

Earth Sciences 3001B: Astrobiology

Winter 2026

Instructor: Dr. Catherine Neish, BGS 0170

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Telephone: (519) 661-3188

Office hours: After class on Mondays (in my office)

TA: Ms. Kyran Punch

Office hours: TBD

Lectures: M, Th 1:30-2:30 pm

Location: TBD

Lab time: Th 2:30-4:30 pm

Location: TBD

Course Description:

Astrobiology is the study of life in the universe, including the origin of life on Earth, the possibility of life elsewhere in the solar system/universe, and the future of human life off-Earth. As such, it is interdisciplinary in nature, and will include topics that draw from biology, physics, astronomy, geology, chemistry, and other areas.

Prerequisites: Any 1.0 course equivalent at the 1000 level from Chemistry, Biology, or Physics.

Unless you have either the prerequisites for this course or written special permission from the Department of Earth Sciences to enroll in it, you may be removed and withdrawn from this course in accordance with university policy. This may be done after the add/drop deadline of the academic term, and the course will be marked as withdrawn (WDN) on your academic record. This decision may not be appealed.

Course Objectives:

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

- Explain the possible origins of life and the evolutionary steps of life on Earth
- Explain how to search for life elsewhere in the universe
- Apply knowledge of the origin and evolution of life to interpret and explain a recent paper in astrobiology
- Develop writing and teamwork skills as they pertain to the field of astrobiology

Anticipated Lecture Topics:

Earth Sciences 3001B is a course about life in the universe, and thus, is very interdisciplinary in nature. The topics listed below may be adjusted to reflect lecture progress or to introduce new developments in the field.

- **Week 1:** Astrobiology and Life
- **Week 2:** Life's Structure
- **Week 3:** Energy for Life
- **Week 4:** The Origin of Life
- **Week 5:** Early Life on Earth
- **Week 6:** The Tree of Life
- **Week 7:** READING WEEK
- **Week 8:** The Limits of the Biosphere
- **Week 9:** The Habitability of Planets
- **Week 10:** The Moons of the Giant Planets
- **Week 11:** Exoplanets: The Search for Other Habitable Worlds
- **Week 12/13:** The Astrobiology of Mars
- **Week 14:** Dragonfly + Wrap-up

Course Materials:

Textbooks:

Required: *Astrobiology: Understanding Life in the Universe (2nd Edition)* by Cockell

The print edition of the textbook costs \$127.45 and the eBook costs \$87.00 (<https://bookstore.uwo.ca/textbooks-and-course-materials>). Students are welcome to purchase second-hand or earlier editions of this textbook.

In addition to the required textbook, material will be presented during lectures in the form of PowerPoint presentations and handouts. All course material will be posted to OWL: <https://westernu.brightspace.com/>. Students are responsible for checking the course OWL site (<https://westernu.brightspace.com/>) regularly for news and updates. This is the primary method by which information will be disseminated to all students in the class. If students need assistance with the course OWL site, they can seek support on the [OWL Brightspace Help](#) page. Alternatively, they can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Software:

It is recommended that you download the JMARS software package in advance of the class. **JMARS** is a free planetary GIS package, which provides instant access to planetary data for almost every object visited by spacecraft in our Solar System. It is highly recommended that you download from this link (<https://jmars.mars.asu.edu/download>).

You will also need access to **Microsoft Excel and Word**. These software packages are made freely available to all Western students. To access this software, please consult this website: <https://wts.uwo.ca/sitelicense/microsoft/index.html>.

Finally, you will need an **active UWO account** so that you can connect to OWL. If you have an issue with any of the above, please let me know as soon as possible.

Course Evaluation:

My goal in this course is to promote your interest in learning and encourage creativity. Research has shown that assigning grades can reduce your interest in learning and make you less happy. To learn more about this, I would encourage you to listen to the following podcast:

<https://www.happinesslab.fm/season-1-episodes/making-the-grade>

As a result, *I will not be assigning grades in the traditional way for this course*. I will instead use a system of grading called “Contract Grading”. This is a system of grading that gives students grades based on their work effort and completeness (i.e., how many assignments did you complete?), rather than “right or wrong” answers. You will sign a contract that explicitly spells out what is required to achieve different grades, and assign yourself a grade to work towards this semester.

