

LSC Use Only

Number: _____

Action: _____

Date: _____

UWUCC Use Only

Number: 91-4/9

Action: _____

Date: _____

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. Title/Author of Change

Course/Program Title: SC 103 Earth and Space Science

Suggested 20 Character Course Title: Earth & Space Sci

Department: Geoscience

Contact Person: Connie Sutton

II. If a course, is it being Proposed for:

 X Course Revision/Approval Only
 Course Revision/Approval and Liberal Studies Approval
 Liberal Studies Approval Only (course previously has been
approved by the University Senate)

III. Approvals

Deleene Richardson
Department Curriculum Committee

FW Hall
Department Chairperson

AKamiasz
College Curriculum Committee

W J Cole
College Dean *

Director of Liberal Studies
(where applicable)

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: _____

Semester to be
implemented: _____

Date to be
published
in Catalog:

to UWUCC: _____

Fall 1992

Fall 1992

LIBERAL STUDIES COURSE APPROVAL FORM INSTRUCTION SHEET

Use this form only if you wish to have a course included in a Liberal Studies Learning Skill or Knowledge Area category. Do not use this form for synthesis or writing-intensive sections; different forms are available for these. If you have questions, contact the Liberal Studies Office, 352 Sutton Hall, telephone 357-5715.

This form is intended to assist you in developing your course to meet IUP's Criteria for Liberal Studies and to arrange your proposal in a standard order for consideration by the Liberal Studies Committee (LSC) and the University-wide Undergraduate Curriculum Committee (UWUCC). When you have finished, your proposal will have these parts:

- ☒ Standard UWUCC Course Proposal Cover Sheet, with signatures (one page)
- ☒ Completed copy of LS General Information Check-List--Parts 1-3 of this form. (one page)
- ☒ One sheet of paper for your answers to the four questions in Part IV of this form. (one page)
- ☒ Completed check-list for each curriculum category in which your course is to be listed--e.g. Non-Western Cultures, Fine Arts, etc. (one page each)
- ☒ Course Syllabus in UWUCC Format.

Note: If this is a new course or a course revision not previously approved by the University Senate, you will also need a catalog description on a separate sheet and answers to the UWUCC Course Analysis Questionnaire. These are not considered by the LSC but will be forwarded to the UWUCC along with the rest of the proposal after the LSC completes its review. For information on UWUCC procedures, see the UWUCC Curriculum Handbook.

SUBMIT ONE (1) COPY OF THE COMPLETED PROPOSAL TO THE LIBERAL STUDIES OFFICE. (352 SUTTON HALL). The Liberal Studies Committee will make its own copies from your original; the committee does reserve the right to return excessively long proposals for editing before they are duplicated. (If you happen to have extra copies of the proposal, you are invited to send multiple copies to the LSC to save unnecessary copying.)

PLEASE NUMBER ALL PAGES.

LIBERAL STUDIES COURSE APPROVAL, PARTS 1-3: GENERAL INFORMATION CHECK-LIST

I. Please indicate the LS category(ies) for which you are applying:

LEARNING SKILLS:

☐ First Composition Course
☐ Mathematics

☐ Second Composition Course

KNOWLEDGE AREAS:

☐ Humanities: History
☐ Humanities: Philos/Rel Studies
☐ Humanities: Literature
☒ Natural Sci: Laboratory
☐ Natural Sci: Non-laboratory

☐ Fine Arts
☐ Social Sciences
☐ Non-Western Cultures
☐ Health & Wellness
☐ Liberal Studies Elective

II. Please use check marks to indicate which LS goals are primary, secondary, incidental, or not applicable. When you meet with the LSC to discuss the course, you may be asked to explain how these will be achieved.

Prim Sec Incid N/A

☒ ☐ ☐ ☐
☐ ☒ ☐ ☐
☒ ☐ ☐ ☐
☐ ☐ ☒ ☐
☒ ☒ ☐ ☐
☐ ☐ ☐ ☒

A. Intellectual Skills and Modes of Thinking:

1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.
2. Literacy—writing, reading, speaking, listening.
3. Understanding numerical data.
4. Historical consciousness.
5. Scientific Inquiry.
6. Values (Ethical mode of thinking or application of ethical perception).
7. Aesthetic mode of thinking.

