CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

LSC Use Only	
Number	
Action	
Date	

UWUCC Use Only	
Number	37
Action	
Date	

I. TITLE/AUTHOR OF CHANGE GS 141 Introduction to Ocean Science
COURSE/PROGRAM TITLE ~~GS 141Introduction to Ocean Science~~
DEPARTMENT Geoscience
CONTACT PERSON Dr. R. Richardson

II. THIS COURSE IS BEING PROPOSED FOR:

___ Course Approval Only
_✓_ Course Approval and Liberal Studies Approval
___ Liberal Studies Approval only (course previously has been approved by the University Senate)

III. APPROVALS

Connie J. Sutton
Department Curriculum Committee

Richard D. Roberts
College Curriculum Committee

Director of Liberal Studies
(where applicable)

Department Chairperson

College Dean*

Provost
(where applicable)

*College Dean must consult with Provost before approving curriculum changes. Approval by College Dean indicates that the proposed change is consistent with long range planning documents, that all requests for resources made as part of the proposal can be met, and that the proposal has the support of the university administration.

IV. TIMETABLE

Date ~~Submitted~~ to LSC _____
to UWUCC _____

~~Semester/Year to be implemented~~ _____

Date to be ~~published~~ in Catalog _____

Revised 5/88

(Attach remaining parts of proposal to this form.)

APPLICATION FOR LIBERAL STUDIES APPROVAL FOR 1989-1990

COURSE: GS 141 INTRODUCTION TO OCEAN SCIENCE

LIBERAL STUDIES CATEGORY: NATURAL SCIENCE: NON-LABORATORY

PROPOSERS: DR. DARLENE S. RICHARDSON and PROF. PAUL A. PRINCE
GEOSCIENCE DEPARTMENT

PROPOSED CATALOG DESCRIPTION

GS 141 Introduction to Ocean Science 3c-01-3sh
Prerequisite: none

Introduction to physical, chemical, biological, and geological processes in oceanography and the interactions among them. Impact of exploitation of the oceans, coastal areas, marine physical and living resources on the environment and on humankind. Includes field trips which may occur on weekends.

PART I. BASIC INFORMATION

A. Knowledge Area: Natural Sciences: Non-Laboratory Course

B. Regular approval for this course is requested

C. No, this course should not be listed as an approved substitute for a current General Education course.

PART II. LIBERAL STUDY GOALS MET BY THIS COURSE

A. Intellectual Skills and Modes of Thinking

1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process: primary goal

This introduction to marine sciences course will provide the students with the scientific concepts, terms, and principles of the origin of the oceans, the methods of accumulating data about the oceans, and the understanding of the oceans in terms of large scale physical, chemical, geological, and biological processes and cycles. Such an understanding will allow the students to appreciate that the oceans, atmosphere, biosphere, and land make up an integrated whole. They will understand that changes in one of these will affect the others. For example, we will discuss the ability of the oceans to take up excess carbon dioxide being produced by the burning of "fossil fuels" and thus ameliorate the build-up of that gas in the atmosphere. The students will also appreciate that the oceans cannot be used as a sewer for humankind's waste products without detriment to both the physical and living environments. The students will, by means of a research paper or field experience and in their examinations, not only critically evaluate lecture material and readings in terms of scientific principles and natural processes, but will also study the decisions made in the past about coastal land developments, fishing, and pollution, as examples, which will help them make decisions in the future about balancing the exploitation of the marine environments versus preservation of the natural environment, wildlife, and

so on. The primary objective in this course is to produce citizens who can appreciate the complexity of the world ocean and make informed decisions about the ramifications (positive and negative) of, for example, uses of deep sea mineral resources.

2. Literacy--writing, reading, speaking, listening: primary goal

The students will be required to write a short paper (5-10 pages) on some aspect of the marine sciences or they will write a scientific journal of their field experiences. They may choose their topics from a list of topics generated by the professor, so that the students are assured that sufficient information on these topics is easily available to them. They can look at their topics from a variety of perspectives--for example, they may wish to deal with the chemistry of the oceans rather than with the geology of the ocean floors.

