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LIBERAL STUDIES

UWUCC USE Only
Number: 95-40j
Submission Date: 12/12/95
Action-Date: App Senate App 2/6/96

CURRICULUM PROPOSAL COVER SHEET
University-Wide Undergraduate Curriculum Committee

I. CONTACT

Contact Person Karen Rose Cercone Phone 5623

Department Geoscience

II. PROPOSAL TYPE (Check All Appropriate Lines)

X COURSE Exploring Universe
Suggested 20 character title

X New Course* GS 105 Exploring the Universe / GS 106 Exploring the U (lab)
Course Number and Full Title

____ Course Revision _____
Course Number and Full Title

X Liberal Studies Approval + for new or existing course GS 105 Exploring the Universe / GS 106 Explorin the Universe Lab
Course Number and Full Title

____ Course Deletion _____
Course Number and Full Title

____ Number and/or Title Change _____
Old Number and/or Full Old Title

_____
New Number and/or Full New Title

____ Course or Catalog Description Change _____
Course Number and Full Title

____ PROGRAM: ____ Major ____ Minor ____ Track

____ New Program* _____
Program Name

____ Program Revision* _____
Program Name

____ Program Deletion* _____
Program Name

____ Title Change _____
Old Program Name

_____
New Program Name

III. Approvals (signatures and date)

Karen Rose Cercone 4-7-95
Department Curriculum Committee

[signature] 4/7/95
Department Chair

[signature]
College Curriculum Committee

[signature] 10/20/95
College Dean

+ Director of Liberal Studies (where applicable)

*Provost (where applicable)

II. DESCRIPTION OF THE CURRICULUM CHANGE

1. New Syllabi of Record

Two syllabi of record are attached for the new course sequence GS 105/106 Exploring The Universe, part of a new non-major sequence entitled Introduction to Geoscience

GS 105 Exploring the Universe

I. Catalog Description

GS 105 Exploring the Universe — 3 credits
3 lecture hours
Prerequisites: No Geoscience Majors/Minors — (3c-0l-3sh)

Examines the history of time, the reasons for the seasons, the characteristics of the planets, moons, stars and galaxies; and the history and future of space exploration.

II. Course Objectives

1. Students will be able to explain the relationships between time keeping and the celestial sky.
2. Students will be able to compare and contrast the characteristics and motions of the planets and their moons.
3. Students will be able to distinguish between characteristics and types of stars to predict the future changes for these stars.
4. Students will analyze the past accomplishments and applications of the space program to determine their usefulness to humans.

II. Course Outline

A. History of Astronomy (5 hours)
   1. Does anybody really know what time it is?
      Time-keeping methods, old and new
      Development of the calendar
   2. Ancient astronomy in many cultures
      Western developments in astronomy
      Non-western developments in astronomy

B. What's your Zodiac sign? (3 hours)
   1. Movement in the heavens
      Rotation, revolution and precession
   2. Seasons and signs
      Turn, turn, turn.... for every time there is a season
      Astrology: its ancient origins and cultural significance

C. How powerful is that scope? (3 hours)
- 1. Looking at the heavens
  - The nature of light
  - What's the Doppler effect?
- 2. Telescopes -- keep watching those skies!
  - Visual astronomy
  - Other kinds of telescopes

D. Our nearest neighbor (4 hours)
- 1. How we see the Moon
  - Lunar phases
  - Eclipses, solar and lunar
- 2. Moon-Earth interactions
  - The turning of the tides
  - The geology of the Moon and its origins

E. The space program --what do you get for your bucks? (2 hours)
- 1. Unmanned satellites
  - The history of satellites
  - The Earth-observing system
- 2. Manned space-flight
  - A glorious history
  - An uncertain future

F. Where are the Martians? (9 hours)
- 1. The nine planets and their moons
  - My Very Educated Mother
  - Just Showed Us Nine Planets
- 2. The rest of the solar system
  - Meteors, comets and asteroids

G. The Sun is green (3 hours)
- 1. How the sun works
  - Fusion reactions
  - Sunspots, coronas, flares and solar winds
- 2. Sun-Earth interactions
  - Solar energy
  - Magnetic storms and northern lights

H. Betelgeuse and her sisters (8 hours)
- 1. How many types of stars are there?
  - Stellar characteristics

Variations on a theme
Oh, Be a Fine Girl/Guy, Kiss Me!

2. Star cycles
Novas. supernovas and neutron stars

I. Where's the black hole? (3 hours)

1. You are here...the fun stuff is over there
The Milky Way
Other galaxies

2. The Big Bang
Bubbles in space-time
Expanding, contracting, static ... or all of the above?

J. E.T., phone home (2 hours)

1. UFO's and aliens
What's real, what's not
The statistical chances

2. Life in the Universe

IV. Evaluation Methods

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

85% Tests. Four tests, consisting of multiple choice, true-false and matching questions. 100 points each. Tests will be computer-graded and adjusted to a mean of 75% so that 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D; below 60%=F. The same scale will be used for the final point score.

