Academic Calendar Fall Semester 2015

Fall Semester Begins Wednesday, August 19, 2015
Fall Instruction Begins Wednesday, August 26, 2015
Labor Day Holiday Monday, September 7, 2015
Last Day to Add/Drop Courses Wednesday, September 16, 2015 (at 4:00 PM)
Veterans Day Holiday Wednesday, November 11, 2015
Non-Instructional Day Wednesday, November 25, 2015
Thanksgiving Holiday Thursday, November 26 - Friday, November 27, 2015
Fall Instruction Ends Friday, December 11, 2015
Final Exams Saturday, Dec 12 & Monday, Dec 14 - Friday, Dec 18, 2015
Fall Semester Ends Friday, December 18, 2015
Final Grades Due Tuesday, December 22, 2015 (at noon)

SYLLABUS, FALL 2015

Lecture: Tue & Thu TBD
Discussion: TBD (4 units; 3 hours of lecture and 1 hour discussion)
Course website: UCMCROPS
Instructor: Professor Emeritus Wil van Breugel, SNS and College One wvanbreugel@ucmerced.edu, ph. 209-228-4686 (College One office)
Teaching Assistant: TBD

COURSE GOALS

Astrobiology refers to the study of the origin and evolution of life in the cosmos: What is life, how did it form, and where is it? It is an integrative, multidisciplinary field that includes areas of astronomy, biology, (bio-) chemistry, geology, and physics. After a brief review of how humans have attempted to address these questions in the past we will look at the foundations on which modern astrobiology is built:

- Our deep connection to the cosmos
- The formation and evolution of planets like Earth
- The key physical, chemical and biological processes that may help us understand the origin and evolution of life
• How life survives in extreme environments
• The search for extraterrestrial life in our solar system and elsewhere
• Ethical considerations of astrobiology related research and exploration, and of potential encounters with extraterrestrial intelligent life forms

This course is meant to make students understand and appreciate the scientific method, using observations, experiments and computer simulations to learn about the universe and the origin of life, and appreciate the many interesting insights and further questions that this entails.

To structure the course and lectures I will loosely follow the textbook ‘Planets & Life’ by Sullivan & Baross (Cambridge University Press; 2007; ISBN 978-0-521-53102-3 paperback), but significant parts will be adapted and updated using other recent books and conference proceedings. During the course I will be keeping track of any new discoveries in the various (many!) disciplines in so far as they are relevant to astrobiology and will post these on UCMCROPS.

An important book of historical interest, and which might be considered the beginning of the scientific search for the origin of life, is by the quantum mechanic physicist Edwin Schrodinger based on lectures given 1944 and 1958: What is Life?, Mind and Matter, and Autobiographical Sketches (Cambridge University Press; 2004; ISBN 0-0521-42708-8 paperback)

**LEARNING OBJECTIVES**

This course intends to fulfill a general education science requirement for SSHA students, and is an elective lower division course for SNS and SOE students. The course will address several of the Eight Guiding Principles for General Education at UC Merced i.e. Scientific Literacy (P1), Decision Making (P2), Communication (P3), Self & Society (P4), Ethics & Responsibility (P5), Leadership & Teamwork (P6), Aesthetic Understanding & Creativity (P7), and Development of Personal Potential (P8) (http://catalog.ucmerced.edu/content.php?catoid=2&navoid=51).

Specifically, the instructor will:

• Introduce students to a broad spectrum of natural sciences (P1)
• Cultivate intellectual curiosity about the origin and evolution of planets and of life (P1, P4)
• Show how different science disciplines are needed to approach such a complex problem as the origin of life (P1, P2, P3)
• Demonstrate interdisciplinary analytical thinking, problem-solving, decision-making, and ethical considerations (P1, P2, P3, P4, P5)
• Review effective strategies for learning and presenting (P6, P7)

**LEARNING OUTCOMES**

By the end of the course students will be able to organize and assess information from a variety of natural science disciplines as they pertain to fundamental questions about the origin of life in the cosmos.