Those students who elect to go on the four-day oceanographic field trip at the Marine Science Consortium at Wallops Island, Virginia will write up their scientific results in the form of a journal. This journal will include not only the raw scientific data, but will also indicate what these data can tell us about the state of the ocean at that time. For example, an analysis of the distribution of temperature and salinity with depth will indicate the tidal stage. The students will be given a specific format in which to enter their scientific observations.

The students will also be assigned two or three short writing assignments--some of which will be done in class and some of which will be done out of class. The students will write a review of the articles or book (other than the textbook) which they have read. The tests will be combinations of short answer type and essay type questions. In addition to their textbook, the students will read a book, journal articles, and newspaper articles concerning the marine sciences.

3. Understanding numerical data: secondary

The students need to understand numerical data in order to solve some simple problems which will be assigned to them as homework assignments. They will also need elementary computational skills to allow them to critically evaluate conflicting models for the genesis of ocean floor, for example.

4. Historical consciousness: secondary

The development of oceanography as a science which incorporantes many branches of science within it will be laid in a historical context. It will be made obvious to the students that theories about the evolution of the oceans and oceanic crust were postulated after years of collecting oceanographic data using a variety of instruments and techniques. Much of what the students learn in this course will be placed in its historical sequence.

5. Scientific inquiry: primary

The lectures throughout the course will emphasize how the advances and revolutions in our knowledge of the sea around us depend on the accumulation of data and old and new ways of looking at that data. Given a set of information and given their basic scientific knowledge from lectures the students themselves will be

encouraged to speculate on differing models or theories which place the data in a systematic framework. With their model or theory the students should be able to make predictions concerning the nature of the oceans and ocean floor in other areas and they should be able to develop plans for scientific investigations which will prove/disprove their hypotheses.

6. Values(ethical mode of thinking or application of ethical perspection):primary

Application of our knowledge of the oceans is laden with ethical judgements. Because the oceans, air, and land are intimately inter-related and because a change in one affects the change in another, humankind, in its exploitation of the oceans, must make value judgments about what is more important to its way of life. As examples, we can ask the question as to whether government money should be used to support infrastructures to housing/commercial/industrial developments on barrier islands when we know that these infrastructures are built on shifting sands and that these coastal marine environments are easily destroyed by sewage and industrial effluents. Or, we can note that building dams upstream of major deltas will inevitably result in the erosion of that delta and the destruction of a major habitat for commercial fish (e.g. Aswan Dam and Nile Delta). Citizens can best make valued judgements when they understand the consequences of their actions/inactions on the physical and living world around them.

B. Acquiring a body of knowledge or understanding essential to an educated person: primary

As mentioned above, the primary objective in the course is to produce an educated citizenry who can make effective decisions concerning the use of the oceans or coastal areas on the basis of understanding how the oceans "work." Much of what we as a nation do in the future will impact upon the oceans. For example, estuaries and coastal marshes are important nurseries for 50-70% of commercial marine fish. When we convert that marshland to a football stadium or pollute the estuaries we should know that we are potentially harming our food supplies. In 1979, Dr. Paul Barton of the US Geological Survey said: "It is as important for the future voter to appreciate the realities of our resource-environment situation as it is to be able to read the ballot."

D. Certain Collateral Skills:

1. Use of the Library: primary

In writing their papers and in their readings outside the assigned textbook, the students will have to use the library. They will be introduced to the computer bibliographic retrieval system of DIALOG which will facilitate their search for background information for their papers.

PART III. GENERAL CITERIA FOR LIBERAL STUDIES

A. This course will be taught as one section by one professor.

B. Traditionally, marine science, as a field science, has been a man's world, although women have (and still do) contributed greatly in laboratory studies. The reasons for this past exclusion of women is difficult to assess although much of it was due to

society's (American and European primarily) perceptions of "women's roles." Today, however, women are leaders and members of oceanographic research cruises as students will discover in their readings and in their viewing of videocassettes and films. Lectures and test questions will continue to be sensitive to gender-balancing in both use of language and selection of examples. In the United States men of color have been important discoverers of oceanographic processes (ex. Hsu and the drying up of the Mediterranean Sea) and men of color are playing even more important roles with international oceanographic and marine geological expeditions.

