

Planetary Geology and Exploration
University of Texas at El Paso
Department of Geological Sciences
Spring Semester 2017

Instructor:

Dr. Jose Miguel Hurtado, Jr.
Geology room 301A
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Class Website:

<http://www.geo.utep.edu/pub/hurtado/planetary>

Class Meetings:

Lecture/Lab: TTh 1:30-2:50 pm, Geology 320
Office Hours: TTh 11 am – 1 pm (or by appointment), Geology 301A

Text:

There is no required text to purchase. Students will be given required readings from a variety of published books and current articles in professional journals as PDFs for download from the class website. Materials will also be drawn from selected internet sites, including the websites for current and past NASA exploration missions, the NASA Planetary Data System (PDS), and other agencies. In addition, a selection of textbooks and reference materials will be available for your use from Dr. Hurtado.

Grading:

Grades will be based on cumulative points earned from: assignments (40% total), in-class quizzes and paper discussions/participation (30% total), and final exam (30%). Among the assignments will be a required field trip (see schedule).

Graduate students will be held to a higher standard than undergraduate students, and they can expect additional tasks on assignments, quizzes, paper discussions, and exams, including leading in-class discussions and/or making class presentations.

Policies:

Please contact the instructor about any concerns, schedule conflicts, missed work, etc. **in advance** or otherwise **as soon as possible!** *Valid excuses include illness, absence with the instructor's prior approval, official University business, etc., but all require documentation.* Otherwise, there are **no make-ups** for missed work, and **late work will lose 50% of its value for each day it is late!** **Attendance and participation are mandatory, and excessive absences may result in being dropped from the course!**

There will be a lot of reading for this class that everyone will be responsible for!
I will assume you to be familiar with all the material in the readings on the

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day we discuss it in class. Therefore, you will be expected to keep up with all reading assignments and do the reading before the class meeting where it will be discussed. Come to class prepared with answers to the assigned questions and with your own questions. **I expect everyone to contribute to class discussions.**

If you are in the military with the potential of being called to military service and/or training during the course of the semester, you are encouraged to contact the instructor as soon as possible. If you think you may have a disability or if you are experiencing learning difficulties, please contact the Disabled Student Services Office (DSSO) at (915) 747-5148. They're located in Union East room 106 or you can reach them by e-mail at dss@utep.edu. The student is responsible for presenting to the instructor any DSS accommodation letters and instructions.

Reasonable collaboration is allowed on assignments (not exams). However, **I expect everyone to turn in work that is his or her own!** You **MUST** learn to trust your own reasoning and **NOT** rely on the interpretations of others, otherwise you are wasting your time. The assignments are your opportunity to learn the material. **Show all your work and be prepared to explain it!** Cheating **WILL** be noticed and **WILL NOT** be tolerated. **The University guidelines for academic dishonesty are very specific and will be strictly followed. Please read the guidelines (see <http://studentaffairs.utep.edu/dos>), and contact the Dean of Students or the instructor if you have any concerns.**

Because they are vital venues for all course business, **computer and internet use outside of class are required.** You need to have your free UTEP email account activated for this course and you need to check it regularly. If you do not have one, go to <https://newaccount.utep.edu/> to activate yours. **You will also be expected to stay continually up to date with all information posted on the course website, which will include course notes, readings, supplemental material, and assignments.** I may be experimenting with internet activities this semester so the syllabus may change as the class evolves.

Course Description:

A survey of a broad range of topics in lunar and planetary science, including the origin, evolution, and present state of the objects in our solar system. The focus of the class will be on process, as well as phenomenology, and, in particular, a quantitative understanding of important planetary processes. We will discuss the geologic properties of and contrasts among the terrestrial, rocky planets (Earth, the Moon, Venus, Mars, Mercury), the characteristics of the gas giant planets (Jupiter, Saturn, Uranus, Neptune), and the wide array of asteroids, comets, planetary moons, ring systems, and other small bodies. Planetary ages, derived from impact cratering records and other methods, and remotely-sensed data derived from robotic probes will be presented and students will gain experience with working with those data. An ongoing emphasis will be on the technology and science behind the robotic and human exploration of the solar system.

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Course Outline (subject to continual change!):

<u>Week</u>	<u>Dates</u>	<u>Topics and Labs</u>
Week 1	Jan. 17, 19	Introduction <i>Stellar evolution and nucleosynthesis; The Sun; Planet formation; Tour of the solar system; Planetary dynamics and orbital mechanics</i> Assignment 1: Differentiation, planetary properties, and Kepler's Laws
Weeks 2, 3	Jan. 24, 26, 31, Feb. 2	Water and Habitability on Mars Assignment 2: Mars from Orbit: Atmosphere and Geology Assignment 3: Mars from the Surface: Landers and Rovers
Weeks 4, 5	Feb. 7, 9, 14, 16	Planetary Tectonics and Magmatism <i>Deformation, volcanoes, and geomorphology of Mercury, Venus, Mars, the Moon, and other solid planetary bodies</i> Assignment 4: Remote Sensing and Geologic Mapping of Mercury, Venus, and Mars Assignment 5: Tectonics and Volcanism
Week 6	Feb. 21, 23	Impacts and Surface Processes <i>Impacts and impact craters; Surface processes on airless bodies; Crater counting and geochronology</i> Assignment 6: Analog & Numerical Experiments; Crater Counting
Week 7	Feb. 28, Mar. 2	The Moon I <i>Formation of the Moon; Geology of the Moon</i> Assignment 7: Remote Sensing and Geologic Mapping of the Moon
Week 8	Mar. 7, 9	The Moon II <i>Water in, on, and of the Moon; Lunar exploration</i> Assignment 8: NASA Lunar samples
Spring Break	Mar. 13-17	No Class Meetings
Week 9	Mar. 21, 23	No class meetings (Lunar and Planetary Science Conference) Assignment 9: LPSC Abstract Review
Weeks 10, 11	Mar. 28, 30, Apr. 4, 6	Mysteries and Treasures of the Asteroids and Small Bodies <i>Meteorites, asteroids, comets, TNOs, KBO, etc.; Pluto and Charon</i> Assignment 10: Remote Sensing of 4-Vesta and 1-Ceres Assignment 11: Is Asteroid Mining Feasible?
Weeks 12, 13	Apr. 11, 13, 18, 20	The Giant Planets <i>Atmospheres, oceans & interiors; Potential fields; Icy Moons & Rings</i> Assignment 12: Remote Sensing of the Galilean Moons and Titan Assignment 13: Outer Planets, Rings, and Moons
Weeks 14, 15	Apr. 25, 27, May 2, 4	Planetary Analogs and Exploration I <i>Technology and mission design for human and robotic exploration</i> Assignment 14: Kilbourne Hole Field Trip (Sat., Apr. 29) Assignment 15: Critical Review of the SpaceX Mission to Mars

Final Examination Thurs., May 11, 1-3:45 pm in Geology 320

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