

Life in the Universe

General Information

- CEFNS Department of Physics and Astronomy
- AST 183 (Life in the Universe) – Section 1
- Semester: Spring 2020
- Meeting Time: TTh 2:20-3:35 (3 Credit Hours)
- Location: Physical Sciences Bldg 19, rm 103
- Instructor: Dr. David Koerner
- E-mail: david.koerner@nau.edu [Note: Instructor does not regularly use the mail feature on BbLearn]
- Office address: Physical Sciences (bldg 19) 319
- Office hours: TTh 12:45- 2:15 or by appointment
- Office Phone: 928-523-4562

Course Prerequisites:

None

Course Description:

AST 183 is a multi-disciplinary exploration of modern scientific inquiry into the question of life's origin, evolution, and future place in the universe. We will investigate the cosmological origin of life's chemical building blocks together with planetary influences on its biogenesis, evolution, and range of habitable environments. Additional studies of the technological search for extra-terrestrial life in the solar system and beyond will focus on spacecraft missions to Mars and Europa, together with NASA technologies currently being designed to search for life on planets around nearby stars. Twin thematic focuses are Environmental Consciousness, and Technology and Its Impact. This course is a liberal studies course in the Science/Applied Science distribution block. It will address several essential skills (creative thinking, critical reading, and ethical reasoning) and will pay particular attention through assessment to critical thinking, quantitative analysis, use of technology, and scientific inquiry. The course meets a 3-hour liberal studies science requirement. It also meets the lab-science requirement when taken together with the 1-credit-hour lab, AST 184L.

Course Objectives and Learning Outcomes:

- Students will be able to discriminate between scientific and pseudo-scientific claims about evidence for extra-terrestrial life (scientific inquiry, critical reading)
- Students will be able to identify the principal astrophysical events which contributed to the origin and evolution of life on Earth and use this information to make conclusions

about the likelihood of extra-terrestrial life (creative thinking, critical thinking, quantitative analysis, and scientific inquiry)

- Students will be able to describe the key elements of life's interaction with the planetary environment (Environmental Consciousness, scientific inquiry, critical thinking quantitative analysis)
- Students will be able to make predictions about the likelihood of extra-terrestrial intelligent life, based on understanding of key evolutionary events that led to its appearance on earth (scientific inquiry, creative thinking, critical thinking, and quantitative reasoning)
- Students will be able to discriminate between the epistemology and narrative associated with a modern scientific view of origins and those of mythological cosmologies that were widely accepted in the pre-scientific era.
- Students will identify the life-supporting properties of Earth from the general perspective of planets in our solar system and beyond
- Students will be able to assess the validity of a claim, taking into account different conceptual schemes, contextual factors, and evidence. They will especially learn to evaluate media claims and identify pseudo-science, over-sensationalized science, and highly politicized media claims that purport to be objective scientific results.

Course structure/approach

This course will blend online modes of learning with lecture and in-class activities. Initial online assessment of text chapter reading engages students to begin the task of gathering information before coming to class. Lecture reviews of the material follow up to ensure comprehension. Active learning is then employed to engage students to synthesize the material. Exercises are in the form of in-class tutorials and/or clicker response activities that help students to achieve final learning outcomes and succeed at exams.

Textbook and required materials

Textbook chapters will be available online in BbLearn. No purchase necessary

iClicker2 Student Response Pad Registration We will make use of clickers to facilitate peer interaction during each lecture class. **YOU MUST HAVE A REGISTERED CLICKER TO EARN PARTICIPATION CREDIT.** Instructions and a link for registering are on the class BbLearn site.

Assessment Methods for Student Learning Outcomes

- Regular attendance is required and will count for 10% of the course grade. Attendance will be monitored by a clicker participation grade
- Weekly online quizzes in BbLearn will cover the assigned textbook reading – students must complete a particular online quiz prior to the class period in which the material will be discussed. Quizzes are open-book and allow plenty of time for students to re-read chapter material to provide a thoughtful answer to questions. As part of the quiz score, a mandatory "commitment quiz" on syllabus material will be given at the beginning of the

term. Quiz grades will account for 15% of the over-all grade. Quizzes must be completed by the deadline. It is the student's responsibility to check BbLearn routinely for upcoming deadlines. No Quiz makeups will be given.

- In-class activities, Homework, and Essays – Homework assignments, essays, and a clicker correct answer score and occasional in-class tutorial activities will compose 15% of the course grade. Clicker questions and in-class tutorials will be designed to help students review and synthesize the chapter material.
- Two mid-term exams will be assigned in which students pull together all they have learned in low-stakes assignments and respond to challenging questions of their ability to recall detailed material, synthesize in the context of underlying concepts, and carry out quantitative calculations. Format may include multiple choice questions, single-answer and short essay questions, and quantitative calculations. Combined mid-term exams count for 40% of the course grade. No midterm makeups will be given. If you have a medical excuse, your final exam score will be substituted for the score of the midterm for which you have an excuse.
- Final exam – A final exam will be cumulative with extra emphasis on material covered after Midterm II. The final counts for 20% of the course grade.

Grading

Midterm course Grade in LOUIE: Midterm grades for LOUIE will be computed as follows: Midterm 1: 50%, Essay 1: 10% Quiz: 15%, Class Participation and attendance: 25%

Final Grade: Attendance: 10%, Online Quizzes: 15%, Homework, Essays, and In-class Activities: 15%, Mid-term exams 40%, Final 20%

Course Schedule (approximate)

PART I – Cosmic Habitability

Week 1 – Course Overview/Nature of Science

Week 2 – Origin of the Universe

Week 3 – Stars and Habitability

Week 4 – Origin of Molecules and Planets

Week 5 – Planets and Life

PART II – Primitive Life in the Solar System

Week 6 – *Midterm 1*; Origin of Earth

Week 7 – Origin of Life

Week 8 – Primitive Life on Earth

Week 9 – *Spring Break*

Week 10 - Search for Primitive Life in the Solar System

Part III – Complex and Intelligent Life in the Cosmos

Week 11 – Origin of Complex Life; *Midterm 2*

Week 12 – Evolution of Life on Earth

Week 13 – Mechanisms of Evolution

Week 14 – Search for Intelligent Life

Week 15 – Future of Life in the Universe (End of Term Week)

Week 16 – Final Exam Date is given on the Registrars Page:

https://in.nau.edu/wp-content/uploads/sites/153/2018/11/FINAL_EXAM_Schedule_1201_Spring-2020.pdf

Excused Absences: Students who receive excused absences are expected to review class materials for days missed. If students miss a quiz, their quiz average will be computed based on the quizzes they were present for during the semester. Make-up quizzes will not be given.

Class, Departmental, & University Policies

- Please disclose any disabilities or special requirements to the NAU Disabilities Resources Office, who will contact me privately regarding any accommodations.
- Please silence all cellular devices during class. Please refrain from any other “electronic distractions” (e.g., text messaging, browsing social media) during class. If you are anticipating cellular disruptions during class for any personal or professional reasons, please notify the professor prior to class.
- Class disruptions are defined as activities that distract the instructor or other students from delivering or learning the course materials. Such activities include talking or whispering during class, habitual tardiness or leaving class early, or electronic distractions. Disruptive students will be asked to leave the classroom, and repeat offenders may be withdrawn from the class.
- Neither audio nor video recording will be permitted except under special circumstances prescribed by the NAU Disability Resources Office or discussed with the professor prior to class.

University and Course policies displayed and linked at:
<http://www.physics.nau.edu/SYLLABI/POLICY/policy.html>