C. The students will be required to read one of the books listed in the syllabus. Other readings such as journal articles and newspaper articles will be assigned throughout the course with attempts to balance the required reading among the various sub-disciplines of marine science. Some of the specific journal articles are given in the syllabus.

D. This course is designed for the non-geology/geoscience major. We offer a majors level course GS 361 Physical Oceanography which has PY 111 Physics I and MA 121 Calculus I as prerequisites. We also offer a half-semester course GS 101 Geology/Oceanography with or without lab. This course will differ from GS 361 in its much more elementary nature and non-mathematical approach. It will differ from GS 101 in that the study of the world ocean with be studied in greater breadth and depth. A full semester' s worth of lectures and readings will enable the student to study geological, biological, and chemical oceanography in greater detail than the physical oceanography which is mainly taught in GS 101.

E. 1. Confront the major ethical issues which pertain to the subject matter

As discussed above in section II A, the students will use their knowledge of the the processes which operate in the oceans and ocean basins to be able to make decisions about some of the major developmental and environmental issues which they will face in the 21st century. For example, the American people will have to come to some decision about nuclear energy, location of waste disposal of nuclear wastes, and the search for alternate sources of energy (example, wave energy or tidal waters in hydroelectrical plants). Some people feel that the oceans can be an unlimited dump for the disposal of waste products from the production of nuclear energy as well as well as sewage. The students will find out how delicate or robust the marine environment is. The potential for exploitation of mineral resources from the seafloor is great--who owns these resources and what would be the impact of mining the seafloor have on deep sea life and the health of the oceans in general are two of the most obvious questions that we can ask ourselves now and which will have to be answered in the future if we exploit the oceans.

2. Define and analyze problems, frame questions, etc.

In being able to confront major ethical issues given above as examples, the students will be able to define and analyze these questions in terms of their knowledge of scientific principles and oceanographic processes and examples given in lecture and in their readings of case histories detailing past problems and solutions and continuing problems in humankind's impact on the oceans both in terms of the physical environment as well as of the living environment. Given basic knowledge of the sea around us the students should be able to make informed, rational choices on many issues of concern dealing with the oceans, coastal areas, and ocean

floors.

3. Communicate knowledge and exchange ideas

By reading books and articles in addition to their textbook and by writing a paper and answering essay questions, the students will communicate their knowledge and show that they can bring together different lines of thought to solve a problem. By having students do a reflective paper on one of their readings, they can express their opinions on a specific issue. For those students who elect to go on the oceanographic expedition, their journals should allow their colleagues who did not go to sea to learn about data collection.

5. Continue learning

The main objective of this course is to produce informed citizens who understand the complexities of some of the environmental versus developmental questions which they will face on local, regional, or national levels. By having them read popular science literature and newspaper and journal articles, the students will continue to be interested in the oceans and environmental issues and, we hope, will continue to keep themselves informed and involved in these discussions and problems.

6. Recognize relationship between what is being studied and current issues, thoughts, etc.

Marine sciences and environmental issues are of daily interest and concern to the general public. The students will have no trouble seeing the interrelationships among marine sciences, environmental concerns, developmental issues, alternate energy searches and their daily lives, for these topics will occur in every section of the newspaper, from front page to business section.

Part IV. CHECK LIST OF CRITERIA TO BE SAFISFIED FOR NATURAL SCIENCES: NON-LABORATORY COURSE

Knowledge Area Criteria which the course must meet:

✓ Treat concepts, themes, and events in sufficient depth to enable students to appreciate the complexity, history, and current implications of what is being studied; and not be merely cursory coverages of lists of topics.

✓ Suggest the major intellectual questions/problems which interest practitioners of a discipline and explore critically the important theories and principles presented by the discipline.

✓ Allow students to understand and apply the methods of inquiry and vocabulary commonly used in the discipline.

✓ Encourage students to use and enhance, wherever possible, the composition and mathematics skills built in the Skill Areas of Liberal Studies.