Specifically they will know
• How and when the universe formed, and its stars and galaxies
• How planets formed, and what their early geological and biological conditions were, in our Solar System and around other stars
• How life on Earth has found ways to adapt to even the most extreme environments, supporting a certain optimism that other life forms, in other extreme environments, on other planets, around other stars, may well exist
• Which conditions must (have) exist(ed) on other planets or moons such that life might (have) develop(ed)
• Which of the Solar System bodies (planets, their moons, asteroids) might be good targets for space missions to search for other life forms
• What strategies can be used to find whether other life forms exist, including possible intelligent life, on extraterrestrial planets, and what trade-off decisions must sometimes be made to maximize ‘scientific return’
• Why we would need to take the utmost precautionary measures when exploring our own Solar System planets/moons/asteroids in our search for other life forms
• What it might mean for our own world view IF we ever found that other intelligent civilizations exist
• How one effectively presents a case study on an astrobiological topic

GENERAL EDUCATION GUIDING PRINCIPLES

The course reinforces the following General Education Guiding Principles:

Scientific Literacy (P1): The students will learn how the scientific method works (‘gathering facts before drawing conclusions’), and how an understanding of fundamental principles in several disciplines of the natural sciences is needed to elucidate key conditions under which life may have developed on Earth, and how it may have developed on other Solar System bodies, and at other possible locations in the Cosmos.

Communication (P3): The students will learn to appreciate the severe limitations of scientific communication across cosmic distances (electromagnetic spectrum, instrumentation, time lag), especially in the search for extraterrestrial intelligence, and including potential language and intelligence barriers.

Ethics and Responsibility (P5): The students will learn about ethics and responsibility with respect to searches for potential different life forms using spacecraft in our Solar System and return mission to Earth (avoiding cross-contamination).

Leadership and Teamwork (P6): The students will work in groups to discuss issues of current astrobiological interest, and in preparing for, and presenting on, an astrobiological research project of their choice near the end of the course.

PROCEDURES AND GUIDELINES

LECTURES
This course is a general introduction to astrobiology with no prerequisites. It is multi-disciplinary and fast-paced, with nearly every lecture devoted to new ideas. It is imperative that students come to class. Not keeping up will put you hopelessly behind and your grade will inevitably suffer.

Cell phones, Ipods and other distracting devices in class will not be tolerated. Be prepared to bring laptops to access online material and take notes—stay off email, chat, and social-networking sites.
Because of the wide range of science disciplines involved, and our rapid increased understanding of various topics through research, experiments and observations, the main source of information for students will be the lecture slides, web-based readings, readings of some sections chosen from the above list of textbooks, and astrobiology news features as posted by myself.

Each lecture will begin with answering questions about topics as they pertain to the main subject(s) under discussion that week. Students are encouraged to keep up-to-date with astrobiology news through websites such as https://astrobiology.nasa.gov/, http://www.astrobio.net/, http://www.astrobiology.com/, http://www.newscientist.com/section/space, and others as recommended in class.

During the lecture students are expected to take notes; and are also asked to write down questions on index cards that can be picked up at the beginning of class and dropped off at the end of class. We will discuss some of these questions during class and / or in the discussion sections. The below 5 questions can serve as a general guide:

Reflection on learning
1. Which of the concepts presented in class are difficult for you?
2. What was the key concept today?
3. What else would you like to know about the topic?

Critical thinking
4. Describe a connection between today’s lecture and recent news issues (science, technology, politics, economic, etc.)
5. Describe how your own personal background and thinking (cultural, ethnic, education, religion, experience, gender) may affect your interpretation of the material presented today

DISCUSSION SECTIONS
The TA will determine how the discussion sections will be conducted.

