LSC Use Only Proposal No:	UWUCC Use Only Proposal No: 12-16d.
LSC Action-Date: App - 1/31/13	UWUCC Action-Date: App-2/5/13 Senate Action Date: App-2/26/13

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

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Proposing Department/Unit Geoscience Dept.	Phone 724-357-5626

Check all appropriate lines and complete all information. Use a separate cover sheet for each course proposal and/or program proposal.

1. Course Proposals (check all that apply)

- ☐ New Course
- ☐ Course Prefix Change
- ☐ Course Deletion
- ☑ Course Revision
- ☐ Course Number and/or Title Change
- ☐ Catalog Description Change

Current course prefix, number and full title: GEOS 106 Exploring the Universe Lab

Proposed course prefix, number and full title, if changing:

2. Liberal Studies Course Designations, as appropriate

This course is also proposed as a Liberal Studies Course (please mark the appropriate categories below)

- ☐ Learning Skills
- ☑ Knowledge Area
- ☐ Global and Multicultural Awareness
- ☐ Writing Across the Curriculum (W Course)
- ☐ Liberal Studies Elective (please mark the designation(s) that applies – must meet at least one)
  - ☐ Global Citizenship
  - ☐ Information Literacy
  - ☐ Oral Communication
  - ☐ Quantitative Reasoning
  - ☐ Scientific Literacy
  - ☐ Technological Literacy

3. Other Designations, as appropriate

- ☐ Honors College Course
- ☐ Other: (e.g. Women's Studies, Pan African)

4. Program Proposals

- ☐ Catalog Description Change
- ☐ Program Revision
- ☐ Program Title Change
- ☐ New Track
- ☐ New Degree Program
- ☐ New Minor Program
- ☐ Liberal Studies Requirement Changes
- ☐ Other

Current program name:

Proposed program name, if changing:

5. Approvals	Signature	Date
Department Curriculum Committee Chair(s)	Kenneth S. Coles	11/5/2012
Department Chairperson(s)		11/5/12
College Curriculum Committee Chair		12/4/12
College Dean		12/5/12
Director of Liberal Studies (as needed)		1/31/13
Director of Honors College (as needed)		
Provost (as needed)		
Additional signature (with title) as appropriate		
UWUCC Co-Chairs	Gail S Eschrist	2/5/13

Received
DEC 10 2012
Liberal Studies

Part II.

1) Syllabus of Record

I. Catalog Description

GEOS 106 Exploring The Universe Lab 0c-2l-1cr

Prerequisites: No Geoscience Majors/Minors

Corequisite: GEOS 105

Introduces the techniques astronomers use to study the nature and motions of objects in the sky, including the Sun, Moon, planets, and stars. Includes two observations which are held at night.

II. Course Outcomes and Assessment (Expected Undergraduate Student Learning Outcomes)

Objective 1:

Students will demonstrate how light from distant objects is collected and analyzed by telescopes and spectroscopes and what it tells us about the characteristics and history of those objects.

Expected Student Learning Outcomes 1 and 2

Informed and Empowered Learners

Rationale:

Light is the basis for nearly all understanding in astronomy. Students will create their own hypotheses and then test them in lab and at the telescope using their observations and analyses.

Objective 2:

Students will describe and analyze the history of features on the Moon and planets by applying geologic principles.

Expected Student Learning Outcomes 1 and 2

Informed and Empowered Learners

Rationale:

Just as rocks hold the record of the Earth's geologic past, they also reveal the history of other planets and moons. Course assignments and content will engage students, working in groups, in the critical interpretation of maps and images, strengthening their ability to reconstruct past events based on their own observations.

Objective 3:

Students will distinguish correct from incorrect explanations for seasons, phases of the Moon, and solar activity, and predict the occurrence and effects of these phenomena on Earth.

Expected Student Learning Outcomes 1, 2, and 3

Informed, Empowered and Responsible Learners

Rationale:

The explanations for motions of objects in the sky and the influence of space on our lives are key contributions of astronomy. Assignments and course content will require students to master physical models and verbal explanations in order to make predictions about the Moon, Sun, seasons, and solar activity and their effects on daily life.

Objective 4:

Students will employ coordinate systems, such as longitude/latitude and right ascension/declination, to find and describe objects on planetary surfaces and in the sky.

Expected Student Learning Outcomes 1 and 2

Informed and Empowered Learners

Rationale:

The ability to decipher and plot using coordinate systems enables recognition of patterns in the sky, in time, and in various astronomical objects. Students will practice organizing observations and predicting events to become critical users of quantitative observations.