Natural Science Criteria which the course must meet:

✓ Examine a body of knowledge of natural science that will contribute to an understanding of the natural world.

✓ Provide an understanding of the development of natural science theories and their modification.

✓ Teach students to formulate and test hypotheses.

✓ Provide an understanding of some of the "great moments" in the history of natural science and the individuals, including women and minorities, responsible for them.

Additional Natural Science Criteria which the course should meet:

✓ Encourage an appreciation of the complex interrelationship of natural science with the life of the individual.

✓ Develop in students the abilities necessary to cope with the consequences of natural science in the modern world.

✓ Develop an inquiring attitude consistent with the tenets of natural science, an attitude that is willing to expose fallacy on the basis of reason, that demands evidence for scientific assertions, and yet is tolerant of hypotheses in the absence of contradictory evidence.

COURSE SYLLABUS

GS 141 INTRODUCTION TO OCEAN SCIENCE
Prerequisite: none 3c-0l-3sh

Introduction to physical, chemical, biological, and geological processes in oceanography and the interactions among them. Impact of exploitation of the oceans, coastal areas, marine physical and living resources on the environment and on humankind. Includes field trips which ~~may~~ occur on weekends. May involve a fee and may

Course Objectives:

1. You should be able to discuss briefly the oceanographic research that needs to be undertaken in the following fields of study, explaining why such research would be useful, and identifying general methods by which oceanographic data should be collected in each of the following cases:
   a. oceanic circulation
   b. the ocean crust, including deep-sea sediments
   c. atmosphere, surface waters, life interactions with seawater

2. Given data, you should be able to deduce the degree of exploitation of fish in different areas of the oceans and identify the problems involved in predicting potential fish catches and in managing fisheries

3. You should be able to list the actual and potential physical resources obtainable from within and beneath the oceans and you should be able to discusss the limitations that govern the exploitation of these resources.

4. You should be able to describe the shape of the ocean basins (major physiographic provinces) and explain the importance of this knowledge of the bathymetry of the seafloor.

5. You should be able to describe the major stages in the evolution of an ocean basin, and given suitable data, to determine the stage of evolutions of any ocean basin.

6. You should be able to explain the physical-chemical-biological parameters (listed below) and describe any important effects that variation in one parameter may have on any of the others.
   a. static physical properties: temperature, density, transparency, pressure, sound
   b. dynamic physical properties: currents, tides, waves
   c. chemical properties: salinity, dissolved gases, nutrients
   d. biological properties: productivity, diversity
   e. sedimentary properties: processes and products, preservation vs destruction

7. You should be able to describe and explain, in general terms, the following:
   a. surface ocean currents
   b. thermohaline circulation
   c. tides
   d. waves and their effects on coastlines

8. You should understand what controls the amounts of the principal chemical and biological components of the oceans.

Hey Jacob. See and Mary

9. You should be able to describe and explain, in general terms, the physical, chemical, biological, and geological processes occurring at the boundaries of the ocean system, including
   a. the ocean-atmosphere boundary
   b. the ocean-ocean floor boundary
   c. the ocean-continent (coastal zone) boundary

10. Given examples of a particular coastal area, you should be able to discuss the activities of humans in that coastal zone and describe how such activities relate to
   a. sediment movement
   b. fish and other living organisms
   c. pollution
   d. changes in the environment

11. You should understand the processes by which sediments deposited on the ocean floors record the history of the oceans and you should be able to list the major historical changes in ocean size, bathymetry, chemistry, biology and currents.

12. Finally, you should appreciate (and to able to show with examples) that the oceans must be viewed as an interrelated physical, chemical, and biological system and that the sediments deposited on the seafloor record any changes in that system.

