# ASTR-1035: LIFE IN THE UNIVERSE SPRING 2020

**Instructor**: Dr. Gary Henson Office: S272 Phone: 439-6906 hensong@etsu.edu
Office Hours: 10:30-12:00 WF, 1:40-2:40 MWF, 11:15-12:30 TTh or by Appointment

**Textbook** : "Life in the Universe", 4th ed. By Bennett and Shostak
Class Lecture: MWF 12:35-1:30 pm Room 370, Brown Hall
**Required for Laboratory: "**Life in the Universe"' Lab Manual (in Bookstore)
**Laboratory: Section 001 Thursday, 1:35pm - 3:35pm**
**Section 002 Friday, 1:40pm – 3:40pm**
**(Lab Room: usually Room 264, Brown Hall)**

COURSE DESCRIPTION: This is an interdisciplinary course which will touch on aspects of astronomy, physics, geology, chemistry, biology, and engineering to investigate the question of the existence of life elsewhere in the Universe. This course is not about a hunt for UFO's, but will instead employ the scientific method as we discuss the structure, origin, and evolution of the Universe as a whole, particularly as it pertains to the possibility of life beyond the Earth. We will begin by posing the question about a Universe full of life, looking at the structure, scale, and nature of our universe. We will also investigate the origin and evolution of life here on Earth and address the possibility of life on other planets and moons in our own solar system in light of results from recent interplanetary spacecraft and the recent discoveries of extrasolar planets. We will also cover topics in interstellar communication and spacecraft design, discuss factors that may limit the lifetime of an advanced civilization, and investigate the possibility of advanced civilizations existing elsewhere in the Galaxy. This course uses a little math at the level of high school algebra, but assumes students may have only a very basic knowledge of the physical and biological sciences.

At the end of the Life in the Universe course, students are expected to be able to:

*1. Apply concepts to new situations using logical, deductive reasoning. The student will recognize the appropriate concept or principle to be applied to a new situation not given in the book or in lecture.*
*2. Demonstrate a knowledge of scientific methodologies when solving a problem.*
*3. Describe what has to take place first and what is needed to create a habitable planet with life on it.*
*4. Describe the properties and processes of the Earth that make it a habitable planet and contrast our situation with the environments on other planets in our solar system that make life impossible or very unlikely to exist. Closely allied with that is that students will be able to describe how those nice properties of our situation informs us in our search for habitable planets or moons in other solar systems.*

*5. Explain the chemical, molecular and cellular nature of Life.*
*6. Explain how scientists know about the geological history of the Earth and biological history of life.*
*7. Explain the known and expected evidence for the existence of intelligent, self-aware complex life beyond the Earth and what efforts are being made to detect extra-terrestrial intelligent life.*

LABORATORY: There will be 11 regularly-scheduled laboratories throughout the semester, on a wide range of related topics, from extrasolar planets to DNA. Students must do at least 10 labs for full credit in the lab portion of the course; an 11th lab (done in or outside class) can be used as a make-up or as extra credit. The laboratory is a required part of the course. STUDENTS MUST COMPLETE AT LEAST 8 LABS OR A FAILING GRADE WILL BE ASSIGNED FOR THIS COURSE!
There will be no individual make-ups for the lab; the lab manual describes two additional outside-class labs which are the only available make-ups. A lab report (the lab manual pages) will be due at the end of each lab period and will be graded on a 10 point scale.

EXAMS: There will be five short exams (~40 minutes in length) during the semester, as well as a comprehensive final exam. The short exams will all be multiple choice questions (25 questions each). PLEASE bring your own pencil and a scantron form to each exam! Note that no electronic devices (including iPods, cell phones, and calculators) may be used during the exams. Calculators will not be needed for the exams. There will be NO individual makeups scheduled for the exams. Instead, the lowest exam score of these five short semester exams will be dropped. ***The final exam is comprehensive and is required for all students***. It will consist of 60 multiple choice questions covering both lab activities and the five short semester exams.

IN CLASS ACTIVITY OR HOMEWORK: There will be at least 12 such activities, randomly spread out throughout the semester. **[NOTE: I may utilize a "free" active learning ap/web program for this purpose at some point during the semester.]** These may be a brief in class essay or short answer question, a small online research assignment, or other homework assignment. I will count only your best 10 scores of these activities toward your course grade. There are No Make-Ups for missing any of these activities.