III. Course Outline

Lab 1: Interpreting planetary surfaces	2 hours
Lab 2: Constellations, Part I	2 hours
Lab 3: Seasons	2 hours
Lab 4: Celestial Coordinates	2 hours
Lab 5: Telescopes	2 hours
Lab 6: Surface of the Moon	2 hours
Lab 7: Exam One	2 hours
Lab 8: Phases of the Moon	2 hours
Lab 9: Planetary size and orbits	2 hours
Lab 10: Sunspots and solar activity	2 hours
Lab 11: Telescope observation (at night)	2 hours
Lab 12: Star classification	2 hours
Lab 13: Constellations, Part II	2 hours
Lab 14: Exam Two	2 hours

IV. Evaluation Methods

Each component of the course will contribute to final grade according to:

Exam 1	25%
Exam 2	25%
In Class Assignments	25%
Quizzes	25%
Total	100%

V. Example Grading Scale

The final grade for this course will be determined using the following schedule:

A=90-100%; B=80-89%, C=70-79%, D=60-69%, F=<60%

VI. Attendance Policy

The attendance policy will conform to IUP's undergraduate course attendance policy as outlined in the undergraduate catalog.

VII. Required textbooks, supplemental books and readings

Lab activities will refer to the course text for the Corequisite GEOS 105 lecture:
Comins, Neil, 2012, Discovering the Essential Universe, 5th Edition: Freeman, 412 pages.

Lab Manual: IUP Instructors lab manual available at Pro-Packet.

VIII. Special resource requirements

There are no special resource requirements for this course.

IX. Bibliography

In addition to the required textbooks and and lab manual, the following will be used to develop the course curriculum:

Comins, N. F., 2001, Heavenly Errors: Misconceptions about the real nature of the universe: Columbia University Press, 244 p.
Moche, D. L., 2009, Astronomy: A self-teaching guide, 7th edition: John Wiley, 388 p.
Ridpath, I., 2004, Norton's star atlas, 20th edition: Pi Press, 195 p.
Royal Astronomical Society of Canada, 2011, Observer's Handbook (issued annually), 352 p.
Seasonal Star Charts, 2008: Hubbard Scientific, 21 p.

2. SUMMARY OF PROPOSED REVISIONS

1. Objectives – course objectives were modified from the 1995 syllabus of record and aligned with the Expected Undergraduate Student Learning Outcomes (EUSLO).

2. Common Learning Objectives for a laboratory Natural Science course were incorporated into the content of the course. These objectives include: understand a body of knowledge in a science domain; understand that science knowledge is generated by an empirical approach to nature and analyze problems from the perspective of a natural scientist; demonstrate an understanding of intellectual honesty in the context of scientific methodology, and contrast science with pseudoscience; understand how science knowledge is relevant to non-scientists and use critical thinking skills and scientific methodology.

3. Revised Course content for consistency with current teaching involving modern telescopes and equipment and use of online resources for charting the heavens.

4. Added reference to the text for the associated lecture, GEOS 105 Exploring the Universe, and also updated the bibliography.

3. JUSTIFICATION/RATIONALE FOR REVISIONS

The course is a currently approved for Liberal Studies Laboratory Natural Science (in conjunction with its companion course GEOS 105 Exploring the Universe). Both courses are being revised to meet the new curriculum criteria.

4. OLD SYLLABUS OF RECORD

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.

Liberal Studies Course Approval General Information

1. This course has been taught by one or two instructors each semester it has been offered, generally taught in one section. Each instructor may teach one or multiple sections. Instructors use an identical lab manual and frequently consult and collaborate on syllabi, textbooks and assignments for this course.

2. Readings taken from Johnson, G., 2006, Miss Leavitt's stars: The untold story of the woman who discovered how to measure the universe: [Norton, 176 p.] will showcase contributions that female scientists have made to astronomy. Scientists highlighted in these readings and in the the course include Caroline Herschel: She and her brother revolutionized the study of astronomy; Annie Jump Cannon: Built a star classification of more than 350,000 stars; Henrietta Leavitt: Discovered a way to measure distances between stars; Cecilia Payne Gaposchkin: The first woman granted a Ph.D. in astronomy at Harvard; Margaret Burbidge: Described the way chemical elements form in stars; Jocelyn Bell Burnell: Discovered quasars; Vera Rubin: Discovered dark matter in galaxies; Carolyn Shoemaker: Discovered more comets than any living person.

3. In addition to the textbook for the accompanying lecture course GEOS 105 Discovering the Universe, the class will read a variety of government and university web-sites (updated each term) to engage in interactive learning about planetary geology and currently visible celestial objects.