Some key features of this grading scheme include:

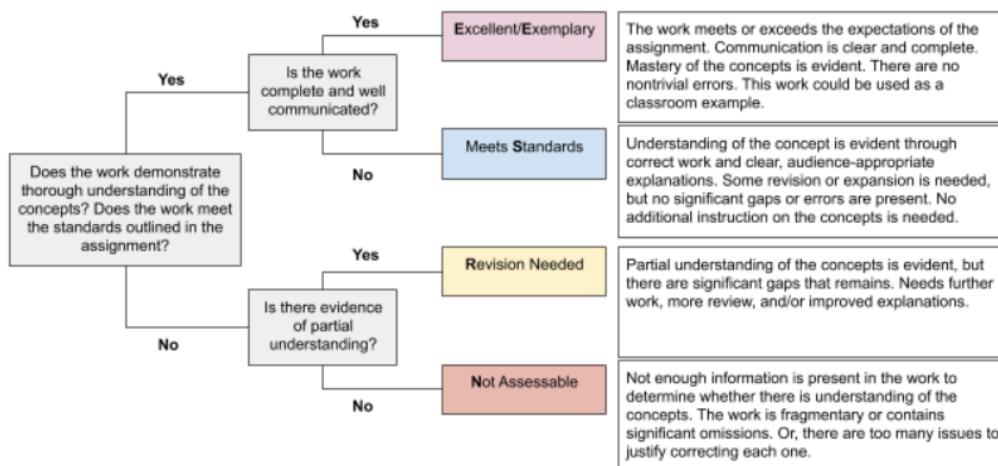
- Your work will be graded on a simple, mostly qualitative scale: Satisfactory (S), Unsatisfactory (U), or Incomplete (I).
- I will not assign letter or percentage grades until the end of the semester.
- The TA and I will provide written feedback on your work that responds to your ideas, explains your strengths and weaknesses, and offers suggestions for revisions or future improvements. Our feedback will be geared towards responding to your work, not to justify or explain a grade.
- Students will receive higher final course grades as a result of extra work, which is intended to increase and deepen your learning experience.

- All work is treated as being equally important; that is, there are no percentages that create work hierarchies (e.g., research paper is 30% of the grade, participation is 10%).
- You will understand exactly how to get various letter grades, and will have more agency and access to whatever grade you want to get.
- There is room for varying levels of teacher-student negotiations of final grades, given extenuating circumstances, which will ideally take place via face-to-face discussions.

Below, I outline the components of the course. The required quantities of submitted material needed to achieve a certain grade is given in the **Grading Contract** (*appended to the end of the Syllabus*).

Component	Notes
In-class quizzes	Five open book quizzes based on course material
Lab assignments	Ten assignments based on activities conducted during lab time
Group project	Oral and written report on a recent paper in astrobiology, completed in groups of two
Concluding reflection	Document reflecting on your work in the course.
Writing assignment	Optional writing assignment about a proposed astrobiology space mission.

These components will be adjudicated on a qualitative scale, rather than a quantitative scale. To determine whether an assignment is Satisfactory (S or 2), Unsatisfactory (U or 1), or Incomplete (I or 0), I will use the evaluation scheme given below. Work that is “Excellent” or “Meets Standards” is considered an “S”, work that “Needs Revisions” is considered a “U”, and work that is “Not Assessable” or missing is considered an “I”.



In-class Quizzes

On occasion I will give informal quizzes during lecture periods. These five open book **In-class Quizzes** will be used to determine how well you understand the material, and will serve as a random check on attendance. These quizzes will be graded as either "S", "U", or "I" based on completeness and your understanding of the material. Those who receive a grade of "U" will have an opportunity to revise and resubmit the quiz based on my feedback, up to three weeks after the quiz was assigned. Make-up quizzes will take place in-person, during the lab section. There is no make-up available for those who receive a grade of "I", but students may consult the section on "Pleas" in the **Grading Contract**.

Lab Assignments

Ten assignments related to work conducted during lab time will be assigned during the course. These **Lab Assignments** will typically be assigned on Thursday and will be due at the beginning of class on the following Thursday. These assignments will be graded as either "S", "U", or "I" based on completeness and your understanding of the material. Those who receive a grade of "U" or "I" will have one opportunity to revise and resubmit the assignment based on my feedback, three weeks after it was originally assigned. A schedule of assignments is given below.