Course Outline:

Introduction to oceanography: what is it, why we study it, brief history of ocean exploration, instrumentation, coordinate systems, living and non-living resources (read Davis, preface, chapters 1and 20) (1.5 weeks)

Ocean basins: bathymetry, phsiographic provinces, major geological processes, plate tectonics (read Davis, chapters 2,3 and 10) (2 weeks)

Physical and chemical properties of seawater: the water molecule, temperature, salinity, density, sound, illumination, pH (read Davis, chapter 4) (1.5 weeks)

Oceanic circulation: surface circulation, thermohaline circulation, upwelling, downwelling, tides (Davis, chapters 5 and 7) (2.5 weeks)

Coastal (shoreline) processes: waves and beaches, estuaries, deltas, barrier islands, rocky coasts, reefs (Davis, chapters 11-15) (3 weeks)

Open ocean processes and environments: outer continental margins, abyssal ocean, mid-oceanic ridges and thermal springs (3 weeks)

Required textbook:

Davis, Richard A., 1987, Oceanography, an introduction to the marine environment: Brown, 432 pages.

Additional reading:

You are required to read and write a report on one of the following books. Journal

articles will be assigned during lectures. Newspaper articles may also be assigned as extra reading and will be placed on reserve in the main library.

American Geological Institute, 1979, The Deep Sea Drilling Project, Legs 45-62, AGI.

Beebe, W., 1926, The Arcturus Adventure: Putnam, 439 pp.

Carson, R., 1979, The Edge of the Sea, Prentice-Hall, 250 pp.

Cousteau, J. and Dugan, J., 1988, The Living Sea: Lyons and Burford, 280 pp.

Darwin, C., 1972, Voyage of the Beagle: Bantam, 439 pp.

Dana, R. (reprinted 1964), Two Years Before the Mast, Signet, 383 pp.

Ericson, D.B. and Wollin, G., 1964, The Deep and the Past: Grossett, 292 pp.

Fox, W.T., 1983, At the Sea's Edge: Prentice-Hall, NJ, 317 pp.

Gordon, D.L., ed., 1970, Man and the Sea: classical accounts of marine exploration: Natural History Press, NY.

Guberlet, M., 1986, Explorers of the Sea: Famous Oceanographic Expeditions, UMI Press.

Heezen, B.C. and Hollister, C.D., 1971, The Face of the Deep: Oxford Univ. Press, NY, 415 pp.

National Research Council, 1970, The Continuing Quest--large scale ocean science for the future: National Academic Press, 245 pp.

Parker, H.S., 1985, Exploring the Oceans--an introduction for the traveler and amateur naturalist, Prentice-Hall.,N.J., 368 pp.

Scientific American, Ocean--A Scientific American Book, 1969, Sci. Am., 140 pp.

Turekian, K.K., 1976, Oceans: Prentice-Hall, NJ., 150 pp.

UNESCO, 1981, Harvesting Ocean Energy: UNIPUB, NY, 192 pp.

van Andel, T.H., 1977, Science at Sea: Tales of an Old Ocean: Freeman, 186 pp.

Required viewing (videocassettes): (either in class or as homework assignment)

Nova: Adrift on the Gulf Stream
The Planet Earth series: The Blue Planet

Course assessment:

The final grade for the course will be determined as follows:

60% Two tests: one midterm and one final consisting of short-answer type

(multiple choice, completion, matching) and short essay type questions (100 points each test).

15% Quizzes (short essay type) on lecture and reading material (done in 10-15 minutes of class time) on the assigned readings.

25% Short paper (about 5-10 pages) on a topic approved by the professor. The research paper will deal with any aspect of ocean science--from the perspective of chemistry, physics, geology, biology, or the environment. The topic is to be selected from a list of topics generated by the professor by quarter term, an outline is to be submitted at mid-term, a rough draft at three-quarter term and the polished paper will be due two weeks before the final examination period. The research paper will be graded on selection of the appropriate amount and kind of factual material, critical evaluation of those data, ability to synthesize that information to make a point, proper citation of references, and a clear, concise writing syle.

OR

25% Students who attend the field trip will keep a log of their activities. This log which will be kept in a specific format as instructed by the professor will include not only itinerary and compilations of scientific data from the various oceanographic instruments used, but will also include interpretations of those data in terms of daily variations and the implications of changes in the oceans over days or weeks. Students will also record their observations of the marine geological investigations on the coasts and again the implications for change on the shoreline with seasons or transgression of the sea.

