

1. Course Information

Earth Sciences 1086a – Summer term 2025

List of Prerequisites: None

List of Antirequisites: Earth Sciences 2232F/G, Astronomy 2201A/B, Astronomy 2232F/G

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.

2. Instructor Information

Instructors: **Section 650:** Dr. Wyatt Bain, Department of Earth Sciences (wbain2@uwo.ca)

We encourage you to post questions about the course content in the online Forums. If you need to contact us about something personal, please e-mail the instructor for your section.

Students must use their Western (@uwo.ca) email addresses when contacting their instructors and put the course code (ES1086a) in the subject line. **Please read the syllabus before asking or posting a question.**

Office hours – There are no regular office hours. Your first contact point will be your TA. If you need to speak with me, please send an email and I'll set up an appointment to meet over Zoom or in person.

3. Course Description, Schedule, Delivery Mode

Important dates (all dates and deadlines are Eastern Standard Time)

- Classes begin: **Monday May 5**
- Academic Integrity Quiz **MANDATORY**: **Friday May 16**
- ProctorTrack Onboarding Deadline: **Wednesday June 4 at 11.59 pm EST**
- Mid-term test: **Tuesday June 10 at 9:00 am EST**
- Mid-term ***makeup** test: **Thursday June 12 at 6:00 pm EST**
*The makeup is only available to students with an approved accommodation from your faculty councilors. If you miss the makeup and have an approved accommodation you will be able to write the mid-term the next time the course is run. **This is the only makeup available. No exceptions.**
- Essay submission #1 deadline: **Wednesday June 25 at 3:00 pm EST**
- Revised essay submission #2 deadline: **Wednesday July 23 at 3:00 pm EST**
- Deadline to post in the Forums: **Wednesday July 23 at 5:00 pm EST**
- Deadline for Quizzes: **Wednesday July 23 at 5:00 pm EST**
- Classes end: **Friday July 25**
- Final exam: TBD set by the Registrar's office (**July 28 to 31**)

Course Description

This half-course will explore the Solar System; we will look at our star (the Sun), the planets and their satellites, and other bodies such as asteroids and comets. We will consider the hypotheses and theories that attempt to explain their origins. We will see how our knowledge of Earth's geology applies to other planetary bodies in the Solar System. We will end the course with a discussion of potential extraterrestrial life. As technology improves and as more and more space vehicles probe beyond Earth, knowledge expands dramatically. This course emphasizes qualitative approaches to the topics included, thus is appropriate for all students, irrespective of backgrounds.

Course Objectives

- The primary goal of the course is to gain an appreciation of what we know about the Solar System, and how we know what we know.
- We will learn to recognize the processes of evolution of a star-planet system, and we will see that the evolution we know best – that of Earth – may not apply well elsewhere.
- We need to understand the logic of a scientific study: from observation and gathering of evidence to hypothesis and, eventually, refined theory.
- We will learn to write scientific reports; an assigned topic will be researched and presented in scientific format.

Delivery Mode

The course content course is entirely on-line and mostly asynchronous. Asynchronous means you set your own schedule. Chapters are provided as PDF files. A suggested reading schedule is provided below. Quizzes are on-line and asynchronous (not timed). Exams will be synchronous, on-line, timed, and proctored. This means you need to write the exam online at the scheduled time.

4. Course Materials

Course materials

All course material will be posted to OWL Brightspace: <https://westernu.brightspace.com/> There is no additional textbook.

Students should check OWL Brightspace on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class. **Students are responsible for checking OWL on a regular basis.**

If students need assistance, they can seek support on the OWL Help page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Technical Requirements

It is your responsibility to maintain access to the internet for the duration of the course.

To complete the exams for this course you will require a stable internet connection and a computer with a working webcam and microphone (not a tablet, nor iPad). I pads are not supported. It is YOUR responsibility to be able to take and complete the exams.