EXTRA CREDIT: The only extra credit students may earn is within the laboratory grade. If more than the 10 labs required for full credit are completed, a student may achieve a lab grade greater than 100%. The lab grade will count as 25% of the total course grade.

FINAL GRADE ASSIGNMENT:
Laboratory grade ---------- (100+ pts possible) --- 25% of course grade
In Class Activity ---------- (40 pts possible) -------10% of course grade
Five semester exams ----- (200 pts possible) ------50% of course grade
Final Exam ---------- (60 pts possible) -------15% of course grade

The final letter grades will be based on the following scale:

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| **A** | = 92% or better | **B-** | = 80-82.99% | **D+** | = 67-69.99% |
| **A-** | = 90-91.99% | **C+** | = 77-79.99% | **D** | = 60-66.99% |
| **B+** | = 87-89.99% | **C** | = 72-76.99% | **F** | = Less than 60% |
| **B** | = 83-86.99% | **C-** | = 70-71.99% | | |

**Course Schedule:** We will cover material at a rate of about one chapter per week. The first chapter in the text is mostly introductory but I will introduce outside material to go along with it. Some chapters will require a little more or less than a week to discuss. I will post on D2L some of the lecture notes, a brief study guide for each exam, and practice exam questions with answers. Each semester exam will cover the lecture material and from 2 to 3 chapters in the textbook. Below is a fixed schedule for exam dates. I will announce in class and by email any schedule changes that may occur during the semester.

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| Exam 1 (Chapters 1 & 2) | Friday, February 7 |
| Exam 2 (Chapters 3 & 4) | Friday, February 28 |
| Exam 3 (Chapters 5 & 6) | Wednesday, March 25 |
| Exam 4 (Chapters 7-10) | Monday, April 13 |
| Exam 5 (Chapters 11-13) | Friday, May 1 |

FINAL EXAM

**Wednesday, May 6, at 1:20 – 3:20 PM**

# ASTR 1035 "Life in the Universe" Laboratory Syllabus SPRING 2020

The Laboratory Manual for Life in the Universe is REQUIRED. You will complete activities, write responses to questions, and write a written summary on the lab manual pages to be turned in at the end of each lab period. It can be purchased for just a few dollars in the campus bookstore.

PLEASE PURCHASE AND READ the Introduction pages in the lab manual BEFORE the first lab meeting. **Be sure to get the Lab Manual for ASTR 1035 as it looks similar to other astronomy course lab manuals in the bookstore!** You will not need to purchase a "Star and Planet Locator" as these will be provided for you.

The lab instructor will also go over the lab details at the beginning of the first lab.

**LAB SCHEDULE:** There are 11 regularly scheduled lab dates as listed below. Section 001 meets on Thursday afternoons, section 002 (Dr. Smith) on Friday afternoons. Students must do at least 10 labs for full credit in the lab portion of the course. The Lab material cannot be made up and students must attend only the lab section for which they are registered. **You must complete a minimum of 8 labs or you will receive a Failing grade for the entire course!**

[The labs will typically meet in Room 264 of Brown Hall but we also meet in the Planetarium or another Brown Hall room. The location for each week will be announced in lecture, emailed to students and posted on D2L.]

January 30, 31 --- Lab 7: Interplanetary Spacecraft
February 6, 7 --- Lab 1: Stars with Known Extrasolar Planets
February 13, 14 --- Lab 3: Spectral Analysis of Planetary Atmospheres
February 20, 21 --- Lab 2: Interstellar Travel
February 27, 28 --- Lab 6: Amino Acids and Proteins
March 5, 6 --- Lab 5: DNA
March 12, 13 --- Lab 14: The Habitable Zone
March 26, 27 --- Lab 8: The Surface of Mars
April 2, 3 --- Lab 4: Searching for Extrasolar Planets
April 16, 17 --- Lab 15: Kepler Exoplanet Properties
April 23, 24 --- Lab #: The Drake Equation

**[Note: Students may do a 12$^{th}$ Lab for extra credit or to makeup a missed lab. Either Lab #12 (The Real Night Sky) or Lab #13 (The Gray Fossil Site) can be used for this purpose as both are done as independent activities at sites off the main campus. Ask your lab instructor for more details about these labs.]**