Course Syllabus

Comparative Planetology (SCI/PHYS 5327)
Fall 2016
Mondays 5:30 – 8:15 pm, SLC 1.214
Some coursework will be online.

Professor Contact Information: Dr. Mary L. Urquhart (Kelly)

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Office Location	FN 3.218 C
Email Address	urquhart@utdallas.edu
Office Hours	Mondays 1:30-2:30 pm, Wednesdays 3:30 – 4:30 pm, immediately after class and by appointment.
Other Information	Assignments should be submitted through eLearning, or on paper when necessary. Other correspondence with the instructor should be by email. Please DO NOT email assignments through regular email.

Course Pre-requisites, Co-requisites, and/or Other Restrictions
(including required prior knowledge or skills)

For the SCI section, no prior astronomy, physics, or geology course work is required. However, this is a graduate course, and all students will be expected to be able to understand, synthesize, apply, evaluate, and use course content creatively, as well as develop the foundation necessary to extend the exploration of course topics independently and to find and evaluate current information in the dynamic field of planetary science. Students will be expected to draw from their own backgrounds in physics, astronomy, geology, and/or teaching during class participation and group projects.

Students in the PHYS section of the course are expected to have substantial physics knowledge equivalent to a degree in the field, and to bring this knowledge into their study of planetary processes and assist peers in the SCI section who may struggle with physics concepts important to the course.

Course Description

Comparative Planetology will engage students in the field of planetary science through an exploration of the physical properties of, and underlying principles that shape the planets, dwarf planets, natural satellites, and small solar system bodies that orbit our nearest star, the Sun. Our most familiar and best-studied planetary body, the Earth, will be compared with each of the other objects we will encounter in our journey through the solar system.

Student Learning Objectives/Outcomes

At the completion of this course, the successful student will:

- Organize the complex and interconnected systems and processes that shape Planet Earth into a framework shareable with others.
- Explain the concepts and physical principles related to basic physical properties of planets and discuss why planetary objects differ from one another to an 80% level on written responses on thought questions, projects, and post-instructional journals.
- Apply critical thinking skills to reasoned arguments in quizzes, projects, and in class discussions.
- Demonstrate an ability to utilize and critically evaluate classroom applications of the science content related to planetary science, including hands-on activities that can be used with pre-college students, through instructor-observed performance in small group work and class discussion and written journals to an 80% level.
- Demonstrate an ability to compare some of the major findings of recent planetary science research to older ideas and recent discoveries apply to teaching and learning of Earth and space science concepts in class discussions and to an 80% level in written post journals.
- Describe how new discoveries drive changes in scientific understanding in responses on applicable quiz questions to within 80% of possible points in the rubric.
- Design a final project that demonstrates the ability to synthesize and apply course content in the creation of a new application or teaching resource to at least 80% of possible points in the project rubric.

Required Textbooks and Materials – Please note class sets for checkout

- *An Introduction to the Solar System* (McBride and Gilmore), 2nd edition (2011, ISBN-10: **1107600928**) is our primary book for readings. Homework will not be directly from the book. *Copies are available to check out for your use all semester from the class set.*
- *The Essential Earth, 1st edition* (2008, ISBN-10: **142920429X)** or 2nd edition (2011, ISBN-10: **1429255242)** is a reference book we will be using heavily in class and is available in multiple formats. *We have copies in a class set available to check out for use all semester.*
- **For a quantitative reference preferred for students in the PHYS section**, *Planetary Sciences* 2nd Edition (2010) by Imke de Pater and Jack J. Lissauer, from Cambridge University Press. A slightly less technical book with one loaner copy available is *Fundamental Planetary Science: Physics, Chemistry, and Habitability*" by the same authors.
- A scientific calculator (or app) will be useful in most, if not all class meetings. Please bring yours to each class session.
- Access to a computer and the Internet outside of class, for research and for eLearning.

Suggested Course Materials

Strongly Recommended: *Dictionary of Geological Terms* or equivalent. No specific edition is necessary.

Other entirely optional recommendations:

An excellent but more mathematically oriented text is a recent edition of *Moons and Planets*, by William Hartmann.

A more geologically-based text is *The Earth in Context* (2001) by David M. Hartland from Springer-Praxis Books.

The New Solar System, 4th edition (1999 publication date). The mass-market paperback version of this book is no longer in print. This book has a planet-by-planet treatment some students may prefer. However, some chapters in the book are out of date.

Planetary science is a very dynamic field. Additional readings will be handed out in class and/or posted on eLearning.

Assignments & Academic Calendar
(Topics, Reading Assignments, Due Dates, Exam Dates)

August 22	1. Scale in the Solar System: Why it Matters • Begin Tour of Planets with online resources. *Assigned Text Reading: Ch.1 A Tour of The Solar System*
August 29	2. Earth as a Planet: • Earth systems: solid Earth, atmosphere, water, and life *Assigned Text Reading: Ch. 2 The Interior Structure of the Terrestrial Planets*
September 5	**University Holiday: No Class**
September 12	3. Earth as a Planet: • Planetary Processes • Resources Abound *Assigned Text Reading: Ch. 4 Planetary Surface Processes*
September 19	4. Impacts: Worlds in Contrast, the Earth and Moon • Role of impacts in Earth systems • Dating planetary surfaces *Assigned Text Reading: Ch. 8 Origin of the Solar System*
September 26	5. Planetary Origins: A Lunar Record to Star Birth • The signatures of giant impacts and late heavy bombardment • Distant stars and distant worlds *Assigned Text Reading: Ch. 7 Minor Bodies of the Solar System*
October 3	6. Stories in Stone and Ice: Small Solar System Bodies • Asteroids • Comets • Meteorites *Assigned Reading: Ch. 8 Meteorite: A Record of Formation*
October 10	7. The Mysteries of Mercury *Assigned Reading: Ch.5 Atmospheres of the Terrestrial Planets*
October 17	8. Venus • Earth's "Evil" Twin?