☒ ☐ ☐ ☐

B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person

☐ ☐ ☐ ☒

C. Understanding the Physical Nature of Human Beings

☐ ☒ ☐ ☐
☐ ☒ ☐ ☐

D. Collateral Skills:

1. Use of the library.
2. Use of computing technology.

III. The LS criteria indicate six ways that courses should contribute to students' abilities. Please check all that apply. When you meet with the LSC, you may be asked to explain your check marks.

- ☒ 1. Confront the major ethical issues which pertain to the subject matter; realize that although "suspended judgment" is a necessity of intellectual inquiry, one cannot live forever in suspension; and make ethical choices and take responsibility for them.
- ☒ 2. Define and analyze problems, frame questions, evaluate available solutions and make choices.
- ☒ 3. Communicate knowledge and exchange ideas by various forms of expression, in most cases writing and speaking.
- ☒ 4. Recognize creativity and engage in creative thinking.
- ☒ 5. Continue learning even after the completion of their formal education.
- ☒ 6. Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.

Liberal Studies Course Approval Parts 4-6:

IV. A. This is a multi-section (2 lecture, 6 labs) and multi-instructor (3) course: the three faculty who met and devised the syllabus will be the instructors most of the time. They will meet and discuss any changes in content, assignment, and evaluations.

B. The three instructors (Sutton, Cercone, and Richardson) most likely to teach this course have attended (and even organized) conferences which deal with the issues of gender and ethnicity in science specifically. They teach all of their classes with great care to be as inclusive as possible in their use of languages and examples. Where appropriate scientists are identified by their full names and nationalities.

C. Because this course is taught in three parts, we thought that requiring students to read a typical book per topic would be too burdensome. This course will be taken by elementary education majors only; thus, we thought it would be most appropriate if the students were to read books and magazines that their future young pupils would be reading. We will assess their opinions of the science content and interest-level of these children's books and magazines and how these children's book might be incorporated in the elementary science curriculum.

D. This is an introductory course in earth science designed for the elementary education major. As such, it differs from the courses we offer the general student audience (GS 101-104 Earth Science, GS 110 General Astronomy, GS 141 Introduction to Ocean Science, GS 150 Geology of the National Parks, GS 151 The Age of Dinosaurs, and GS 221 Physical Resources of the Earth) and our major (GS 121-133 Physical and Historical Geology Lectures and Labs) in its scope and its lab exercises on the students' creating hands-on experiences for their future pupils.

CHECK LIST — NATURAL SCIENCES (Laboratory)

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 coverage 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.

Natural Science Laboratory Criteria which the course must meet:

- ☒ Provide students with opportunities to learn and apply data-gathering techniques.
- ☒ Provide students with opportunities to develop skills in making accurate observations, in formulating concise and appropriate descriptions of natural phenomena, and in producing meaningful systems of classification for natural objects.
- ☒ Provide students with opportunities to apply theories to practice in the working world of science.

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 sciences, 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

I. Catalog Description

SC 103 Earth and Space Science

2.5 credits
2 lecture hours
2 lab hours
(2c-21-2.5 sh)

Prerequisites: SC 101, SC 102

Introduction to geology, astronomy, oceanography and meteorology. Emphasis is placed on the understanding of large scale processes and how the Earth, Solar System and Universe work. Lab experiences include hands-on work with earth materials and with instruments from all four subjects, map, and field trips which may occur during class times, nights, and weekends.

II. Course objectives

1. Students will understand large scale processes and which operate in the earth and space sciences and will appreciate that many of these processes are linked and inter-dependent upon each other.

2. Students will be able to interpret and understand the processes which create our local environment and the Earth as a whole.

3. Students will be able to develop a personal philosophy and sense of ethics by studying the origin of the universe, the role of humankind in the health of planet Earth and specifically our local environments, and become aware that they may be able to influence national and local political decisions on these issues.