4. This course introduces students to the fundamental processes that create the objects we see in the sky, how we gather information without visiting these objects, and how they influence our life on Earth today. This course is intended to give students enough knowledge of and experience in astronomy to permit them to make informed and responsible decisions. The strong emphasis on how we learn about the universe and how objects and processes in space influence our life on Earth makes this course very different from our majors courses such as GEOS 341 and 342 that go into more detail and depth about the objects in the solar system and universe and how they evolved.

Example Assignment and Grading Rubric

Lab 1: Making maps of Mars (attached)

Lab Grading Rubric

	Excellent	Good	Unsatisfactory
Numerical data **Pts _____**	Student answers all coordinate and scale questions correctly and with specific details. (3 points)	Student answers all coordinate and scale questions with only minor errors and/or with fewer details. (1 to 2 points)	Student answers coordinate and scale questions incorrectly or does not answer at all. (0 points)
Geologic feature interpretation **Pts _____**	Student gives specific supporting ideas for all geologic feature questions. (3 points)	Student names geologic features but with little or no supporting ideas. (1 to 2 points)	Student does not name any geologic features. (0 points)
Synthesis: Q 5 Overlap and Q 10 Landing site **Pts _____**	Student answers all synthetic questions clearly and with supporting details. (4 points)	Student answers all synthetic questions with only minor errors and/or with few supporting details. (2-3 points)	Student answers some synthetic questions incorrectly or does not answer them at all. (0-1 points)

Name _____
Day and Time of Your Lab:

_____

GEOS 106
Introductory Lab Exercise

You will look at maps of Mars. Understanding the history of a planet from images taken from orbit is a young science. You can interpret what you see in the same way a professional planetary scientist does.

PART 1

Note: Please take care of these maps! We only have one copy of each, and many of them are now out of print. They will be unfolded and you are asked to leave them that way. Repeated folding wears them out faster. Thank you.

You will examine the maps with a small group. You may discuss your ideas, but each of you should write your own answers in your own words.

Look at one of the Shaded Relief Maps.

What is the name of your map? _____

1. The scale of the map is given as 1:5,000,000 ("one to five million"). This means one unit on the map equals five million of the same unit on the ground.

One cm on the map equals how many cm on the ground?

One cm on the map equals how many km on the ground? (Note: 100,000 cm = 1 km)

2. Look at the circular features on your map. What could have made these? Explain the process.

Give the coordinates (in latitude and longitude along the edges of the map) for two examples of these features. If they have names on the map, give the name also.

3. Look for valleys or other low areas on your map. What could have made these? Explain the process.

Give the coordinates (in latitude and longitude along the edges of the map) for an example of this feature. If it has a name on the map, give the name also.

4. One feature seen on several planets were first called "wrinkle ridges." Find these or other ridges on your map. What could be their origin, that is, how could they form?

Give the coordinates (in latitude and longitude along the edges of the map) for an example of a ridge.

5. Sometimes on images of Mars, one feature or unit of rock appears to overlap or overlie another. Look for overlapping units. Describe them and tell which you think is younger (newer) and why.

Give the coordinates (in latitude and longitude along the edges of the map) for you example of overlap of units.

Now use a piece of tracing paper and a pencil to trace the region you are examining for overlapping relation ships. Outline the units and give their relationship (which is on top or younger, etc.). Colored pencils may be helpful for this.

PART 2

Please have your lab checked by the instructor. If you are done to this point, you will get a geologic map of the same area you have been studying. A geologic map is where planetary scientists have used colors to show different units of rock and features that have formed by different processes or at different times.

6. Find the circular features you looked at before. What unit are they a part of?

What is their origin?

7. Find the valley or low area you looked at before. What unit is it a part of?

What is its origin?

8. Find the wrinkle ridges or other ridges you looked at before. What symbol shows them on the geologic map?

What is their origin?

9. Find the overlapping units you looked at before. What units are overlapping?

Which unit is younger?

Add the unit names, if any, to your tracing paper from question 5.

10. Imagine you are hired by NASA to choose a landing site for a robotic (unmanned) spacecraft somewhere on your map. You want to avoid hazards like boulders or cliffs that may cause the spacecraft to tip over. You also want to choose a site where you can study an interesting geologic question, such as one or more of the features you have looked at, or one of the units on the geologic map.

Give the coordinates of your landing site: _____

Justify your choice in a paragraph (use the back of the page for more room). Name the landing site, tell how it avoids hazards, and explain the important things that can be learned there. You need to make a strong case to convince NASA to choose your landing site and make you the Chief Scientist for this space mission.