

The Benefits of Adding SETI to the University Curriculum and What We Have Learned from a SETI Course Recently Offered at UCLA

Larry Lesyna¹, Jean-Luc Margot^{2,3}, Adam Greenberg³, Akshay Shinde⁴, Yashaswi Alladi⁴, Srinivas Prasad MN⁵, Oliver Bowman², Callum Fisher³, Szilard Gyalay³, William McKibbin³, Brittany Miles³, Donald Nguyen³, Conor Power⁵, Namrata Ramani⁶, Rashmi Raviprasad³, Jesse Santana³

1. LXL Technology, Las Vegas, NV. 2. Dept. of Earth, Planetary, and Space Sciences, UCLA. 3. Dept. of Physics and Astronomy, UCLA. 4. Dept. of Computer Sciences, UCLA. 5. Dept. of Electrical Engineering, UCLA. 6. Dept. of Materials Science and Engineering, UCLA.

Why Teach a Course Dedicated to SETI?

It's solid science. NAS Decadal Reviews from 1980+ have recommended moderate funding for SETI as a worthy scientific endeavor. Both public and private funding have enabled SETI since that time.

SETI is a dynamic endeavor that has adapted to take advantage of existing astronomical facilities and advances in semiconductor and related technologies. SETI concepts are used in astronomy, physics and engineering disciplines. These concepts aid students in their dissertation research or careers.

The discovery of exoplanets in last two decades have bolstered the prospects for intelligent life outside our solar system.

SETI is an exciting topic that draws students from other disciplines to learn more about astronomical concepts.

How SETI Complements Astrobiology

Although some topics like exoplanet detection, biological evolution, and planetary habitability are common to both disciplines, topics unique to SETI include:

- Communication by electromagnetic waves over interstellar distances
- Effects of the interstellar medium and cosmic background radiation on transmitted signals
- Properties of radio and optical telescopes, antennas and receivers
- Signal processing methods and algorithms
- Search strategies
- The prospects for interstellar travel, probes and exotic propulsion methods
- Other SETI strategies, such as the detection of technosignatures

Planned SETI Courses

UCLA will again offer a regular SETI course with emphasis on observing, signal processing methods, and data analysis. See right panel for more details. Instructor: Jean-Luc Margot

The Breakthrough Listen project and SETI Institute will now provide unanalyzed SETI data for use in the classroom at universities offering SETI courses.

PSU will offer in Spring 2018 a regular, permanent numbered graduate SETI course. It will be directed to students across astrobiology disciplines, and considers SETI as a subfield of astronomy, not necessarily tied to radio astronomy. Astrobiology program students will take either this SETI course or an exoplanets course. Instructor: Jason Wright

More SETI Course Information

seti.lxltech.com

seti.ucla.edu

Contact

lesyna@lxltech.com

jlm@epss.ucla.edu

UCLA Course Description

"Searching for Extraterrestrial Intelligence: Theory and Applications"

In Spring 2016, nine undergraduate students and five graduate students took a SETI course at UCLA. Students designed an observing sequence for the Arecibo and Green Bank telescopes, observed known planetary systems remotely, wrote a sophisticated and modular data processing pipeline, analyzed the data, and presented the results. In the process, they learned radio astronomy fundamentals, software development, signal processing, and statistics.

Observations and Results

UCLA students conducted a radio survey of 14 exoplanets in the Kepler field. Students selected sources that rank highly on habitability scales. The observing sequence required a few hours of telescope time and resulted in ~10 terabytes of data. An initial search for narrowband signals yielded ~1 million candidate signals, almost all of which were classified automatically as terrestrial radio frequency interference. For details, see Margot et al., SETI Observations of 14 Planetary Systems in the Kepler field with the Green Bank Telescope at 1.1-1.9 GHz, in prep.

Course Evaluations

Students were eager to learn because of the engrossing nature of SETI. Anonymous course evaluations revealed the following median scores assigned by undergraduate and graduate students (scale from 1 to 9): overall rating of course (U=8.5, G=9) and overall rating of instructor (U=9, G=9). Excerpts from course evaluations read:

- "This was one of the most interesting courses I have attended at UCLA. Students from different majors working together to achieve a common goal was the highlight of this course."
- "One of the most enjoyable, informative courses I have taken."
- "I felt like I learned a lot of very useful skills in this course. These skills were presented to me in the form of a long term team-oriented project, which felt much like how things would work in real life."

Several students have remained engaged in SETI research after the conclusion of the course. The course will be offered again in Spring 2017.

The Spring 2016 UCLA SETI class with guest lecturer Larry Lesyna



LXL Technology

UCLA