4. Students will learn to work cooperatively and will collaborate on the development of laboratory teaching exercises.

III. Course Outline

A. Geology: 9 lecture periods

1. Structure of the Earth, its internal layers and processes
2. Plate tectonics; relationships to earthquakes and volcanoes
3. Mineral resources; impact on human development
4. The rock cycle: weathering and soils
5. Geologic time and the rock record of Earth's past environments
6. The fossil record; dinosaurs and ancient mammals
7. Rivers and erosion; landscape development
8. Natural hazards: landslides, earthquakes, tsunamis
9. Geology exam

Geology: 5 labs

1. Minerals: identification techniques, mineral families, uses of minerals
2. Rock types: sedimentary, igneous, metamorphic
3. Fossils: plants, invertebrate and vertebrate animals
4. Maps: map reading, topographic contours, distances and directions

5. Synthesis exercise: design a teaching exercise with lab specimens

In addition, students will be required to attend and write-up notes from one of several optional field excursions.

B. Astronomy: 10 Lecture periods

1. Origin of time-keeping (day, week, month, year); calendars
2. Instrumental use: camera, spectroscope, telescope
3. Our satellite: Moon (phases and surface)
4. The Space Program: manned and unmanned, applications
5. The Planets: characteristics
6. Comets, meteors, and asteroids: characteristics
7. Sun: its impact on Earth, its characteristics
8. Properties of stars and the life of a star
9. Galaxies: our Milky Way, other galaxies
10. Astronomy Exam

Astronomy: 4 Lab periods

1. Constellations: origins, use, identification
2. Seasons: causes, effects
3. Planets: motion, characteristics
4. Stars: properties

In addition, students will be required to attend and write-up notes on one evening observation.

C. Fluid Environments: Oceanography and Meteorology: 10 Lecture periods

- 1-2. Properties and characteristics of water and air: similarities and differences
- 4-5. Water cycle, adiabatic processes, condensation, evaporation, and so on.
- 6-7. Understanding weather and climate: wind patterns and atmospheric circulation, Coriolis Effect.
- 8-9. Ocean currents: surface and thermohaline circulation, Ekman Transport
10. Marine geology and paleo-oceanography
11. Ocean and Met exam

Fluid Environments: 5 Lab periods

1. Measuring properties of air: pressure, temperature, wind direction and velocity
2. Measuring properties of water: temperature, salinity, current direction and velocity, depth
3. Maps and adiabatic diagram: understanding distribution of air temperature and pressure, cyclones and anticyclones
4. Maps and T-S diagram: understanding distribution of temperature, salinity, density of seawater; how water masses move and mix
5. Synthesis exercise: students will design a teaching exercise for elementary students to measure air or water temperature, salinity, pressure or to demonstrate wind and water currents.

In addition, students may choose to attend a 3-day field trip to the Marine Science Consortium at Wallops Island, Virginia.

IV. Evaluation Methods

The final grade for the course will be the average of the grades earned in geology, astronomy, and fluid environments. The individual professors teaching each portion will determine the grade by the following:

- 60% Tests which integrate lecture and lab material
- 40% Lab exercises and quizzes which may include book or article reviews

V. Required Textbooks, Supplemental Books and Readings

Textbook: Edward J. Tarbuck and Frederick K. Lutgens, 1988, Earth Science: 5th edition, Merrill Publishing Company, N.Y., 612 p.

Non-textbook readings: students will read a variety of childrens' science books and magazines such as "3-2-1 Contact," "Odyssey," and astronomy. The students will be required to critique these books and for their science content as well as how they might appeal to children and be used in the elementary science classroom. Students will read a children's book and a magazine for each of the three portions of this course.

VI. Special Resources Requirement

Instructional media such as 35 mm slide sets, videocassettes, subscriptions to magazines, mineral and rock specimens, star charts

VII. Bibliography

Abell, Geology and others, 1988, Realm of the Universe: Saunders Publ. (N.Y.), 528 p.

Ahrens, C. Donald, 1982, Meteorology Today: An Introduction to Weather, Climate, and the Environment: West Publ. (Minneapolis), 514 p.

Hartmann, William K., 1991, Astronomy: The Cosmic Journey: Wadsworth Publ. (Belmont, CA), 693 p.

Harvey, J.G., 1976, Atmosphere and Ocean: Our Fluid Environments: Artemis (Sussex), 143 p.

