Course Outline

THE UNIVERSITY OF WESTERN ONTARIO
PLANETARY SCIENCE PROGRAM
Plan. Sci. 9762 - Planetary Image Interpretation
Winter 2015

COURSE DESCRIPTION

This course is intended to provide experience with the acquisition of planetary map and image data from NASA and other sources, and with the interpretation of these images in a geological context. Although it deals with geology, only basic principles are involved and no background in Earth Sciences is required. It also deals with the planets, but no background in astronomy is is required. Necessary background will be provided in the readings. This is intended to make the course equally accessible to students from Physics and Astronomy and Earth Sciences, the two sides of a Planetary Science program. By the end of the course students should be able to describe the geological history and surface processes involved in the formation of a planetary landscape seen in an image, and plan a realistic rover mission to that area.

INSTRUCTOR: Dr. Philip J. Stooke, room 2425 SSC
Phone: 661-2111 ext. 85022

e-mail: pjstooke@uwo.ca
website: publish.uwo.ca/~pjstooke

INSTRUCTOR OFFICE HOURS: Monday to Thursday, each day, 11:30 to 12:30 in the MAP AND DATA CENTRE, Weldon Library (LOCATION) , or by appointment, or just drop by my office any time (best days - Tuesday to Thursday). **NOTE:** Because those office hours are held in the Weldon Library, you cannot reach me on my office phone during those times.

CLASS TIME - To be determined at the start of term, chosen to suit everybody. **NOTE:** The first meeting will be in the MAP AND DATA CENTRE, Weldon Library, at a time chosen to suit everybody.

READINGS: There is no textbook for this course. Readings may be assigned, and if so will be placed on reserve in the Taylor Library.

EVALUATION: The final mark is the sum of marks for the assignments listed in the schedule. Final grades may be modified to conform with Faculty or Program policy.

If assignment due dates are missed, whether due to illness or any other factor, they must be made up during the remainder of the term on a schedule agreed by the student and instructor. For

UWO Policy on Accommodation for Medical Illness and a downloadable SMC see: Medical Accommodation

For a downloadable Student Medical Certificate (SMC) see: Student Services under the Medical Documentation heading

---

ACCESSIBILITY STATEMENT:
Please contact the course instructor if you require material in an alternate format or if you require any other arrangements to make this course more accessible to you. You may also wish to contact Services for Students with Disabilities (SSD) at 661-2111 x 82147 for any specific question regarding an accommodation.

PREREQUISITE CHECKING:
It is the student's responsibility to ensure that prerequisite courses have been passed prior to registration in this course. Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

PLAGIARISM:
Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site:

http://www.westerncalendar.uwo.ca/2013/pg113.html

All work you hand in must be your own. You may seek advice from other students regarding design, techniques or software operations, but you must not share or duplicate map files, including base maps. This includes finding another student's saved file on a computer, making minor modifications, and passing the work off as your own. Any offence will trigger the procedure outlined on the linked document.

SUPPORT SERVICES FOR STUDENTS:
Registrar's Services
Student Development Services

Students who are in emotional/mental distress should refer to mentalhealth@western for a complete list of options about how to obtain help.

Planetary Image Interpretation

Schedule for this term

(January to April 2015)
(subject to minor modifications)

NOTE: First class (week 2 in schedule) will be held in the Map and Data Centre, Weldon Library.

Week	**Dates**	**Class Topic**	**Assignment** (to be completed before the next class) **(% marks)**
1	Jan. 5 - 9	Organizing week	We will arrange meeting times etc. this week. As soon as you decide you are taking this course, email the instructor: pjstooke@uwo.ca
2	Jan. 12 - 16	Introductions; purpose of course; planetary map resources.	First meeting - in Map and Data Centre, Weldon Library Reading: D. E. Wilhelms, "The Geologic History of the Moon", USGS Prof. Paper 1348, 1987: **Read Chapters 1 and 2.**
3	Jan. 19 - 23	NASA's Planetary Image Atlas and other resources	Reading: over next 2 weeks, D. E. Wilhelms, "The Geologic History of the Moon", USGS Prof. Paper 1348, 1987: **Read Chapters 3 and 5.** Exercise: download and print 5 images from any 5 different missions, with the image ID numbers, approximate image dimensions and location. Raw NASA data, not maps or press images!**(10%)**
4	Jan. 26 - 30	Importance of context and scale. Introduction to planetary mapping	Exercise: download images of the Moon from (1) Lunar Orbiter 4, (2) Apollo Metric Camera, (3) Clementine UV/VIS and (4) Lunar Reconnaissance Orbiter LROC (Narrow Angle), all of the same area. Also download a context map of the area from Map-a-Planet (PDS, link below) or the USGS nomenclature map (link below). Order by level of detail and outline each image on the one before, zooming in as in the example provided. Hand in the set of annotated images, including image identification numbers. **(10%)**
5	Feb. 2 - 6	Observing and interpreting material units and sequences. Moon mapping examples: local history,	Reading: Shoemaker and Hackman, "Stratigraphic Basis for a Lunar Time Scale", pp. 289-300 of The Moon (Kopal, Z. and Mikhailov, Z. K., eds), IAU Symp. 14, 1962.