	• A glimpse of our future *Assigned Reading: Ch. 3 Planetary Volcanism*
October 24	9. Mars: How Warm, How Wet? How Earth-like? *Assigned Reading: TBD*
October 31	10. Mars and the Challenges of Planetary Exploration *Assigned Reading: Ch. 6 Gas Giants*
November 7	11. Giant Planets • Gas and gravity • Ice giants *Assigned Readings: Journal Articles on Satellites of Giant Planets TBD*
November 14	12. Worlds of their own: Icy worlds of the Outer Solar System *Assigned Reading: Articles on Titan TBD*
November 21	Fall Break
November 28	13. Titan: Earth in the Deep Freeze? Assigned Reading: Articles on Pluto and the Kuiper Belt
December 5	14. Little Objects Everywhere: Small Moons, Kuiper Belt, and the Oort Cloud
December 12	More on Pluto, Presentation of Final Projects

Times and topics are subject to change. Other readings will be as assigned in class.

Grading Policy
(including percentages for assignments, grade scale, etc.)

Pre-Journals, Discussions, and Group Work (10%): Much of the class will be done in the style of an educator workshop. You will be expected to be an active participant in all activities and in class and online discussions and contribute to the learning environment for your classmates. **The quality of your contributions and the evidence of deep thinking and development of understanding will be part of this grade.**

Reflective Journaling (10%): You will be required to do reflective journaling on the classes and assigned readings. Specific journal questions may be given in class or through eLearning.

Weekly Quizzes (also called Thought Questions) (40%): Every class meeting, one or more thought questions will be asked of the class to probe each student's understanding of the topics discussed. Answers to the questions must be in your own words. Questions will generally be take home and due by the next class meeting unless otherwise specified. All quizzes will be graded on a 10 point scale:

Content:

4 point: Excellent. Complete, correct and clear. Little or no corrections are necessary.

3 points: Good. Minor problems with the answer in content, completeness, or clarity.

2 points: Fair. Requires at least one major correction or revision.

Consider redoing the quiz.

1 point: Poor. Serious flaws in the answer. Turning in a redo of the quiz is strongly recommended.

0 points: Did not address the question asked**.** Please try again.

Thoroughness (not length!):

4 point: Excellent. Answer is thorough and demonstrates the student has thought critically deeply about the question.

3 points: Good. Answer is acceptable and demonstrates a reasonable amount of critical thought about the question.

2 points: Fair. Answer is not thorough.

1 point: Poor. Answer does not demonstrate sufficient thought or effort.

0 points: Did not address the question asked**.** Please try again.

Other:

1 point: Readability: Answer is clear, legible, understandable, and does not ramble.

1 point: References are given when necessary and are accurate.

Note: these quizzes are generally given in place of exams. An initial grade of 50% or less on three or more quizzes may result in you being required to take a final exam.

Small Projects: (20%): A small project is generally an experiment or set of observations you will conduct on your own. These projects are not meant intended to be extremely time consuming but to extend your learning beyond the classroom setting. Examples of small projects:

- Systems concept maps
- Mini-paper on Lunar and Planetary Science Conference abstracts.
- Interactive online mapping programs
- Crater dating of planetary surfaces

Final Project (20%): Each student is required to select, complete, and present a final project to the class. You may partner with a classmate with approval from the instructor. Examples of projects:

- A 5 E format lesson plan, with necessary background information related to planetary science.
- A "proposal" for a new astronomy space-based mission.
- A creative project such as a game or children's book on that demonstrates solid understanding of the science content (with an emphasis on concepts) and would assist students in developing their own scientific understanding of an Earth/space science topic addressed in this course at the appropriate to the intended developmental level.
- A term paper *and* accompanying poster or PowerPoint presentation on a

planetary science topic.

Revisions: Whenever reasonable, you may redo take-home quizzes, and post-journals to **earn back up to half** of your missed points, unless otherwise stated by the professor. Such revisions must be submitted in a timely manner, and will be held to the same standards as the original assignment. We will discuss assignments, including quiz questions, in class. Revisions must demonstrate an individual understanding of the material rather than a summary of the class discussion. If a redo of your project is necessary, it may result in a grade of incomplete in the course.

Important! All submitted work must be in your own words and represent your own understanding. You may use quotes to make up a small portion of your answers to support an argument. All sources and references MUST be properly cited or no credit will be given. Your professor will use Turn-it-in to check for plagiarism and follow university procedure on reporting suspected violators of university policy.

Course & Instructor Policies

Make-up Exams	**NA**
Extra Credit	**NA**
Late Work	**Accepted only at the discretion of the professor**
Special Assignments	**If you need special arrangements, talk with the instructor as soon as possible.**
Class Attendance	**Attendance of all class sessions is required! You *must* get all absences excused by the professor, in advance if possible.**
Classroom Citizenship	**This is a graduate class and students are expected to behave accordingly. Your presence should enhance rather than detract from the learning of your classmates. Your classroom citizenship is part of your participation grade.**

Comet Creed

This creed was voted on by the UT Dallas student body in 2014. It is a standard that Comets choose to live by and encourage others to do the same:

"As a Comet, I pledge honesty, integrity, and service in all that I do."

UT Dallas Syllabus Policies and Procedures

The information contained in the following link constitutes the University's policies and procedures segment of the course syllabus.

Please go to http://go.utdallas.edu/syllabus-policies for these policies.

The descriptions and timelines contained in this syllabus are subject to change at the discretion of the Professor.