Planetary Systems: A Data-Driven Exploration

Time: Tuesday and Thursday 9:00-10:15 AM
Location: TBD

Instructors: Eric Gaidos (gaidos@hawaii.edu) and Dan Huber (huberd@hawaii.edu)
Office hours: by arrangement

A mere three decades ago the only planetary system we were aware of was our own. Now we know of thousands of systems; their diversity challenge our theories of planet formation and evolution, provide required context for understanding the Solar System, and is the foundation upon which rigorous searches for habitats and life elsewhere in the Universe will be built. This course will expose graduate students in planetary science and astronomy to the present state of knowledge of planetary systems using representative data at the field's leading edge, introduce key theoretical concepts and analytic and numerical tools with broad application, and develop teamwork, presentation, and publishing skills.

Course prerequisites: Undergraduate degree in physics, astronomy, or planetary science or equivalent background. ***Students must have a laptop and be willing to install software and do some simple coding.*** Python will be the standard language used in the course. A general facility with computers and programming is expected; knowledge of Python will be very useful but is not required.

The course consists of five modules, each on a different aspect of planetary systems and centered around a different project working on a relevant data set. Students will work in pairs on these projects and present their findings on the 5th day of each cycle.

Day 1: Lecture on background concepts and theory
Day 2: Tutorial introduction to the data and tools
Day 3: Structured, tutored work session
Day 4: Unstructured work session
Day 5: Student presentations

Each student will write a *Research Note* based on a project selected from a list of topics provided by the instructors. Other topics will be considered on a case-by-case basis. *Research Notes of the American Astronomical Society (http://iopscience.iop.org/journal/2515-5172)* are reviewed by an editor and published and citable but are neither peer reviewed nor copy-edited. They have a maximum of 1000 words, including titles, author names and affiliations and references, and up to 1 figure or table.

Schedule (provisory):

Jan 12 Course orientation

Jan 14	Software installation
Jan 19	*Research Notes* project discussion and selection
Jan 21,26,28, Feb 2,4	Module 1: Detection and Enumeration of Planetary Systems
Feb 9,11,13,16,18,23	Module 2: Properties of Host Stars and their Planets
Feb 25, Mar 2,4,9,11	Module 3: Masses and Compositions of Planets
Mar 23	Project mid-point presentations
Mar 25,30 April 1,6,8	Module 4: Dynamics and Formation of Planets
April 13,15,20,22,27	Module 5: Atmospheres and Climates of Planets
April 29, May 4	Project work sessions
May 14	Final *Research Notes* manuscripts due

Grading (provisory):
Letter grade only
Course participation: 30%
Team Presentations: 30%
Research Note Manuscript: 40%

Student learning outcomes:
- Learn key theoretical principles of exoplanet science
- Acquire knowledge and experience with key analytical, statistical, and numerical tools
- Develop teamwork and organizational skills to carry out projects
- Improve scientific writing and presentation skills

Disability Access: The Geology and Geophysics Department will make every effort to assist those with disability and related access needs. For confidential services, please contact the Office for Students with Disabilities (known as "Kokua") located in the Queen Lili'uokalani Center for Student Services (Room 013): 956-7511, kokua@hawaii.edu, www.hawaii.edu/kokua

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