non-majors who have completed their GE science requirements to take the course.

6. REQUIREMENTS: ENV-1150, Permission of Chairperson, Open to all ENV, ES and ENVSUS majors

7. COURSE DESCRIPTION: An introduction to the attributes and natural processes of the world's oceans. Topics to be covered include: origin and evolution of the oceans; air-sea interaction, hydrologic cycle, and weather; ocean circulation and currents; tides and waves, beaches and shoreline processes; marine organisms, biodiversity and biological productivity; sea-level rise and global warming. 2-1/2 hr. lecture. (this course is also offered occasionally as a hybrid on-line course)

8. STUDENT LEARNING OBJECTIVES & OUTCOMES:
Upon completion of this course students should be able to:

1. Demonstrate familiarity with the basic physical features of the ocean basins and the processes that formed those features as evidenced by and through their performance on examinations.
2. Understand how ocean sediments form and how those sediments are used to interpret and critically examine evidence for ocean history as assessed either by performance on examinations or through papers and oral reports.
3. Understand the nature of ocean currents and the methods used to study them as evidenced either by performance on examinations or through papers and oral reports.
4. Demonstrate a basic understanding of ocean-water chemistry, the fundamental cycles that control ocean chemistry, and the methods used to study those cycles by critically evaluate either/or empirical or theoretical change in ocean chemistry and its consequences.
5. Demonstrate a broad knowledge of ocean life, including the names and relationships between marine flora and fauna, and be able, through written reports or oral presentation, to relate the distribution of ocean life to the physical and chemical variations of ocean water.
6. All of the above objectives shall be accompanied by the student's demonstrated ability to collect and integrate information from a variety of paper and electronic courses.

9. COURSE CONTENT:

A. The origin of the Earth,. the oceans, and life: (2 weeks).

1. Age of the Earth and its origin, radioactive dating.
2. Origin of the oceans. role of volcanic activity as a source of water.
3. Origin of life. nature and composition of the early ocean and atmosphere, role of ultra-violet radiation environment of the primitive Earth.
4. Changes in the distribution of land and sea during geologic time. area and Volume of the oceans

at present.

B. History of oceanography early investigations and modern research: (2 weeks)
   l. Research Ships, submersible devices, drilling apparatus.
   2. Sounding methods, sea-floor sampling devices, underwater photography.
   3. Biological, geological, geophysical, and chemical research.
   4. Recent advances in the use of space photography.

C. Chemical oceanography: (2 weeks)
   1. Properties of water and the effects of adding salt and other substances to water.
   2. Composition of sea water; dissolved inorganic matter, dissolved gases and organic materials, particulate substances.
   3. Reactions that influence the ocean's chemical composition: chemical and biochemical reactions and physical processes.
   4. Isotopes in chemical oceanography - stable and radioactive isotopes. Oxygen-18, Potassium-40, and Carbon-14.

D. Biological oceanography: (2 weeks)
   1. The biological environment of the sea and biologically important properties of sea water.
   2. Divisions of the marine environments the benthic and pelagic realms
   3. The biological community, the population of the ocean, and the biomass and
   4. Plant and animal life of the sea, coral reefs and atolls.

E. Physical oceanography: (3 weeks)
   1. Physical properties of sea water: temperature, salinity, and density.
   2. Interaction of the atmosphere and the ocean: wind-driven circulation, wind-generated waves, internal waves the geostrophic current, storm surges.
   3. Tides and tidal currents, earthquakes and tsunami.
   4. Turbidity currents and the transportation of sediment.
   5. Sound and light transmissions through water.

F. Marine Geology and geophysics: (2 weeks)

   1. The continental margin: coasts and shorelines, beaches, estuaries, lagoons, and processes that affect the shore.
   2. Continental shelves and slopes. submarine canyons.
   3. The ocean basins: abyssal plains, trenches, mid-oceanic ridges and guyots; sea-floor spreading, volcanic and magnetic researches, deep-sea sediments
   4. Crustal structure beneath the oceans and continents, continental drift and the origin of the ocean basins, recent advances in geophysical investigations.

G. Resources of the oceans: (2 weeks)

1. Renewable and non-renewable resources. biological, chemical. physical and geological resources.
2. Pollution: its sources effects. regulation and control.
3. The future of oceanography and the oceans.

10. TEACHING METHODS:

1. Lectures, discussion, audio-visual materials.
2. Group, student-led discussion.
3. Computer simulations of ocean-processes.
4. A field trip will be made to the Lamont-Doherty Earth Observatory, the New Jersey Marine Consortium. or to some other nearby oceanographic establishment.

11. EVALUATION:

Two one hour examinations. problem sets, a term paper, and a final.

12. TEXTBOOK:

Garrison, T., 2005, Oceanography, Thomson Learning Brooks/Cole, Belmont, CA.

13. Pertinent References:

Carson, R., 1961, The Sea Around Us, Signet Science Library, The New American Library, N.Y., N.Y.

Gross, M.G., Oceanography: A View of the Earth, (most recent edition) Prentice Hall.

Hill, M.N., ed., 1965, The Sea: Ideas and Observations on Progress in the Study of the Seas, Volumes 1, 2, and 3, John Wiley & Sons, Inetrscience Publishers, N.Y. (These volumes are now out of print, but remain the fundamental reference work for marine geology up through the period of explosive growth in knowledge during the early 1960's)

Hsu, K., 1983, The Mediterranean Was a Desert: A Voyage of the Glomar Challenger, Princeton University Press, Princeton, N.J.

Pickard, G.L., Descriptive Physical Oceanography, (most recent edition) Pergamon Press, Oxford, England.

Stowe, K., Ocean Science, (most recent edition) John Wiley and Sons, New York.

Sverdrup, H.U., Johnson, M.W., and Fleming, R.H., 1942, The Oceans: Their Physics, Chemistry, and General Biology, Prentice Hall, Inc., Englewood Cliffs, N.J. (this book is out of print but is and will always be the primary reference in Oceanography).

Weyl, P. , Oceanography: An Introduction to the Marine Environment, (most recent edition) Wiley, New York.

15. PREPARER'S NAME AND DATE: Richard R. Pardi, January 25, 2005

16. ORIGINAL DEPARTMENTAL APPROVAL DATE: Spring 1990

17. REVISER'S NAME AND DATE: Richard Pardi, December 2004, Michael Griffiths 2013

18. DEPARTMENTAL REVISION APPROVAL DATE: Spring 2005, Fall 2013