Course Outline

Each Unit contains an Introduction, a Self-Test, and a Graded Quiz. The “Learning Goals” in the Unit Introductions are a starting off point for you to begin your studies. [More detailed information on what to study is provided in the “Study Guides” that can be found in the section “Reading and Studying the Material” under the Course Notes.](#)

1. Unit 1: Basic concepts
 - Chapter 1 – Scientific Theory and the Big Bang
 - Chapter 2 – Time and Space
 - Chapter 3 – Matter and the Nebular Hypothesis
2. Unit 2: The Solar System
 - Chapter 4 – A Star called Sun
 - Chapter 5 – Geometry of the Solar System
3. Unit 3: The Terrestrial Planets
 - Chapter 6 – When two planets collide
 - Chapter 7 – Earth
 - Chapter 8 – The Moon
 - Chapter 9 – Mercury
 - Chapter 10 – Venus
 - Chapter 11 – Mars

* The Mid-term exam covers up to the end of Chapter 11 *

4. Unit 4: From Asteroids to Meteorites
 - Chapter 12 – Asteroids
 - Chapter 13 – Meteorites
5. Unit 5: The Gas Giant Planets
 - Chapter 14 – Jupiter and family
 - Chapter 15 – Saturn and family
 - Chapter 16 – Uranus and Neptune
6. Unit 6: Plutoids, TNOs and Comets
 - Chapter 17 – Plutoids and TNOs
 - Chapter 18 – Comets
7. Unit 7: Extraterrestrial Life
 - Chapter 19 – Life in the Universe

8. The Final exam is not cumulative and covers the Unit 4 Intro to Chapter 19 *

Suggested weekly schedule

This is a suggested schedule – you should plan your own schedule according to your reading speed and your other obligations. There are 2 weeks without suggested readings to allow time to work on your essays and study for the midterm. Plan ahead, read regularly and keep up with the chapters.

Week 1, starts **May 5** (23 pages)

- Start work on the essay as soon as your schedule will allow
- Read the introductory materials and familiarize yourself with course site on OWL
- Unit 1 Introduction
- Chapter 1
- Chapter 2

Week 2, starts **May 12** (35 pages)

- Chapter 3
- Quiz 1**
- Unit 2 Introduction
- Chapter 4

Week 3, starts **May 19** (41 pages)

- Chapter 5
- Quiz 2**
- Unit 3 Introduction
- Chapter 6
- Chapter 7

Week 4, starts **May 26** (44 pages)

- Chapter 8
- Chapter 9
- Quiz 3a**
- Chapter 10

Week 5, starts **June 2** (29 pages)

- Chapter 11 (This is the end of the material that will be on the midterm)
- Quiz 3b**
- ProctorTrack Onboarding: Wednesday February 7 at 3:00 pm EST**

Week 6, starts **June 9**

- Revision for Midterm
- Midterm test: Tuesday June 10 at 9:00 am EST (TENTATIVE)**

Week 7, starts **June 16** - (33 pages)

- Unit 4 Introduction
- Chapter 12
- Chapter 13
- Quiz 4

Week 8, starts **June 23** (29 pages)

- Unit 5 Introduction
- Chapter 14
- Deadline for first essay submission: **Wednesday June 25 at 3:00 pm EST**

Week 9, starts **June 30** (38 pages)

- Chapter 15
- Chapter 16
- Quiz 5

Week 10, starts **July 7** (32 pages)

- Unit 6 Introduction
- Chapter 17
- Chapter 18
- Quiz 6

Week 11, starts **July 14** (22 pages)

- Unit 7 Introduction
- Chapter 19
- Quiz 7

Week 12, starts **July 21** (no readings)

- Deadline for revised essay: **Wednesday July 23 at 3:00 pm EST**
- Have you completed the course and instructor evaluation survey?
- Deadline for posting to the Forums: **Wednesday July 23 at 5:00 pm EST**
- Deadline for Quizzes: **Wednesday July 23 at 5:00 pm EST**
- Deadline for participating in the OWL polls: **Wednesday July 23 at 5:00 pm EST**

