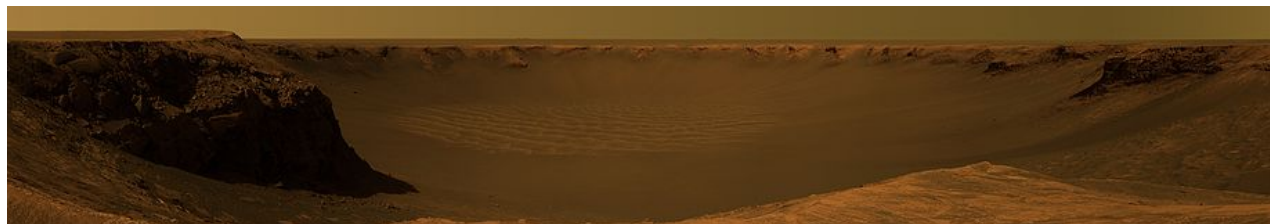


## Astronomy 2232F / Earth Sciences 2232F: Sun, Earth and Planets



Victoria Crater, Mars. Taken by the NASA rover "Opportunity"

\*\*\*\*This is a Blended Course with both online and in-person instruction\*\*\*\*

	<b>Day:</b>		<b>Time:</b>	<b>Location:</b>
<b>Lectures</b> (choose 1):	Section 200	Monday	1:30–2:30pm	SSC 2028
	Section 201	Thursday	1:30–2:30pm	MC 110
<b>Laboratories:</b>	Online			
<b>Instructor:</b>	Prof. Stanimir Metchev			
<b>Office:</b>	Room 201, Physics & Astronomy Building			
<b>Email:</b>	<a href="mailto:metchev@uwo.ca">metchev@uwo.ca</a>			
<b>Prerequisites:</b>	None.			
<b>Antirequisite:</b>	Astronomy 2201A/B.			
<b>Textbook:</b>	There is no required textbook for this course. Material will be presented online in various formats. There are abundant online resources for this course, including <i>Exploring the Planets</i> (2nd edition © 2007), E. H. Christiansen & W. K. Hamblin), which is freely available online at <a href="http://explanet.info/">http://explanet.info/</a>			

### Course Calendar Description:

A survey of the contents of the solar system, of space science phenomena, and of extrasolar planetary systems. Emphasis will be put on processes that are common to solar system bodies and to planetary systems. Advances in space science will be highlighted with particular attention to recent results from space missions and contemporary ground-based observations.

### Detailed Course Description:

This course provides an introduction to the interdisciplinary field of planetary science, which can be defined as the scientific study of planets, moons, and planetary systems. This course explores the origin and development of the Solar System with an emphasis on what is presently known about the Solar System and its constituents, with particular emphasis on the terrestrial (or rocky) planets – Mercury, Venus, Earth, and Mars – and the Earth's moon. Students will be introduced to the major processes that shape the interior and surface of rocky planets and moons, as well as the processes that affect the atmospheres of the terrestrial planets and the giant planets of the outer Solar System. The course will then place this understanding in the context of what is known about planetary systems around other stars.

This course seeks to highlight the exciting nature of planetary and exoplanetary science, and the rapid pace of discoveries. The results of recent and ongoing space missions will be integrated into the lecture material. Guest lectures from researchers participating in planetary missions will be incorporated. The course also seeks to enhance students' understanding of how our Solar System formed, of the processes that shape the planets and moons of the Solar System, and the implications for the origin and evolution of Earth and of life itself. This course will focus on the following topics:

- Why do we explore Space? What is planetary science?
- The properties of planetary bodies in the solar system.
- The origin of the solar system.
- Planetary interiors.
- Planetary surface processes (e.g., volcanism, impact cratering, aqueous processes).
- Planetary atmospheres.
- Meteorites: rocks from Space.
- Exoplanets: Extending planetary science beyond our Solar System.
- Astrobiology and the search for life.

**Learning Outcomes:**

Upon completion of this course successful students will be able to:

- Define the properties of the various objects in the Solar System.
- Distinguish and explain processes that shape the various objects in the Solar System.
- Apply knowledge of planetary system dynamic processes to develop a targeted space exploration project.
- Integrate theoretical and observational information to describe the cause(s) of the variety of objects in our solar system and in other planetary systems.
- Evaluate and begin to synthesize concepts, theories, and observations related to course material.
- Develop writing skills and project development related to planetary science and space exploration.

**Course Materials:**

The majority of the materials for this course will be presented online through pre-recorded lectures, tutorials, and laboratories. The 1-hour per week in person classroom time will be used for various activities and will vary from week to week. New material may be presented in class so it is imperative that you attend.

**Course Evaluation (summary):**

Scientific Engagement	10%
Weekly News Assignment	5%
Laboratory Exercises	30%
Quizzes	15%
Group Project Assignment	25%
Group Project Presentation	<u>15%</u>
	100%

## **Course Evaluation (details):**

Two of these activities will be carried out in groups. You will sign up for groups in OWL during the first week of classes.

