

## Earth Sciences 3001B: Astrobiology

**WINTER 2016**

**Instructor:** Dr. Catherine Neish, BGS 0170  
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**Office hours:** T 2:30-3:30 pm, W 4:00 pm, or by appointment  
**TA:** Jonathan O'Callaghan (jocalla@uwo.ca)

**Lectures:** T-Th 1:30-2:30 pm  
**Location:** Stevenson Hall 3101

**Lab time:** W 6:00-8:00 pm  
**Location:** Biological and Geological Sciences 0184

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### 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:* Chemistry 1301A/B or 1302A/B; 0.5 credit in any 1000-level Biology course; Earth Sciences 2232F/G or Astronomy 2201A/B, 2232F/G or the former Earth Sciences 2001F/G.

### Course Materials:

Required: *Astrobiology: Understanding Life in the Universe* by Cockell  
Required: *Activities Manual for Life in the Universe* by Prather, Offerdahl, and Slater

In addition to the required textbooks, material will be presented during lectures in the form of PowerPoint presentations and handouts. Some additional material may be posted on OWL (<http://owl.uwo.ca>). Students should check OWL on a regular basis for news and updates.

*NOTE: There will be assigned weekly readings (schedule to be announced in class). It is your responsibility to read the relevant readings prior to attending each class. Doing so will help you to better understand the lecture material and be prepared to answer questions.*

### 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.

- Astrobiology and Life
- The Formation of the Elements of Life
- Life's Structure
- Energy for Life
- The Origin of Life
- Early Life on Earth
- The Tree of Life
- The Limits of the Biosphere
- The Habitability of Planets
- The Astrobiology of Mars
- The Moons of the Giant Planets
- Exoplanets: The Search for Other Habitable Worlds
- The Search for Extraterrestrial Intelligence

### 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
- Design a basic life detection mission including instruments

### Course Evaluation:

The overall course grade, out of 100, will be calculated as listed below. Listed next to the respective components are their maximum contributions toward the course grade.

<i>Component</i>	<i>Notes</i>	<i>Value</i>
Writing assignments	Online discussion of reading assignments	10
Lab reports	Assignments based on activities conducted during lab time	20
Group project	Oral and written report on astrobiology mission	20
Midterm exam	To be held in class on Feb. 24, 2016	20
Final exam	Scheduled by the Registrar	30

Once a week throughout the semester, a question related to pre-assigned reading will be posted. Students will be expected to contribute ~250 words to an online discussion of that topic. Each **Writing assignment** will receive a score between 0 and 2. If the assignment is not received, the score will be a 0. If it is a weak response, the score will be a 1. A

strong response will receive a 2. No make-ups are allowed, except for serious extenuating circumstances (see Course Policies below). However, you may drop one assignment to cover any unexpected absences. Those students who turn in all writing assignments will be able to drop the assignment with the lowest score.

Assignments related to work conducted during lab time will also be assigned during the course. These **Lab reports** will typically be assigned on Wednesday and will be due at the beginning of class on the following Wednesday. No late work will be accepted, so please plan ahead. However, you may drop one lab report to cover any unexpected absences. Those students who turn in all lab reports will be able to drop the report with the lowest score.

Students are also expected to work together in small groups ( $3 \pm 1$  people) to design an astrobiology mission. This **Group project** will consist of a written and oral component. The written component is expected to be 15 pages long (this includes tables and figures, but excludes references). The oral component is expected to be 10 minutes long, and can be presented in person in front of the class or through a previously taped video. Your grade will be based on (a) the assessment of your contribution by the others in your group (individual score), and (b) the instructor's assessment (group score).

One **Midterm exam** and one **Final exam** will also be given. All exams will be closed book, and no electronic devices may be in your possession during the exams. It is Faculty of Science policy that a student who chooses to write an exam deems themselves fit enough to do so, and the student must accept the mark obtained. Claims of medical, physical, or emotional distress after the fact will not be considered.

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

*Assignments:* Assignments must be submitted at the beginning of class on the assigned due date and will not be accepted late, except under medical or other compassionate circumstances (see below). Submitting a late assignment without appropriate documentation will result in a zero (0) grade. However, to allow for reasonable absences, the lowest score on each student's lab reports and the lowest score on each student's writing assignments will be dropped.

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). APA style is the approved style of writing for all assignments produced for this course. Please refer to the University of Western Ontario Library webpage for information on citation style and format or consult the APA publication manual: Publication manual of the American Psychological Association (6<sup>th</sup> ed.). (2009). Washington, DC: American Psychological Association.

*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.

*Missed course components:* If you are unable to meet a course requirement due to illness or other serious circumstances, you must provide valid medical or supporting documentation to the Academic Counseling Office of your home faculty as soon as possible. If you are a Science student, the Academic Counseling Office of the Faculty of Science is located in WSC 140, and can be contacted at 519-661-3040 or scibmsac@uwo.ca. Their website is:

[http://www.uwo.ca/sci/undergrad/academic\\_counselling/index.html](http://www.uwo.ca/sci/undergrad/academic_counselling/index.html)

A student requiring academic accommodation due to illness must use the Student Medical Certificate ([https://studentservices.uwo.ca/secure/medical\\_document.pdf](https://studentservices.uwo.ca/secure/medical_document.pdf)) when visiting an off-campus medical facility. For further information, please consult the university's medical illness policy at:

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

If you miss the Midterm Exam, please contact your faculty's Academic Counseling Office as soon as you are able to do so. The instructor will schedule a makeup exam once the documentation is received.

If you miss the Final Exam, please contact your faculty's Academic Counseling Office as soon as you are able to do so. They will assess your eligibility to write the Special Exam (the name given by the university to a makeup Final Exam). You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (see [http://www.registrar.uwo.ca/examinations/exam\\_schedule.html](http://www.registrar.uwo.ca/examinations/exam_schedule.html)).

*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/handbook/appeals/scholoff.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 multiple-choice tests and/or exams 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.