Attendance at Discussion sections is required for all students. Discussion will be used to help you with online material and course assignments

COURSE REQUIREMENTS
• Class participation and attendance: Attendance will be taken for the discussion sections
• Required readings: Lecture slides, websites, some sections from books covered in the lectures, and regular astrobiology news features as posted on UCMCROPS
• Student presentation / report (see below)
• Other course assignments: To be determined

STUDENT PRESENTATION / REPORT
You will be expected to work in groups of 2 or 3 and choose a topic of relevance to astrobiological research. It can come from topics discussed in class but your presentation should go into more depth and provide new insight from the most recent literature in peer reviewed journals. You must discuss the choice of your topic with your instructor and T. A. Your presentation will be 15 minutes long. Your report has to be at least 3,000 words, excluding figure legends and references. The presentations will be judged following an oral presentation rubric. Work (such as a powerpoint slide) prepared by each individual in a group must be
labeled as such. Slides and report must be submitted to the instructor by email prior to the actual presentation.

**MIDTERMS & FINAL**
You will be given three midterms and a comprehensive final exam. The midterms will be in class exams. No make-up exams will be given unless there are exceptional circumstances justified by the appropriate documentation. Students who have a documented reason (such as a religious observance or scheduling conflict with another exam) may request to take the midterm exam *at a different time* the scheduled exam time.

**GRADING**
45% - Midterms (15% each) 15% - Final exam (comprehensive) 20% - Discussion section assignments and activities 20% - Student presentation / report and other course assessment activities.

If the class mean is 75% or higher, letter grades will be assigned without any adjustment (90-100% A±, 80-89% B±, 70-79% C±, 60-69% D±, <60% F). Within each letter grade, a minus (–) will be assigned to the bottom three percentage points and a plus (+) will be assigned to the top three percentage points (e.g., 80-82.9% is a B–, 87-89.9% is a B+).

If the class mean is lower than 75%, the curve will be adjusted accordingly.

Midterm exams may be submitted for re-grading if the student believes that errors were made in the grading. Requests for re-grading must be made within a week of the exam being returned. Exams submitted for re-grading will be completely re-graded, so that the resulting grade may be higher or lower than the original grade.

**ACCOMMODATIONS FOR STUDENTS WITH LEARNING DISABILITIES**
UC Merced is committed to equal academic opportunities and inclusion for students with disabilities. We are available to discuss necessary academic accommodations. Information regarding disabilities is held in strict confidence. Requests for academic accommodations should be made during the first three weeks of the semester, and students are encouraged to register with the Disability Services Center to verify eligibility for appropriate accommodations.

**ACADEMIC INTEGRITY**
Academic honesty is a core value of the University of California and the central rule of academic honesty is that you must do your own work. While it is acceptable to work in groups to study, it is completely unacceptable to receive assistance of any kind on exams. Existing policies forbid cheating on examinations, plagiarism and other forms of academic dishonesty. The current policies for UC Merced are described in the *UC Merced Interim Academic Honesty Policy and Adjudication Procedures*, see UCMCROPS [http://studentlife.ucmerced.edu/2.asp?uc=1&lvl2=121&lvl3=121&lvl4=123&contentid=171](http://studentlife.ucmerced.edu/2.asp?uc=1&lvl2=121&lvl3=121&lvl4=123&contentid=171). For additional information visit ([http://studentlife.ucmerced.edu/](http://studentlife.ucmerced.edu/)).

Examples of academic dishonesty include:
- receiving or providing unauthorized assistance on examinations
- using unauthorized materials during an examination
- plagiarism - using materials from sources without citations
- altering an exam and submitting it for re-grading
- fabricating data or references
- using false excuses to obtain extensions of time or to skip coursework
The ultimate success of a code of academic conduct depends largely on the degree to which the students fulfill their responsibilities towards academic integrity. These responsibilities include:

- Be honest at all times.
- Act fairly toward others. For example, do not disrupt or seek an unfair advantage over others by cheating, or by talking or allowing eyes to wander during exams.
- Take group as well as individual responsibility for honorable behavior. Collectively, as well as individually, make every effort to prevent and avoid academic misconduct, and report acts of misconduct that you witness.
- Know the rules -- ignorance is no defense. Those who violate campus rules regarding academic misconduct are subject to disciplinary sanctions, including suspension and dismissal.

**SELECTED ASTROBIOLOGY BOOKS**