15% Non-text book review. A four to five page book review of the non-text reading is due the last day of class. Worth 75 points.

V. Required textbooks, supplemental books and readings

Textbook: Chaisson, E.E., 1995, ASTRONOMY: A BEGINNER'S GUIDE TO THE UNIVERSE. Englewood Cliffs NJ: Prentice Hall, 451 p.

Non-text: Raup, D. 1986, THE NEMESIS AFFAIR.

VI. Special resource requirements: None.

VII. Bibliography

Abell, G.O., Morrison, D. and Wolff, S.C., 1993, EXPLORATION OF THE UNIVERSE (6th Ed.). Philadelphia: Saunders College Publishing, 681 p.

Chaisson, E.E. and McMillan, S., 1993, ASTRONOMY TODAY. Englewood Cliffs NJ: Prentice Hall, 658 p.

Ebbighausen, E.G. and Zimmerman, R.L., 1992, ASTRONOMY (6th Ed.). Columbus: Merrill Publishing, 196 p.

VII. Bibliography (con't)

Engelbrektson, S., 1994, ASTRONOMY THROUGH SPACE AND TIME. Dubuque: Wm. C Brown, 448 p.

Pasachoff, J.M., 1992, JOURNEY THROUGH THE UNIVERSE. Philadelphia: Saunders College Publishing, 389 p.

Protheroe, W.M., Capriotti, E.R. and Newsom, G.H., 1989, EXPLORING THE UNIVERSE (4th Ed.) Columbus: Merrill Publishing, 665 p.

Skinner, B.J. and Porter, S.C., 1995, THE BLUE PLANET: AN INTRODUCTION TO EARTH SYSTEMS SCIENCE. New York: John Wiley & Sons, 493 p.

Zeilik, M., 1994, ASTRONOMY - THE EVOLVING UNIVERSE (7th Ed.). New York: John Wiley & Sons, 525 p.

GS 106 Exploring the Universe Lab

I. Catalog Description

GS 106 Exploring the Universe Lab — 1 credit
2 lab hours
(0c-2l-1sh)

Prerequisites: No Geoscience Majors/Minors
Corequisites: Enrollment in GS 105

Introduces students to the techniques astronomers use to study the celestial sphere. Constellations, seasons, motions of Sun, Moon, planets and stars, characteristics of stars and galaxies. Includes two observations which will be held at night.

II. Course Objectives

1. Students will learn the techniques of plotting positions of the Moon and the planets.
2. Students will be able to use a telescope to observe the Moon, planets and the stars.
3. Students will be able to read and use star charts to locate stars, galaxies and other celestial objects.
4. Students will demonstrate an understanding of why we have seasons by synthesizing concepts with raw data.

III. Course Outline

A. Constellations and Star Charts (3 labs)
   1. Rotation, revolution and precession
   2. Constellations of the northern sky
   3. Constellations of the southern sky

B. Seasons and telescopes (3 lab)
   1. The reasons for seasons
   2. How telescopes work
   3. Night observation session

C. Midterm Exam (1 lab)

D. Moon and planets (3 labs)
   1. The Moon
   2. The inner planets
   3. the outer planets

E. Stars and Galaxies (3 labs)
   1. Star classification and cycles
   2. Galaxy classification
   3. Night observation

F. Final Exam (1 lab)

IV. Evaluation Methods

30% Quizzes. Eight ten-point quizzes will cover previous week's lab or field trip.

70% Two non-cumulative lab exams, worth one-hundred points each. Exams will consist of sample identification, short essay and map-based questions. Tests will be adjusted to a mean of 75% so that 90-100%=A; 80-89%=B; 70-79%=C; 60-69%=D; below 60%=F. The same scale will be used for the final point score.

V. Required textbooks, supplemental books and readings

The IUP Exploring the Universe Lab Manual (course packet). This lab manual was locally developed to take advantage of the unique telescope and planetarium facilities of IUP. Nationally published lab manuals were consulted during the development process to ensure quality, parity and relevance to national trends in astronomy and space science.

VI. Special resource requirements: None.

VII. Bibliography

Chaisson, E.E., 1995, ASTRONOMY: A BEGINNER'S GUIDE TO THE UNIVERSE. Englewood Cliffs NJ: Prentice Hall, 451 p.

Ebbighausen, E.G. and Zimmerman, R.L., 1992, ASTRONOMY (6th Ed.). Columbus: Merrill Publishing, 196 p.

