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

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**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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If you wish to report an incident of sex discrimination or gender-based violence, contact: Dee Uwono, Title IX Coordinator, Hawai‘i Hall 124, t9uhm@hawaii.edu, 808-956-2299. As members of the University faculty, your instructors are required to immediately report any incident of potential sex discrimination or gender-based violence to the campus Title IX Coordinator. Although the Title IX Coordinator and your instructors cannot guarantee confidentiality, you will still have options about how your case will be handled. Our goal is to make sure you are aware of the range of options available to you and have access to the resources and support you need. [http://www.manoa.hawaii.edu/titleix/resources.html#confidential](http://www.manoa.hawaii.edu/titleix/resources.html#confidential)