*Scientific Engagement (10%)* – One of the most exciting aspects of planetary science is how rapidly new discoveries are made. As part of this class, you will share relevant news items by “tweeting”. Some examples of space news websites and people to follow on Twitter will be provided on the OWL site. You may wish to create a new Twitter account for the purposes of this class. Please ensure all tweets include the #AST2232 hashtag in order to be counted and that tweets are public. TA’s and myself will be closely monitoring these feeds and grading them according to your depth of insight rather than merely the number of tweets. A tutorial on the use of Twitter for this class will be given in class for those not familiar with this media. For students not comfortable using Twitter, an alternative is to post items to the Forum page in OWL.

*Weekly News Assignment (5%)* – The first 5 minutes of each class will feature a summary of planetary science news from the previous week. This will be followed by a 5-minute (or more!) discussion of this news. This will be done as a group and each group will present once during the semester. The presenting group will submit a summary, including web links, the night before the class via OWL. Feel free to use content from your group and other class members posted via Twitter in this assignment.

*Laboratory Exercises (30%)* – Six online laboratory exercises will cover a variety of topics, including mapping of planetary surfaces, investigation of major rock types common to many planetary surfaces, exoplanets, etc. Each lab is worth 5% of the final mark.

*Quizzes (15 %)* – you are required to take series of quizzes throughout the course. All quizzes are due before, or on, the last day of classes (December 9, 2015). You can take these at any time between the release date and the relevant deadline, but it is recommended that you take them as you work through the relevant sections. Spelling and grammar count on the quizzes! These are online quizzes, so misspelled words will not be recognized.

*Group Project Assignment – Mission to Mars (25%)* – In this assignment, you are required to work together in groups to produce a report for a mission concept “*Mission to Mars.*” Facilitated by an interactive web application, you get to decide what the goal of the mission is, what scientific instruments you need, and where you will land. You will need to draw on the information presented during the course, together with a literature review, to develop a successful mission concept. Detailed requirements for this group project will be provided in class and through the OWL link.

*Group Project Presentation (15%)* – The finale for this class will be a presentation by each group in the final two weeks of the semester. Each group will produce a poster and a 3-minute presentation. Posters should be 36” high by 48” wide. Costs for printing will be covered by the University and a template for compiling the poster in PowerPoint will be provided. Posters and presentations will be evaluated by a Mission Review Panel and the Top 3 Missions will be awarded prizes.

## **Course Polices and Friendly Reminders:**

*Assignments:* All assignments must be submitted via OWL on the assigned due date and will not be accepted late, except under medical or other compassionate circumstances (see below); after the due date a penalty of minus 5 marks per day will be applied. No assignment without appropriate documentation will result in a zero (0) grade. Students must write their assignments in their own words. Whenever students take an idea, or a passage from another author, they must acknowledge this both by using quotation marks where appropriate and by proper referencing such as footnotes or citations. Plagiarism is a major academic offence (see below).

*Accessibility:* 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.

*Absences/Missed Exams/Assignments:* If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or other supporting documentation to the Dean's office as soon as possible and contact your instructor immediately. It is the student's responsibility to make alternative arrangements with their instructor once the accommodation has been approved and the instructor has been informed. In the event of a missed final exam, a "Recommendation of Special Examination" form must be obtained from the Dean's Office immediately. For further information please see:

[http://www.uwo.ca/univsec/pdf/academic\\_policies/appeals/accommodation\\_medical.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_medical.pdf)

A student requiring academic accommodation due to illness should use the Student Medical Certificate when visiting an off-campus medical facility or request a Records Release Form (located in the Dean's Office) for visits to Student Health Services. The form can be found here:

[https://studentservices.uwo.ca/secure/medical\\_document.pdf](https://studentservices.uwo.ca/secure/medical_document.pdf)

*Academic misconduct:* Academic 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.uwo.ca/univsec/pdf/academic\\_policies/appeals/scholastic\\_discipline\\_undergrad.pdf](http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf)

All required papers may be subject to submission for textual similarity review to the commercial plagiarism detection software under license to the University for the detection of plagiarism. All papers submitted for such checking will be included as source documents in the reference database for the purpose of detecting plagiarism of papers subsequently submitted to the system. Use of the service is subject to the licensing agreement, currently between The University of Western Ontario and Turnitin.com (<http://www.turnitin.com>). Computer-marked tests may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

*Classroom Behaviour:* Disruptive behavior will not be tolerated in class or on the course website. Please respect the rights of your classmates to benefit from the lecture by limiting your conversations to those essential to the class. Students who persist in loud, rude or otherwise disruptive behavior will be asked to leave. Cellular phones, pagers, and text-messaging devices are not to be used in class and must be placed in silent mode. Laptops for the purpose of typing lecture notes are permitted in class, but please be respectful to your fellow students and turn the sound off. Audio and/or videotaping of lectures is not permitted unless approval has been sought from the instructor in advance.

*Grades:* Course marks may, in some cases, be adjusted in order to conform to the meaning of course marks described in the Western Academic Calendar,

<http://www.westerncalendar.uwo.ca/2015/pg104.html>, and in order to conform to Department policy

*Support Services:* Students who are in emotional/mental distress should refer to Mental Health@Western <http://www.uwo.ca/uwocom/mentalhealth/> or a complete list of options about how to obtain help. Other support is available from the Office of the Registrar (<http://www.registrar.uwo.ca>) and from Student Support Services (<http://westernusc.ca/services/>).