PART IV. DESCRIPTION OF CURRICULUM CHANGE

1. Catalog description

GS141 Introduction to Ocean Science

3 credits
3 lecture hours
0 lab hours

No prerequisite.

Introduction to physical, chemical, biological, and geological processes in oceanography and the interactions among them. Impact of exploitation of the oceans, coastal areas, marine physical and living resources on the environment and on humankind. Includes field trips which may occur on weekends.
may involve a fee and

2. Course Syllabus

please see pages 6-9 of this course proposal packet

Resource materials used to prepare for and teach this course:

Bowden, K.F., 1983, Physical Oceanography of Coastal Waters: Halsted, 288 pp.

Broecker, W.S., 1974, Chemical Oceanography: Harcourt, Brace, 214 pp.

Burk, C. A. and Drake, C. L., 1974, The Geology of Continental Margins: Springer-Verlag, 536 pp.

Knauss, J.A., 1978, Introduction to Physical Oceanography: Prentice-Hall, 338 pp.

Fairbridge, RW, ed., 1966, The Encyclopedia of Oceanography, Reinhold, 1021 pp.

Fell, B., 1975, Introduction to Marine Biology: Harper and Row, 356 pp.

Heezen, B.C., Tharp, M. and Ewing, M., 1959, The Floors of the Ocean. I. North Atlantic: Geol. Soc. of Am. Special Paper 65, 122 pp.

Hill, M. ed, 1963, The Sea, vol. 1-4, each volume about 600 pp.

Hood, D.W., ed., 1971, Impingement of Man on the Seas: Wiley-Interscience.

Kennett, J., 1982, Marine Geology: Prentice-Hall, 813 pp.

Komar, P.D., 1976, Beach Processes and Sedimentation: Prentice Hall, 429 pp.

Maloney, ES, 1978, Dutton's Navigation and Piloting, Naval Inst. Press, 910 pp.

Neshyba, S., 1987, Oceanography, Perspectives on a Fluid Earth: Wiley, 506 pp.

Neumann, G. and Pierson, W.J., 1966, Principles of Physical Oceanography: Prentice-Hall, 544 pp.

Park, P.K. and others, 1985, Wastes in the Ocean, vol. 1-3: Wiley-Interscience.

Pickard, G.L., 1970, Descriptive Physical Oceanography: Pergamon, 200 pp.

Shepard, F. P., 1973, Submarine Geology, 3rd ed., Harper and Row, 517 pp.

Stowe, K., 1983, Ocean Science: Wiley.

Sverdrup, HU, Johnson, MW, and Fleming, RH, 1942, The Oceans: their physics, chemistry and general biology: Prentice-Hall, 1087 pp.

Thurman, HV, 1986, Essentials of Oceanography, 3rd ed., Merrill, 370 pp.

Wertenbacker, W., 1983, "The Law of the Sea--a reporter at large": New Yorker magazine, August 1 and 8, 1983.

Wust, G., 1978, The Stratosphere of the Atlantic Ocean: Scientific results of the German Atlantic expedition of the Research Vessel Meteor 1925-1927 originally published in 1935 but English translantion by W. J. Emery for the National Science Foundation, 111 pp.

and journals such as Science, Oceanus, Tellus, Deep Sea Research, Marine Geology, Marine Research, Marine Technology Society Journal, Journal of Geophysical Research, Geological Society of America Bulletin, Nature, Scientific American

3. Course analysis questionnaire

Section A: Details of the Course

A1. This course is designed for the Liberal Studies Program in the category of Natural Science Non-Laboratory. Thus, the course is designed for those students who select the option of taking one semester of science with lab and two semesters of science without lab. This course is not intended for majors in the Department.

A2. This course does not require changes in the content of existing courses.

A3. The organization of this course follows the traditional type of offering by the Department, but it is somewhat different from the other courses in the Department in the increased emphasis on the interrelationships among oceanographic events and impacts on the environment and humankind.

A4. This course has not been offered as a special topics course.

A5. This course is not a dual-level course.

A6. This course is not to be taken for variable credit.