5. Methods of Evaluation - All dates and deadlines are Eastern Standard Time (EST)

- 25% Mid-Term **Tuesday June 10th at 9:00 am EST (tentative)**
 - Exam will be online, proctored, and synchronous.
 - The format will be multiple choice, true/false, fill in the blank, and "all or nothing". The midterm is not linear so you can go back and forth. The PDF files are allowed open, but **ONLY** the files posted in Course Notes. No other files (e.g., cheat sheets) will be permitted.
 - *This covers Units 1, 2 and 3 inclusive (to the end of Chapter 11)*

- 25% Final Exam (**Date and time to be determined by the Registrar's office; July 28-31**)
 - Exam will be online, proctored and synchronous.
 - The format will be multiple choice, true/false, fill in the blank, and "all or nothing". The exam is not linear so you can go back and forth. PDF files are **NOT** allowed.
 - *This covers Units 4, 5, 6 and 7. The final exam is not cumulative.*

- 35% Scientific Report. Submitted in 2 parts: *See the Assignment Information on OWL.*
 - 25% Submission of first version: **Due Wednesday June 25 at 3:00 pm (EST)**
 - 10% Submission of second version: **Due Wednesday July 23 at 3:00 pm (EST)**

When you submit your assignments, you will get a Turnitin score. Scores of up to 25% are not unusual, but scores more than 25% could indicate a problem. You **MUST** check your score and ensure it is below 25% otherwise the following penalties will be **automatically applied**:

Turnitin Scores of 25-30% will receive a 10% deduction
Turnitin Scores of 31-35% will receive a 20% deduction
Turnitin Scores of 36-40% will receive a 30% deduction

Turnitin Scores above 40% will receive a 50% deduction and will be scrutinized for originality in the written content. If evidence of plagiarism is found, you will get a penalty and you will be reported to the Dean. Plagiarism is a serious offense (see note on plagiarism below) and is treated seriously in this class.

- 5% Participation Deadline: **Wednesday July 23 at 5:00 pm (EST)**
 - Participation in online forums and online polls throughout the OWL Lessons pages is required.

Please see **"The Exceptional Contributor"** below.

- 10% Graded Quizzes: **Wednesday July 23 at 5:00 pm (EST)**
 - There are 8 graded quizzes (numbered 1, 2, 3a, 3b, 4, 5, 6, 7).
 - There are also 8 self-tests available as practice. These are not graded.
 - You should try to complete the quizzes each week as you read the related chapters.
 - Spelling and grammar count on the quizzes! Misspelled words will not be recognized.
 - The quizzes are automatically administered through the OWL system. **Don't wait to submit your quizzes until the last minute!** Last minute computer problems will not be accepted as grounds for accommodation.

Scientific Report (Essay)

- Details about the requirements for the Scientific Report (essay) can be found on the OWL site under “Assignments”.
- Because this is an “essay course” completion of the essay assignment and a minimum grade of 50% on the second submission is required to pass the course.
- The essay is worth 35% and is submitted in two different versions. The first version will be worth 25% of your course grade. You will receive feedback on this version that you can use to improve your essay and resubmit for the second version, which is worth 10% of the course grade. Revising your essay to improve its content, based on feedback from your TA, is an opportunity both to improve your writing and to increase your grade.
- Submission of the revised (second) version of the essay is NOT MANDATORY. **If you are happy with your grade on Assignment #1 you DO NOT NEED TO SUBMIT ASSIGNMENT #2.** If no submission for Assignment #2 is made, the grade for Assignment #2 will be the same as that for Assignment #1.
- The revised (second) version of the essay may be submitted at any time up to the final submission. ***If you do not make any changes for the second submission, please do not resubmit.*** All assignments submitted will be marked. As this is the final submission you may receive a lower mark than you did on Assignment #1 if you do not improve it.
- Every effort will be made to complete the grading of the essay in a timely fashion. Questions about the essay should be posted to the forum or communicated to your TA or instructor in an email.
- All essay submissions must be made through OWL. Email attachments will not be graded. Submission problems must be communicated to the instructor and TA before the deadline.
- When you submit an assignment, you will receive an email receipt from OWL and an email receipt from Turnitin.com. **Keep these for your records.**
- **Please note:** When you write your essay, you are **not** allowed to copy and paste **ANYTHING** (even if it’s just part of a sentence!) from **ANYWHERE**. This includes text from websites, papers, books, other students, generative AI (e.g., ChatGPT), etc. You may not generate text with artificial intelligence and directly copy it into your paper. You are not allowed to copy and paste paragraphs and then change several words. Paraphrasing is plagiarism. You must gather ideas for your report then **write the entire paper in your own words**. If *any* part of your paper is determined to be plagiarized, that part of your paper will **NOT** be marked. **NO EXCEPTIONS!**