		relative ages, crater density etc.	
6	Feb. 9 - 13	Geological history of the Moon; mapping using Clementine or Apollo images. Extension to other worlds.	Exercise: Choose a map area and make four maps of it. (1) use Map-A-Planet to define an area 5 degrees across on a mare/highland boundary, labelling its borders. (2) identify the same area in Quickmap's Wide Angle Mosaic, make a screen grab of it and crop to the same boundaries as (1). During mapping, refer to the Quickmap version on screen where you can zoom in and out to look at context or greater detail as needed. (3) Use the USGS Planetary Nomenclature website to make a map showing feature names in your area. (4) Draw a geological map with estimates of stratigraphic ages (Copernican, Imbrian etc.) and a cross-section. Describe and interpret your units. Write a brief history of the area. **(20%)**
7	Feb. 16 - 20	'Reading' week.	No class or assignment.
8	Feb. 23 - 27	(1) Class presentation of the last assignment. (2) Mars data sets and introduction to geology	Reading: Viking Orbiter Views of Mars (NASA): **Read from "Earth and Mars: A comparison" to "Deformational Features".** Exercise: Choose a map area and make four maps of it. (1) use Map-A-Planet to define an area 5 degrees across in an interesting area (including at least two major units), labelling its borders. (2) identify the same area in the THEMIS Day IR Global Mosaic, make a screen grab of it and crop to the same boundaries as (1). During mapping, refer to the THEMIS version on screen where you can zoom in and out to look at context or greater detail as needed. (3) Use the USGS Planetary Nomenclature website to make a map showing feature names in your area. (4) Draw a geological map with estimates of stratigraphic ages (Amazonian, Hesperian, Noachian) and a cross-section. Describe and interpret your units. Write a brief history of the area. **(20%)**
9	Mar. 2 - 6	Geology of Mars: basic mapping using sample data from Mars Odyssey	Reading: Viking Orbiter Views of Mars (NASA): **Read from "Craters" to "The Atmosphere".**
10	Mar. 9 - 13	Mars: geological history; Martian time scale; age estimates; Mission planning: landing site selection, rover route planning, sample selection.	Exercise: download all or part of a Mars Odyysey THEMIS visible image, a Global Surveyor MOC image or a HiRISE browse image of an interesting area, and choose just a section if the image is very large. Plan a rover mission which lands in a safe location and collects the maximum number of different types of material, within a total driving range of 5 km (and of course

			avoiding any obstacles). Provide one or more context images, a very brief summary of the geology of the site, and a list of the sampling sites commenting on why they were chosen and what might be sampled there. **(20%)**
11	Mar. 16 - 20	LPSC week.	A week to catch up with reading or any late assignments.
12	Mar. 23 - 27	Mars: current exploration	Class presentations of the last assignment, plus look at current missions to Mars.
13	Mar. 30 - Apr. 3	(1) Evaluation. (2) Wrap-up - Solar System Week	We will look at images from other worlds and discuss them in the context of this course. Bring a print, digital or online image of your favorite place! Final Project: Pulling it all together. Download any interesting high resolution image you like, any mission, any world. Provide appropriate context from maps or images (ask for help if you need it). Two parts: (1) produce a geological map and cross-section of the area covered by the images, including a description of the sequence of events which shaped the area, and (2) plan a rover/sample mission similar to the last assignment, specifying the rover driving (distance) constraint and identifying the materials to be collected with a brief description of what you think they may be. **NOTE:** This should be accompanied by a brief descriptive report with details of images, procedures and results. **Due NO LATER than April 10 (Friday) - but you might like to start planning a bit early! (20%)**
14	Apr. 6 - 8	Advice and help with final assignment	