Lab Assignment	Due Date	Revision Due Date
Lab #1	January 15, 2026	February 5, 2026
Lab #2	January 22, 2026	February 12, 2026
Lab #3	January 29, 2026	February 26, 2026
Lab #4	February 5, 2026	February 26, 2026
Lab #5	February 12, 2026	March 5, 2026
Lab #6	February 26, 2026	March 19, 2026
Lab #7	March 5, 2026	March 26, 2026
Lab #8	March 12, 2026	April 2, 2026
Lab #9	March 19, 2026	April 9, 2026
Lab #10	March 26, 2026	April 16, 2026

Group Project

Students are also expected to work together in small groups (~2 people) to critique a recent paper in astrobiology (papers must have been published between 2021 and 2026). You must note your paper selection in the Forum on OWL by **February 23, 2026**. *Groups will be assigned by the instructor.*

This **Group Project** will consist of a written and oral component. The written component is expected to be **2 pages** long, and include ~1-2 paragraphs summarizing the findings of the paper, ~1-2 paragraphs describing any criticisms you had of the paper, and ~1-2 paragraphs describing the implications of the paper for astrobiology. In addition, each student must individually submit a paragraph describing their experience working in a team of two. *A rubric for your team evaluation will be posted on OWL.*

The oral component is expected to be 10 minutes long, and can be presented in person in front of the class during the lab sessions on **Thursday, March 26** or **Thursday, April 2**. This assignment must be completed in order to receive credit in this class. If you are unable to attend either of the two lab sessions dedicated to the oral presentations, you may schedule a time to present it in front of Dr. Neish and the TA. This project will be graded as either "S", "U", or "I" based on completeness and your understanding of the material. Those who receive a grade of "U" will have one opportunity to revise and resubmit the project based on my feedback. The revision is due on **April 16, 2026**.

Concluding Reflection

At the end of the semester, all students will be required to complete a series of questions as a **Concluding Reflection** on the course. (Please see the Word document posted on OWL.) The point of this activity is to ask you to reflect on your learning journey this semester. This exercise will probably take you 2-3 hours. At the end, you will reflect on whether you achieved the grade you contracted for at the start of the semester. This will be graded as either "Complete" or "Incomplete". You must answer all of the questions to earn a grade of "Complete". This will be due on **April 23, 2026**.

Writing Assignment

Students wishing to receive an A+ grade must complete a **Writing Assignment** at a Satisfactory ("S") level. This is a ten-page report outlining your ideas for a proposed astrobiology space mission. There is no opportunity to resubmit this assignment to improve your grade. *More details on the format of the project can be found on OWL.*

Important Note: Discovery Credit

Given the lack of emphasis on numerical grades in this course, I would strongly encourage you to take this course for **Discovery Credit**. Students are permitted to designate up to 1.0 Discovery Credit course for **pass/fail grading** that can be counted toward the overall course credits required for their degree program *Note: Courses selected as Discovery Credits may not be counted towards the mandatory courses in Honours Specialization, Specialization, Major, Minor modules, or Certificates and Diplomas in which the student is currently registered.* The full policy can be found here: https://www.westerncalendar.uwo.ca/PolicyPages.cfm?Command=showCategory&PolicyCategoryID=5&SelectedCalendar=Live&ArchiveID=#Page_69

Course Policies:

Student Absences: If you are unable to meet a course requirement due to illness or other serious circumstances, please contact the course instructor to discuss an extension or make-up opportunity.

Students should also familiarize themselves with the *University Policy on Academic Consideration – Undergraduate Students in First Entry Programs*, posted on the Academic Calendar: https://uwo.ca/univsec//pdf/academic_policies/appeals/academic_consideration_Sep24.pdf. The policy does not apply to students experiencing longer-term impacts on their academic responsibilities. These students should consult [Accessible Education](#).

Scholastic offences: Scholastic offences are taken seriously, and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence.

Policy on Scholastic Offences:

https://uwo.ca/univsec//pdf/academic_policies/appeals/scholastic_offences.pdf

Procedures on Scholastic Offences (Undergraduate):

https://uwo.ca/univsec//pdf/academic_policies/appeals/undergrad_scholastic_offence_procedure.pdf

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.

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>).

