



GEOL 1700/2700 Introduction to Space Science

Fall Semester 2025/26

Tuesdays and Thursdays 2 – 3.15 PM, 229 Cathedral of Learning

Instructor Information

Instructor

Daniel Williams

Email

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Office Location & Hours

SRCC 508, T.B.D.

General Information

Our Universe is a remarkable place and over the past 100 years our knowledge of it has accelerated. Along with this, so has the development of new technologies that can be used to better understand phenomena seen in our solar system and beyond. This course aims to provide an overview of space science by focusing on three main research foci; Astrophysics, Astrogeology, and Astrobiology. We will spend the first part looking at the formation of stars and galaxies, how gravity works to bring objects into orbit, and the basic fundamentals of light and optical systems. We will then learn about the geologic processes that have shaped the solid body objects in our own solar system, before looking at the materials required for life, how life evolved on our own planet, and how the hunt of exoplanets is helping us determine whether or not life exists elsewhere in the universe.

Learning Goals

- Gain an understanding of the basics of space science across three main disciplines – Astrophysics, Astrogeology, and Astrobiology
- Understand the basics of the formation of the universe, galaxies, and stars
- Learn how planetary bodies are formed and the processes that shaped them
- Look at how pre-biotic molecules are distributed, the processes required to create life and the environments it can exist in
- Undertake different exercises to learn how to use and interpret astronomical data through image processing and GIS

Assignments

Given the varied nature of this course, assignments will cover a breadth of topics. We will complete weekly assignments to better understand the processes that occur in the universe. These exercises will cut across multiple different fields, from using computer models to better understand lava flow propagation to image data analysis from remote sensing.

We will make extensive use of JMars, a free GIS-based planetary data software, which can be downloaded here - <https://jmars.asu.edu/>

Grading Breakdown and Policies

Your final grade will be assessed based upon the following components:

Assignments = **50 %**, Quizzes = **10%**, Exam 1 = **20 %**, Exam 2 = **20 %**

If a curve is required, it will be calculated at the end of the semester and will be based on the average of the **entire** class and the median grade will be equal to a grade of a C+/B-. There are 3 exams for this course are **non-cumulative** and the topics which are covered for each exam are listed in the timetable below. There will be one exam for each of the three themes – Astrophysics, Astrogeology, and Astrobiology. You will be able to drop the lowest of your three exam scores, and only the highest two will be taken forward to count towards your grade.

Exams will be taken **during class time**. The exams will only be made available during this time, so you need to make sure that you are able to take the exam. If you are going to have an issue with taking the exam (not including illness on the day) you must tell me **at least 24 hours in advance** so that an alternate solution can be determined. Make-up exams will only be in-person and must be completed within 10 days of the original exam date (except the Final Exam – this must be made up prior to the grade submissions deadline).

Score	Grade
93 +	A
90 - 92	A -
87 - 89	B +
83 - 86	B
80 - 82	B -
77 - 79	C +
73 - 76	C
70 - 72	C -
67 - 69	D +
63 - 66	D
60 - 62	D -
< 60	F

Quizzes will be taken on Canvas/ and will be done at the beginning of class. These can either be taken on your laptop, cell phone, or tablet. If you don't have a device to hand you will be able to take the exam on paper which will be graded by the instructor. Quizzes will take place every Tuesday and will cover the previous week's topics. These will consist of 5 questions to be answered in 5 minutes. The lowest score on these quizzes will be dropped.

It is your responsibility to keep up with class material. I provide class notes before each lecture; however, these only provide an overview of the topics that we are discussing. There are many examples that I cover in more depth in class that will not be in the notes, but these still might be on your exams!

Homework topics will be introduced during class time, and you will need to complete each exercise in your own time. Exercises must be submitted by **1:00 p.m. the following Thursday**. There is a very strict late policy that is enforced for this. If you hand your work in late (late being defined as after **1.00 pm**) you will lose 20%. You will then lose an additional 20% every day that it is late. You **CANNOT** hand in all the assignments at the end of the semester or make them up after the deadline **without prior**

permission (and must be within 2 weeks). If you are going to have an issue with making these deadlines, you must tell me **at least 12 hours in advance with a legitimate excuse (with evidence)** so that an extension can be arranged.

EVERYTHING HERE IS SUBJECT TO CHANGE, SO PLEASE KEEP AN EYE ON EMAILS FROM ME.

Recommended Reading

An Introduction to Astronomy and Astrophysics (2nd Edition) 2024, Jain, .P, pp. 367

Fundamentals of Astrophysics (2nd Edition) 2025, Owicki, S., pp. 320

Planetary Geoscience (1st Edition) 2019, H.Y. McSween, Jr, J.E. Moersch, D.M. Burr, W.M. Dunne, J.P. Emery, L.C. Kah, M.C. McCanta, pp. 350

An Introduction to Astrobiology (3rd Edition) 2019, Rothery, D.A., Gilmour, I., Sephton, M.A., pp.398