Engelbrektson, S., 1994, ASTRONOMY THROUGH SPACE AND TIME. Dubuque: Wm. C Brown, 448 p.

Zeilik, M., 1994, ASTRONOMY - THE EVOLVING UNIVERSE (7th Ed.). New York: John Wiley & Sons, 525 p.

COURSE ANALYSIS QUESTIONNAIRE

Section A: Details of the Course

A1. The new sequence Introduction to Geoscience of which GS 105/106 Exploring the Universe is a part is designed to be the primary department offering for non-major students who are fulfilling their Liberal Studies science requirement. Students may take any two of the three Introduction to Geoscience lecture/lab sequences to fulfill their Option I science requirement, or they may take all three lectures and one of the three labs to fulfill their Option II science requirement.

The new three-semester Introduction to Geoscience sequence functionally replaces the old two-semester Earth Science sequence. Earth Science is being simultaneously renumbered and converted to an introductory course for science education majors only. Introduction to Geoscience also functionally replaces the non-major portions of GS 121/122 Physical Geology and GS 131/132 Historical Geology. These course sequences are being renumbered and converted to introductory courses for department majors and minors only.

A2. This course does require changes in several department courses and programs. Accordingly, course revisions for the new GS 111-114 Earth Science; GS 121/122 Physical Geology and GS 131/132 Historical Geology are being submitted in conjunction with this new course proposal. In addition, the old non-lab General Astronomy (GS 110) will be dropped from the department course offerings. All science education programs which formerly required GS 101-104 Earth Science will now be changed to require GS 111-114 Earth Science. These minor program revisions have also been submitted as part of the total Geoscience Curriculum packet.

A3. The complete Introduction to Geoscience course sequence has never been offered at IUP. The lecture portion of GS 105 General Astronomy will draw heavily on the former GS 110 General Astronomy. All other components of the course sequence will be new.

A4. This is not a dual-level course.

A5. This is not a variable-credit course.

A6. Almost every institution with a geoscience department offers some type of introductory geology, oceanography and/or astronomy course. Several examples are given in Section D.

Section B: Interdisciplinary Implications

B1: Each component of the Introduction to Geoscience sequence (ie, GS 101, GS 102, etc) will be taught as a separate course by a single instructor.

B2: No other departments on campus offer courses in these three areas.

B3: Seats in this course will be made available to students from Continuing Education.

Section C: Implementation

C1: No additional faculty resources are required to teach this course sequence. As shown in the overview discussion of faculty resources, the faculty contact hours needed to teach GS 101/102, as well as GS 103/104 and GS 105/106, will be obtained primarily from the conversion of our existing introductory science courses to majors only (i.e., much smaller) sections. The two additional hours needed to teach the new schedule will be obtained from alternate-year rotation of upper-level majors courses. The number of class preps in the department does increase, but will be accommodated through careful scheduling.

Please note that while the number of lecture seats for non-majors will be increased by this change, the number of lab seats will be decreased slightly. Please see the course package overview for a detailed discussion of this change.

C2: The department has sufficient lecture and lab space to accommodate this new course. Lecture and lab space previously used for the non-major portions of the old Earth Science and Physical/Historical Geology sequences will now be transferred to Introduction to Geoscience

The department also holds sufficient samples and equipment for the lab component of these new courses. Specimens, maps, student equipment and lab supplies previously designated for use by the non-major labs of Earth Science and Physical/Historical Geology will simply be transferred to use by Introduction to Geoscience.

Funds exist in the department for normal replacement of specimens, maps and equipment parts worn out or broken by student usage.

No additional library resources or travel funds are required for this class.

C3: No grant funding exists or is needed for this class.

C4: Two Introduction to Geoscience courses (usually GS 101/102 and GS 103/104) will be offered in both the Fall and Spring semesters. Courses will also be offered in each of the Summer sessions.

C5: In Fall and Spring, we anticipate offering two lecture sections with four corresponding lab sections for each lecture (ie, eight total). In summer, we will probably offer one lecture section with one or two corresponding lab sections.

C6: In Fall and Spring, lecture sections will accommodate 120 students each (the maximum number of students that can be scheduled in the newly- remodeled Weyandt Room 32 auditorium). Lab sections will always accommodate 25 students each.

C7: No professional society recommendations exist for a course like this.