Generative Artificial Intelligence (AI)

Use of Generative AI is not required in this course.

Generative AI uses sophisticated models that can generate responses to “prompts” from existing examples and patterns. Generative AI models use natural language processing (NLP), neural networks, and deep learning AI algorithms to extract patterns in data. However, you should be aware that all Generative AI platforms (like ChatGPT) still tend to make up facts and fake citations. You are responsible for any inaccurate, biased, offensive, or otherwise unethical content you submit regardless of whether it comes from you or a Generative AI platform.

I acknowledge that some students may be interested in exploring the use of Generative AI as a learning tool. I have chosen not to ban its use in this course. Instead, I require that all essays **MUST** contain one of the two following statements at the end of their essay:

- 1) *I did not use artificial intelligence in creating this paper; or*
- 2) *I did use artificial intelligence in creating this paper. I affirm I did not generate text with artificial intelligence and directly copy it into my paper.*

You may use Generative AI (e.g., ChatGPT, etc.) to get you started and/or help you when you are stuck. If you choose to do this, you must include a brief description of the following:

- Software and version used.
- A complete list of prompts.
- How the generative AI was used (e.g., brainstorming, preparing an outline, discovering facts about the topic, locating background information, improving grammar/spelling/punctuation/structure, etc.)

Why can't we directly copy words from an AI engine into my essay? There are multiple reasons: 1) this is considered plagiarism (which means presenting others' words as if they were our own); 2) I have already created several essays using various Generative AI models so Turnitin is already good at detection and you will likely get a very high similarity index; 3) AI engines are notoriously unreliable on facts; 4) AI engines reproduce biases and prejudices from their source material; and 5) using AI to generate text robs you of the chance to develop your own critical thinking on the subject. The point of this essay course is to help you develop your ability to think critically. Writing is a mechanism to convey your critical thinking. The act of writing helps you cultivate your own intelligence. Not artificial intelligence.

The Exceptional Contributor: "The Class Was Better Because You Were Here"

The OWL website has a forum feature that you can use to discuss topics related to class material with your classmates. Feel free to ask each other questions, answer other people's questions, and make comments. All class participants are required to read and contribute to the forum. If you have any personal questions, you can email the instructor directly and I will respond. Before sending me an email message, consider posting your query to the forum where you may get a quicker response and allow other students to benefit from the discussion. Be sure to check regularly for new forum posts.

As part of the learning process, I expect all students to participate actively online. ***You are expected to contribute one post to the forums and to reply to two of your classmates' posts each week starting January 15th.*** Please make your posts engaging, thought provoking, and relevant. Try to provide clear, concise, and correct explanations that help others gain a better understanding of concepts. There are also polls scattered throughout the course notes – **please complete the polls and see how your classmates responded.** Remember that 5% of your grade is assigned to participation. Here are some guidelines to keep in mind:

- You make outstanding, original, and informative posts.
- You make highly attentive and constructive comments on other people's posts.
- You ask questions that are penetrating or help clarify.
- You contribute strategically (understanding that there are other students in the class).
- You actively encourage others to express their ideas.
- You use language that communicates interest in what others are saying.
- You hand in your assignments on time.
- You interact constructively with the TAs and instructor.
- You are aware of your responsibilities for the course as outlined in this Syllabus.