Class Schedule

Week	Date	Topic	Notes	
1	Aug 26 th	Course Overview & Units, Powers, Angles, and the Scientific Method		
	Aug 28 th	Gravity and Orbits		
2	Sept 2 nd	Fundamentals of Light		
	Sept 4 th	Optics, Telescopes, and Remote Sensing		
3	Sept 9 th	Origins of the Universe	ASTROPHYSICS	
	Sept 11 th	Exploring the Early Universe		
4	Sept 16 th	Stars Pt. 1 – Thermonuclear Energy and Structure		
	Sept 18 th	Stars Pt. 2 – Stellar Formation, Evolution, and Black Holes		
5	Sept 23 rd	Galaxies Pt. 1 – The Milky Way, Dark Matter, and Density Waves		
	Sept 25 th	Galaxies Pt. 2 – Classifications, Clusters, and Quasars		
6	Sept 30 th	EXAM #1: ASTROPHYSICS		Weeks 1 - 5
	Oct 2 nd	Assembling Planets and Planetesimals		
7	Oct 7 th	Planetary Interiors		ASTROGEOLOGY
	Oct 9 th	Geodynamics and Tectonics		
8	Oct 14 th	Igneous Activity		
	Oct 16 th	Impact Cratering		
9	Oct 21 st	Atmospheres and Oceans		
	Oct 23 rd	Ices		
10	Oct 28 th	Fluvial and Lacustrine Processes		
	Oct 30 th	Aeolian Processes		
11	Nov 4 th	EXAM #2: ASTROGEOLOGY	Weeks 6 - 10	

Week	Date	Topic	Notes
	Nov 6 th	Definition of Life, and it's basic structure	
12	Nov 11 th	Requirements for Life on Earth	
	Nov 13 th	Origins of Life on Earth	
13	Nov 18 th	Evolution and the Fossil Record Pt. 1	
	Nov 20 th	Evolution and the Fossil Record Pt. 2	
14	Nov 27 th	Thanksgiving Break	NO CLASS
15	Dec 2 nd	Life in Extreme Environments	
	Dec 4 th	The Search for Intelligent Life/Exoplanets	
16	Dec 8 th	EXAM #3: ASTROBIOLOGY (T.B.D.)	Weeks 11 - 15

ASTROBIOLOGY

Additional Information

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

To learn more about Academic Integrity, visit the Academic Integrity Guide for an overview of the topic. For hands- on practice, complete the Academic Integrity Modules.

Disability Services

If you have a disability for which you are or may be requesting an accommodation, you are encouraged to contact both your instructor and Disability Resources and Services (DRS), 140 William Pitt Union, (412) 648-7890, drsrecep@pitt.edu, (412) 228-5347 for P3 ASL users, as early as possible in the term. DRS will verify your disability and determine reasonable accommodations for this course.

Email Policy: Each student is issued a University e-mail address (username@pitt.edu) upon admittance. This e-mail address may be used by the University for official communication with students. Students are expected to read e-mail sent to this account on a regular basis. Failure to read and react to University communications in a timely manner does not absolve the student from knowing and complying with the content of the communications. The University provides an e-mail forwarding service that allows students to read their e-mail via other service providers (e.g., Hotmail, AOL, Yahoo). Students that choose to forward their e-mail from their pitt.edu address to another address do so at their own risk. If e-mail is lost as a result of forwarding, it does not absolve the student from responding to official communications sent to their University e-mail address. ***I will not respond to emails out of hours (i.e., over weekends and weekday evenings after 6 PM).***

Statement of Classroom Recording

To ensure the free and open discussion of ideas, students may not record classroom lectures, discussion and/or activities without the advance written permission of the instructor, and any such recording properly approved in advance can be used solely for the student's own private use.

Diversity Statement:

Students, faculty, and guests represent diverse perspectives, backgrounds, and experiences which enrich our research and educational environment. Individuals of all races, colors, ancestries, genders, marital status, familial status, ages, backgrounds, beliefs, ethnicities, gender identities and expressions, national origins, religious or political affiliations, sexual orientations, abilities, and other visible and nonvisible differences are welcomed in this class. We urge all to be mindful in this classroom and to feel responsible for creating a space that is intellectually rigorous and is a respectful, welcoming, and inclusive environment for everyone. No demeaning or discriminatory behavior will be permitted. If you feel uncomfortable, please feel free to approach me during or after class to discuss the situation.

In this class, we will have the chance to indicate the name that we prefer to be called and, if we choose, to identify pronouns with which we would like to be addressed. Please approach me if you have such preferences and I will do my best to address and refer to all students accordingly and support classmates in doing so as well. I will endeavor to use gender-inclusive and nondiscriminatory language in all course communication and materials. Your suggestions for how to improve the effectiveness of the course for you personally or other student groups are encouraged and appreciated. Our faculty is committed to communication from students without judgement. In addition, if any of our class meetings conflict with your religious events, please let me know so arrangements can be made.

Your Well-being Matters

College/Graduate school can be an exciting and challenging time for students. Taking time to maintain your well-being and seek appropriate support can help you achieve your goals and lead a fulfilling life. It can be helpful to remember that we all benefit from assistance and guidance at times, and there are many resources available to support your well-being while you are at Pitt. You are encouraged to visit Thrive@Pitt to learn more about well-being and the many campus resources available to help you thrive.

If you or anyone you know experiences overwhelming academic stress, persistent difficult feelings and/or challenging life events, you are strongly encouraged to seek support. In addition to reaching out to friends and loved ones, consider connecting with a faculty member you trust for assistance connecting to helpful resources.

The University Counseling Center is also here for you. You can call 412-648-7930 at any time to connect with a clinician. If you or someone you know is feeling suicidal, please call the University Counseling Center at any time at 412-648-7930. You can also contact Resolve Crisis Network at 888-796-8226. If the situation is life threatening, call Pitt Police at 412-624-2121 or dial 911.

Teaching Surveys

Students in this class will be asked to complete a *Student Opinion of Teaching Survey* from the Office of Measurement and Evaluation of Teaching (OMET). Surveys will be sent via Pitt email and appear on your CourseWeb landing page during the last three weeks of class meeting days. Your responses are anonymous. Please take time to thoughtfully respond, your feedback is important to me. [Read more](#) about *Student Opinion of Teaching Surveys*.