A7. I surveyed universities near IUP and found that ocean science on an introductory level is taught by most of them. In Appendix I I have included excerpts from the appropriate catalogs which deal with this type of course.

A8. The content of this proposed course is not recommended or required by any professional sociaty, accrediting authority, law, or any other external agency.

Section B. Interdisciplinary Implications

B1. This course will be taught by one instructor.

B2. No additional or corollary courses are needed with this course.

B3. The Geoscience Department offers GS 101/102 Earth Science: Geology and Oceanography lecture and lab which covers oceanography in 1/2 semester. This proposed one-semester ocean science course offers greater depth and breadth and will include such topics as living and non-living marine resources and barrier islands which are not covered in GS 101. The Department also offers a majors level course, GS 361 Physical Oceanography.

B4. Students in the School of Continuing Education are welcome to attend this course.

Section C: Implementation

C1. Resources

a. No new faculty is needed to teach this course.

b. Current space allocations are adequate to offer this course.

c. The Geoscience Department just received (in July 1989) an NSF equipment grant entitled "Oceanographic Equipment for the IUP Geoscience Department." for $27,321 under the direction of Dr. Richardson. This money plus a matching grant from IUP is for the purchase of sophisticated, up-to-date oceanographic equipment which will enable our students, both non-majors and majors, to enjoy hands-on experience in the collection of scientific data. We, members of the Marine Science Consortium, Wallops Is., Virginia, have access to 3 ships.

d. The Department budget is sufficient to purchase supplies for this course.

e. Library holdings are barely adequate; new books on oceanography have been ordered. Copies of the books on the syllabus for the students' reading assignments will be ordered.

f. The Department vans will be used to transport students on the field trip.

C2. No grant funds are specifically associated with this course, although the NSF grant will provide equipment for student use.

C3. The Department expects to offer this course every one or two years, preferably in the Fall semester. The frequency of course offering will depends on student demand for the natural science: non-lab option of the Liberal Studies program.

C4. I anticipate offering one section per semester.

C5. Twenty-five to seventy-five students can be accommodated in a section of this course. Space is limited on field trips, but students may elect the field trip or a research paper. Even though the course will be taught by one professor, both Richardson and Prince will supervise the oceanographic field trips.

C6. I do not know of any professional society recommendations which limit enrollments in this lecture course.

C7. This course will be one of the natural science: non-lab courses which a student may take to fulfill his/her natural science requirement in the Liberal Studies program.

Appendix I: Catalog descriptions from other universities offering a similar course.

Edinboro University of Pennsylvania:

GS110 Introduction to Oceanography 3 sem. hrs.
An introduction to the physical, chemical, biological, and geological processes and interactions in the oceans. Topics include: history of oceanography, charts and navigation, the physical and chemical properties of sea water, instrumentation and at-sea measurements, marine geology, beach processes, theory of continental drift air-sea interactions, waves and ocean circulation, tides, plant and animal life in the sea, marine ecology, and the oceans in relation to modern society. Not open to students who have had MS110. No prerequisites.

Millersville University of Pennsylvania:

Oceanography

ES. 104: The World Ocean 3 s.h.
A broad overview of the biological, chemical, geological and physical characteristics of the ocean. For non-earth sciences majors only.

ES. 261: Introduction to Oceanography 4 s.h.
The physical, chemical biological and geologic aspects of the oceans and the methods and techniques of oceanography; lab and sea assignments focus attention on the unity within oceanography and its relation to other environmental sciences. 3 hours lecture, 2 hours lab, field trips required.

West Virginia University:

7. Physical Oceanography. II. 3 hr. The geography and geology of ocean basins and margins, the chemical and physical properties of sea water and the examination of the source and location of resources in the sea.

Penn State University:

040. (GN) The Sea Around Us (3:2-2) Introduction to marine science, including physical, chemical, biological, and geological aspects of oceanography; the sea as a multipurpose natural resource.

Clarion University of Pennsylvania:

ES 270: OCEANOGRAPHY 3 s.h.
A study of the physical properties, marine biology, chemistry, and geology of the oceans and to a minor extent, the role of the sea in the history, culture, and technical developments of man. Once annually.