Accommodated Evaluations

Midterm: Students that have an excused absence (accommodation from an academic counselor) will receive the following accommodations:

- A make-up midterm will be offered on **Thursday June 12th at 6 pm (tentative)**
- If you have a legitimate reason for missing both the mid-term and the make-up midterm, you will receive an “incomplete” (INC) in the course and write the midterm the next time the course is offered. **The final exam is not cumulative and will not be re-weighted. No exceptions.**

Essay

- **Late assignments** submitted within two hours of the deadline will receive a 2% penalty.
- For 5 days following the normal “**Due Dates**” (including weekend days) reports may be submitted but will be subject to a mark deduction of **10 % per day late**. No reports will be accepted after 5 days.
- Accommodation from an academic counselor will result in automatic transfer of the weight to the second assignment deadline.
- Accommodation from an academic counselor on the second Assignment will result in an automatic 48-hour extension.
- Late penalties may be reduced only upon the recommendation of an academic counsellor.

Quizzes

- The quizzes are automatically graded through the OWL system. There are no accommodations for the quizzes. Do them early. **Don't wait to submit your quizzes until the last minute!** Last minute computer problems will not be accepted as grounds for accommodation.

Course-specific conditions that are required to pass the course:

You must receive a 50% overall to pass the course. Because this is an “essay course” completion of the essay assignment and a grade of 50% in the second submission is also required to pass the course.

6. Accommodation and Accessibility

Religious Accommodation

When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at <https://multiculturalcalendar.com/ecal/index.php?s=c-univwo>

Accommodation Policies

Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at https://www.uwo.ca/univsec/pdf/academic_policies/appeals/Academic_Accommodation_disabilities.pdf

Students should note that individual instructors are not permitted to receive documentation directly from a student, whether in support of an application for consideration on medical grounds, or for other reasons. **All documentation required for absences must be submitted to the Academic Counselling office of a student's Home Faculty.**

7. Academic Policies

The website for Registrarial Services is <http://www.registrar.uwo.ca>.

In accordance with policy, <http://www.uwo.ca/its/identity/activatenonstudent.html>, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

Electronic devices: Calculators, phones and other electronic devices are not permitted nor required for exams.

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.

Plagiarism is a **serious academic offence**. The UWO Senate Academic Handbook defines plagiarism as "The act of appropriating the literary composition of another, or parts or passages of his writings, or the ideas or language of the same, and passing them off as the product of one's own mind." Students must write their assignments in their own words. Whenever students take an idea, or a passage from another source, they must acknowledge their debt by using proper referencing. For more information see Scholastic Offence Policy in the Western Academic Calendar.

TURNITIN: 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>).

Remote Proctoring: Tests and examinations in this course will be conducted using a remote proctoring service, such as Proctortrack. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide **personal information** (including some biometric data) and the session will be **recorded**. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: <https://remoteproctoring.uwo.ca>

Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. Ipads are NOT supported. Information about the technical requirements are available at the following link: <https://www.proctortrack.com/tech-requirements/>

8. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: <https://www.uwo.ca/sci/counselling/>

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mental_health) for a complete list of options about how to obtain help.

Western is committed to reducing incidents of gender-based and sexual violence and providing compassionate support to anyone who has gone through these traumatic events. If you have experienced sexual or gender-based violence (either recently or in the past), you will find information about support services for survivors, including emergency contacts at https://www.uwo.ca/health/student_support/survivor_support/get-help.html

To connect with a case manager or set up an appointment, please contact support@uwo.ca

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at http://academicsupport.uwo.ca/accessible_education/index.html if you have any questions regarding accommodations.

Western University is committed to a thriving campus as we deliver our courses in the mixed model of both virtual and face-to-face formats. We encourage you to check out the Digital Student Experience website to manage your academics and well-being: <https://www.uwo.ca/se/digital/> .

Learning-skills counsellors at the Student Development Centre (<http://www.sdc.uwo.ca>) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Additional student-run support services are offered by the USC, <http://westernusc.ca/services> .