Section D: Course descriptions from other universities

203 - The Universe Spring

Designed for humanities and social science majors, this course emphasizes concepts but uses quantitative reasoning freely; fluency in high school algebra is assumed. Topics include telescopes, the sun and the planets, the origin and evolution of stars, matter between the stars, galaxies, quasars, black holes, cosmology, and life in the universe. *N. D. Tyson*

D101fs Concepts of Astronomy
Students explore the contents, temporal and spatial scale, and history of the universe. The laboratory is devoted to observations: constellation study; solar, lunar, and planetary phenomena; visual and photographic observations with small telescopes.
3 meetings, 3 laboratories; 4 credits

113f The Solar System
An introductory course dealing with civilization's evolving perception of our nearest neighbors in the universe. Ancient and classical conceptions of the sky; the Copernican revolution; the many motions of the Earth and planets and causes and consequences of these motions; the tides and their influence; the surfaces, atmospheres, and interiors of the planets and their satellites; minor objects in the solar system; the origin and evolution of the Earth and other planets.
Mr. Dent
2 meetings; 4 credits
First semester, University of Massachusetts

215f Development of Astronomy
This course looks at developments in astronomy and their relation to other sciences and the social background. Nontechnical, with emphasis on history and cosmology.
2 meetings (1 1/4 hours); 4 credits

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. 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) [Check-lists are found in the appendix to this Handbook.]

✓ Course syllabus in UWUCC format.

Note: If this is a new course not previously approved by the University Senate, you will also need 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 for new courses or course revisions, see appropriate sections of this Handbook.

Submit <u>one</u> (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 ____ Second Composition Course
____ Mathematics

KNOWLEDGE AREAS:

____ Humanities: History ____ Fine Arts
____ Humanities: Philos./Rel Studies ____ Social Sciences
____ Humanities: Literature ____ Non-Western Cultures
GS 105/106 X Natural Sci: Laboratory ____ Health & Wellness
GS 105 X Natural Sci: Non-laboratory ____ 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:
X				1. Inquiry, abstract logical thinking, critical analysis, synthesis, decision making, and other aspects of the critical process.
	X			2. Literacy--writing, reading, speaking, listening.
X				3. Understanding numerical data.
		X		4. Historical consciousness.
X				5. Scientific Inquiry.
		X		6. Values (Ethical mode of thinking or application of ethical perception).
			X	7. Aesthetic mode of thinking.
X				**B. Acquiring a Body of Knowledge or Understanding Essential to an Educated Person**
			X	**C. Understanding the Physical Nature of Human Beings**
		X		**D. Collateral Skills:**
		X		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.**

X 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.**

X 2. **Define and analyze problems, frame questions, evaluate available solutions and make choices.**

X 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.**

X 5. **Continue learning even after the completion of their formal education.**

X 6. **Recognize relationships between what is being studied and current issues, thoughts, institutions, and/or events.**

Liberal Studies Approval Parts 4-6
IV. Liberal Studies Questions

A. Presently there is only one astronomy professor in the Geoscience Department. She will be solely responsible for GS 105 Exploring the Universe and GS 106 Exploring the Universe Lab. She will organize the course content, collect and document visual media to support the course and develop initial exams and quizzes, In later semesters, if an additional astronomer is hired in the department, she will share her outlines, notes, library of supporting material and copies of quizzes and exams to ensure that all sections are provided with uniform and fair evaluation for students.

B. Whenever and wherever possible, lectures and lab material for Exploring the Universe will emphasize the contributions of women astronomers and earth scientists from around the world. Examples include Anne Jump Cannon who devised the stellar classification used today by all astronomers and Henrietta Leavitt, who developed the first means of measurement to other galaxies. Also discussed will be Jocelyn Bell, who discovered the first pulsar but was passed over for the Nobel Prize. Instead, her advisor was awarded the prize. Connie Sutton has had articles published reviewing women in astronomy and is currently researching Chinese Astronomy for inclusion into her lectures.

C. As noted in the syllabus, non-text reading material for this course will include factual as well as theoretical works. The Nemesis Affair, Tales of the North American Indian; The Search for Extraterrestrial Intelligence; and Space: The Next Twenty-five Years cover both past and future topics in astronomy. In addition, science fiction novels such as Dragon's Egg (about aliens who live on a neutron star) will be used to engage student's interest and excite their imaginations about astronomy. By providing a range of topics and types of reading material, more students will be able to find a reading subject which is personally interesting as well as informative.

D. To a much greater extent that with our major's courses, Exploring the Universe will emphasize the need to continue to search for answers about the origin and nature of the universe, whether through traditional research or via the space program. Politically, NASA is always one step away from the chopping block of funding. The lay public does not realize the widespread and useful by-products which they receive from space research. Laser surgery, magnetic resonance imaging, Kevlar, Goretex, velcro, zip-pack bags and frozen dinners are a few examples of applications of technology and materials which have moved out to the population from the space program. Discussion of these and other issues will arise in many meetings of Exploring the Universe.

CHECK LIST – NATURAL SCIENCES (Laboratory)

GS 105-106

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.

CHECK LIST -- NATURAL SCIENCES (Non-laboratory) 14

GS 105

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 Area 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:

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