Use of Generative AI Tools: The use of generative AI tools (e.g., ChatGPT, Microsoft Copilot, Google Gemini, or similar platforms) is **not permitted** in the completion of any course assessments, including but not limited to: assignments, lab reports, presentations, and quizzes. Using such tools for content generation, code writing, problem solving, translation, or summarization—when not explicitly allowed—will be treated as a **scholastic offence**.

By using a LLM like ChatGPT to complete your work, you are degrading your ability to think critically. Studies have shown that there is less brain engagement when using ChatGPT, less pride in the resulting work, and that the use of AI can lead to a lack of trust amongst colleagues. In addition, AI writing tools produce content that is bland and often full of mistakes, and relies on the use of content from scholars and writers without their permission or proper citation. ***Thus, the use of AI goes against the learning objectives of this course, and I do not permit its use.*** If you are found to be using AI in your work, you will be expected to meet with me to discuss the consequences, which may include a grade of “Incomplete” (0).

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 an accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Advising office of their Faculty of Registration. Please visit the Diversity Calendars posted on our university’s EDID website for the recognized religious holidays: <https://www.edi.uwo.ca>.

When a recognized religious holiday or observance conflicts with a scheduled academic obligation, students must request accommodation via the University’s Student Absence Portal (SAP). This request should identify the conflict and specify which course component(s) (e.g., assignment) are affected. Students are encouraged to submit the SAP request as early as possible, but no later than one week before any assignment to allow sufficient time for adjustment.

The SAP request serves as official notification to both the course instructor and the Academic Advising Office, in accordance with University policy: https://www.uwo.ca/univsec/pdf/academic_policies/appeals/accommodation_religious.pdf The Faculty of Science considers religious accommodations as scheduling conflicts. For more information on recognized religious holidays, please visit the Diversity Calendar posted on the Equity, Diversity & Inclusion website - <https://www.edi.uwo.ca>

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.

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. If you have any questions regarding accommodations, you may also wish to contact Accessible Education at

http://academicsupport.uwo.ca/accessible_education/index.html

Communications: In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university email address. It is the responsibility of the account holder to ensure that emails received from the University at their official university address are attended to in a timely manner.

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.

Easter Egg: If you have read this far into the syllabus, please send Dr. Neish an e-mail with a picture of your favourite animal (cneish@uwo.ca).

ES3001B Grading Contract

Professor Catherine Neish | Winter 2026

Students,

In this course, I will be asking you to define your own learning path at the start of the semester. My goal is to give you more autonomy in your learning process, and reduce the stress associated with more traditional forms of grading.

As such, you will determine your grade for this course by fulfilling a contract. The contract spells out the requirements for fulfilling the terms of the agreement and achieving a particular grade. The advantage of contract grading is that **you** decide how much work you wish to do this semester. This means planning ahead, thinking about all your obligations and responsibilities this semester, and determining what grade you want or need in this course.

If you complete the work you contracted for, you get the grade. For example, if you have other obligations that would preclude you from doing all the requirements to earn an A in this course, you may choose to contract for a C. So long as you carry out your contract, you will receive that grade. I want to give you the agency to take responsibility for your own project management and workflow. If circumstances change midway through the semester, you can come talk to me, and we can reassess your contract.

During our second class, each student will sign, with a classmate as a witness, a contract for a grade. I will countersign, and we will each keep a copy of your contract. Below, I outline the General Terms of the Agreement, and what is required to earn different grades in the course. Note that for most requirements, there are opportunities for critical feedback and revision. The goal is to allow you to grow and learn from your mistakes.

I know this is an unusual grading system, but I hope you will embrace it as an opportunity to try something new. My goal is to increase your interest in your own learning and give you opportunities to take risks.