Levin, Harold L., 1991, The Earth Through Time: Harcourt-Brace-Jovanovich (N.Y.), 651 p.

Neshyba, Steve, 1987, Oceanography: Perspectives on a Fluid Earth: Freeman and Co. (N.Y.), 506 p.

Open University Course Team, 1989, Series of Volumes on Oceanography: Pergamon Press (Cambridge), about 600 pages in 5 volumes.

Pasachoff, Jay, 1989, Contemporary Astronomy: Saunders Publ. (N.Y.), 577 p.

Plummer, Charles C. and David McGeary, , 1991, Physical Geology: Brown Publishers (N.Y.), 543 p.

Press, Frank and Raymond Siever, 1986, Earth: Freeman and Co. (N.Y.), 656 p.

Spiegel, Herbert and Arnold Gruber, 1983, From Weather Vanes to Satellites: An Introduction to Meteorology: Wiley (N.Y.), 241 p.

Stanley, Steven M., 1989, Earth and Life Through Time: Freeman and Co. (N.Y.), 689 p.

Thurman, Harold V., 1991, Introductory Oceanography: MacMillan (N.Y.), 526 p.

Course Analysis Questionnaire

A1: This course is designed for Elementary Education majors to fulfill their Liberal Studies science requirement and to satisfy national standards for science preparation of teachers in training. Thus, this course is proposed as a Liberal Studies Science Lab course.

A2: No, this course does not require changes in the content of existing courses.

A3: this course is traditional in this it is lecture and lab, but is non-traditional in that the students are spending less time in lecture than in GS 101-104, for example. This is our only 2.5 credit course.

A4: No

A5: No

A6: No

A7: This course was designed to fulfill the national standards set forth by the National Science Teachers Association and to prepare the students for PDE recommended science competencies. This course is one of the four 2.5 credit courses elementary education students will take to fulfill the Liberal Studies Science: Lab requirement.

A8: The content of this course is required by the Pennsylvania Department of Education for elementary teachers. Previously, elementary education majors were not exposed to earth science concepts when they took Physical Science I and II. The idea of this course sequence was created in conjunction with some of the NS&M departments and the department of Professional Studies in Education.

B. Interdisciplinary Implications

B1. This course will be team taught with each professor responsible for a portion of the course: example: Sutton - Astronomy, Cercone - Geology, and Richardson - Fluid Environments.

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B2. No

B3: This content of this course does not overlap with courses from other departments. The content of this course is similar to the content of GS 101-104 Earth Science: Geology and Oceanography and Earth Science: Astronomy and Meteorology, but is taught specifically with the needs of elementary education majors in mind.

B4: No

Section C: Implementation

C1: Faculty: Prof. Paul Prince who teaches the introductory as well as upper level meteorology courses is retiring at the end of Fall 1991. We are seeking a replacement position. Our other courses, which include both Liberal Studies as well as Liberal Studies Synthesis and upper level majors courses, will be much reduced by our offering this course each semester and we project that GS 101 -104 Earth Science will be cancelled if Prince is not replaced.

Space: We need a large lecture classroom such as Weyandt 32.

Equipment is sufficient

Laboratory Supplies: we will more of the following to support 300+ additional students in our department: maps, minerals and rocks, lab supplies such as acid bottles, streak plates, salts, hydrometers.

Library Materials: children's science magazines should be ordered.

Travel Funds: At national educators' conferences Sutton will present the results of this innovation approach to preparing the elementary school teacher in training to teach science. She will require additional travel funds from outside the department.

C2: No

C3: We expect this course to be offered every semester. This course may be offered during the summer.

C4: We expect to offer two lecture sections and six laboratory sections in the Fall and Spring terms; one lecture section and one lab section during the summer.

C5: We expect 75 students in each lecture section and 24 students in each lab section during the Fall and Spring terms.

C6: No

C7: This course is part of the 4-course science sequence required for the Elementary Education major. Please see the requirements of the Department of Professional Studies in Education.

Section D: Miscellaneous

This course was developed through consultation with Biology, Chemistry, Physics and Professional Studies in Education. We suggest that these "sister" courses be evaluated as a unit with representatives from these departments to answer any questions.

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