

EPSS C179/279
Search for Extraterrestrial Intelligence:
Theory and Applications
Spring 2018
WF 1:00 pm - 3:00 pm Young 4232

Course Description:

The Search for Extraterrestrial Intelligence (SETI) or search for technosignatures is based on a number of astronomical, mathematical, statistical, and computational principles. This course covers fundamental concepts in these disciplines in the context of SETI: abundance and architecture of extrasolar planetary systems; radio astronomy, including wave propagation and dispersion; signal processing, including sampling theory and Fourier transforms; random processes, including Gaussian and Poisson statistics, and algorithm development. During the laboratory component of the course, students design an observational program, acquire telescopic data, develop algorithms to analyze the data, and write a report on the results.

Lectures (two hours/week) are supplemented with weekly laboratory modules in a computer lab (two hours/week).

Instructor:

Professor Jean-Luc Margot
5642 Geology
310.206.8345
jlmm@epss.ucla.edu

Teaching assistant:

Textbook:

There is no required textbook. Optional textbooks include:

Bracewell, R. The Fourier Transform and Its Applications, McGraw-Hill, 2nd edition, revised, 1986.

Sivia, D. S. Data Analysis: A Bayesian Tutorial, Oxford University Press, 2nd edition, 2012.

EPSS C179/279 website:

<https://ccle.ucla.edu/course/view/18S-EPSSCIC179-1>

**Earth, Planetary, and Space Sciences C179/279:
SETI - Spring 2018**

Date	Lec	Title	Computer
W Apr. 04	L01	<i>Introduction, motivation, logistics Radio astronomy fundamentals</i>	
F Apr. 06	L02	<i>Computational techniques, Python Celestial coordinates</i>	LST
W Apr. 11	L03	<i>Exoplanets, Habitable Zone</i>	Alt-Az
F Apr. 13	L04	<i>Design of observing program (part 1)</i>	Alt-Az general
W Apr. 18	L05	<i>Design of observing program (part 2)</i>	Travel. Salesm.
F Apr. 20	L06	<i>Design of observing program (part 3)</i>	Travel. Salesm.
W Apr. 25	L07	<i>Fourier transform, sampling theorem</i>	FFT
F Apr. 27?	TBC	Observing with Green Bank Telescope	
F Apr. 27	L08	<i>Time-frequency diagrams</i>	Time-Freq
W May 2	L09	<i>Wave radiation & propagation, Doppler shift</i>	Shift & add
F May 4	L10	<i>GBT debrief, natural vs. artificial signals</i>	Voyager 1
W May 9	L11	<i>Orbital dynamics, Doppler drift rate</i>	Git/Github
F May 11	L12	<i>Dispersion in interstellar medium</i>	Tree algorithm
W May 16	L13	<i>Telecommunication principles, interference</i>	Excision
F May 18	L14	<i>Gaussian and Poisson Statistics</i>	Histograms
W May 23	L15	<i>Filtering techniques</i>	Pipeline
F May 25	L16	<i>Database techniques</i>	Pipeline
W May 30	L17	<i>Machine learning techniques</i>	Pipeline
F Jun. 1	L18	<i>Distributed and GPU computing</i>	Pipeline
W Jun. 6	L19	<i>Final project</i>	
F Jun. 8	L20	<i>Final project</i>	
		Final exam	

GRADING

Undergraduate students: grading is based on five problem sets (25%), a final exam (25%), and a final project (50%) that **will not** require implementation of machine learning, GPU computing, or other advanced CS techniques. There is no mid-term exam.

Graduate students: grading is based on five problem sets (25%) and a final project (75%) that **will** require implementation of machine learning, GPU computing, or other advanced CS techniques. There is no mid-term exam.

DISCUSSION SECTIONS

Students enrolled in EPSS C179/279 conduct weekly computer labs in Young 4232.

OFFICE HOURS

Jean-Luc Margot

M 1-2 pm (consider calling ahead 310.206.8345)

THE FINE PRINT

You are responsible for all material covered in lectures or reading. A PDF version of the lecture notes will be posted on the course web page.

Academic integrity is expected at all times and violations will be reported to the Dean of students. Collaboration between students is never permitted except when explicitly allowed by the instructor.

Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. Students who have experienced sexual harassment or sexual violence can receive confidential support and advocacy at the CARE Advocacy Office for Sexual and Gender-Based Violence, 1st Floor Wooden Center West, CAREadvocate@caps.ucla.edu, (310) 206-2465. You can also report sexual violence or sexual harassment directly to the University's Title IX Coordinator, 2241 Murphy Hall, titleix@conet.ucla.edu, (310) 206-3417.