Sincerely,



Professor Catherine Neish

General Terms of Agreement

1. **Attendance:** You agree to strive to attend every class and be on time. If extenuating circumstances prevent you from attending class, you are responsible for asking your classmates about announcements and/or new requirements. I will not keep formal attendance records, but will track your attendance through your participation in the in-class quizzes (*see below*).
2. **Participation and Collaboration:** You agree to participate in ways that are most appropriate for each day's goal (by actively listening, taking notes, asking questions, offering comments, etc.). You agree to work cooperatively and collegially in groups during class time, as requested by the professor.
3. **Course Assignments:** You agree to strive to turn in on time all course assignments. All work should be completed fully and meet all assignment requirements. **IMPORTANT:** If assignments are not completed fully, they may be marked as "Incomplete" (*see below*). In the gradebook, a grade of "S" will be assigned a "2", a grade of "U" will be assigned a "1", and a grade of "I" will be assigned a "0".
 - a. **In-class Quizzes:** On occasion I will give informal quizzes during lecture periods. These five open book *In-class Quizzes* will be used to determine how well you understand the material and will serve as a random check on attendance. These quizzes will be graded as either "Satisfactory" (S), "Unsatisfactory" (U), or "Incomplete" (I) based on completeness and your understanding of the material. Those who receive a grade of "Unsatisfactory" will have one opportunity for each quiz to revise and resubmit based on my feedback.
 - b. **Lab Assignments:** Ten assignments related to work conducted during lab time will be assigned during the course. These assignments will be graded as either "Satisfactory" (S), "Unsatisfactory" (U), or "Incomplete" (I) based on completeness and your understanding of the material. Those who receive a grade of "Unsatisfactory" will have one opportunity to revise and resubmit the assignment based on my feedback. Those who receive a grade of "Incomplete" will have one opportunity to resubmit the assignment.
 - c. **Group Project:** Students are expected to work together in small groups (~2 people) to critique a recent paper in astrobiology. This project will be graded as either "Satisfactory" (S), "Unsatisfactory" (U), or "Incomplete" (I) based on completeness and your understanding of the material. Those who receive a grade of "Unsatisfactory" will have one opportunity to revise and resubmit the project based on my feedback.
 - d. **Concluding Reflection:** At the end of the semester, students will be required to complete a series of questions as a *Concluding Reflection* on the course. This will be graded as either "Complete" (if you answer all questions) or "Incomplete".
 - e. **Writing Assignment:** Students wishing to receive an A+ grade must complete a *Writing Assignment*. This is a ten-page report outlining your ideas for a proposed astrobiology space mission. This assignment must receive a grade of "Satisfactory," and there are no opportunities for resubmissions.

All Course Components must meet the following conditions:

- f. Complete: Each project must fully meet the expectations of the assignment. The project will not qualify as “complete” unless it has achieved all of the goals of the assignment as discussed in class or explained on the handouts.
- g. Improvement: You are obligated to listen carefully to and address your colleagues’ and my concerns about your work in the class. This means that when you receive feedback you’ll use that feedback to help you continually improve your work

Overview of Grade Breakdown Guidelines

A nominal guide to evaluating your final grade is given below:

Expected Grade	Quizzes	Assignments	Group Project	Concluding Reflections	Extra Assignment
A+ (95%)†	4+ “S”	9+ “S”	“S”	Complete	“S”
A (85%)	4+ “S”	8+ “S”	“S”	Complete	“U” or “I”
B (75%)	3+ “S”	7+ “S”	“S”	Complete	“U” or “I”
C (65%)	3+ “S”	6+ “S”	“S”	Complete	“U” or “I”
D (55%)	2+ “S”	5+ “S”	“S” or “U”	Complete	“U” or “I”
F (<50%)	<2 “S”	<5 “S”	“S”, “U”, or “I”	Incomplete	“U” or “I”

†Note: Earning an A+ in this course requires going above and beyond the basic expectations laid out in the syllabus, including taking the initiative to independently seek out and manage important course information.

Pleas: Life isn’t perfect and each semester does not always go according to our plans, so I offer everyone one plea to change your progress in the course. For instance, you might plea to get a missed assignment or quiz removed from your record so that you may still meet our contract. Anyone can make a plea to me once during the semester. You cannot change your plea after the fact, so please consider your plea seriously before making a request. In addition, there must be some kind of special or extenuating circumstances that warrants the plea. You may not plead a case just because you want something removed from your record. Finally, pleas cannot be used for the Writing Assignment, since it is a months-long project that should be completed over the course of the entire semester.

Adjustments: I can also adjust your grade by +/- a few percent at my discretion (up to 4%). This will be used in cases when 1) your assignments and participation suggest you labored above and beyond the expectations (+%), 2) the quality and completeness of your assignments and participation is lacking in one way or another (-%), or 3) in the case that that a plea is granted and/or we determine special accommodations are in order.

Signature Page

By staying in this course, you agree to all of the above terms

Your Contract Grade: _____

Your Name: _____

Signature: _____

Date: _____

Witness Name: _____

Witness Signature: _____

Date: _____

Co-signed by Instructor: _____

Date: _____