

Syllabus for AST 6112: Planetary Astrophysics (Fall 2013)

Basic Information:

Course website: <http://www.astro.ufl.edu/~s.chatterjee/AST6112.html>

Classroom: Bryant Space Science Center (BRT) Room #3 (in basement)

Class Meeting Times: Mondays, Fridays 4:05-4:55pm, Thursdays 3:00-3:50pm

Section Number: 063H

Instructor: Dr. Sourav Chatterjee

Email: s.chatterjee@ufl.edu (please write AST6112 in the subject line)

Office hours: TBD or by appointment

Office: 310 Bryant Space Science Center (294.1849)

Text Books:

Planetary Sciences (de Pater & Lissauer 2nd Edition; ISBN: 0521853710)

Astrophysics of Planet Formation (Armitage; ISBN 0521887453). Note that the [free draft online](#) at arxiv of the latter text will be sufficient. Any additional readings will be available via arxiv, UF's electronic journal subscriptions and/or the UF libraries [Ares](#) service.

Prerequisites:

None. This is a core graduate course primarily targeted towards graduate students in astronomy and physics. I expect that students will enter the class with a variety of backgrounds (e.g., physics undergrad degree and no astronomy classes). Any prospective students from other backgrounds are encouraged to contact me to determine if this course would be a good match for them.

Goals & Objectives:

In this class we will consider the astrophysics of planetary systems, including planet formation, planetary science and observations of the solar system and extrasolar planetary systems. The greater purpose is to help you develop physical intuition and research skills that are applicable beyond this course. Objectives for you to achieve during this semester are:

- *Knowledge & Comprehension*: Learn technical terms, facts, and observational data so that you can participate in scientific discussions about planetary astrophysics.
- *Application & Analysis*: Describe the purpose and implications of observations and theoretical models. Explain how the results have led to the current state of scientific understanding. Apply scientific reasoning to make quantitative estimates and to deduce the implications of observations.
- *Synthesis*: Explain how future instruments, observations, or theoretical research could address open questions about the astrophysics of planetary systems.
- *Evaluation*: Identify the limitations of observations and theoretical models. Critically evaluate claims and research proposals.

Teaching Philosophy:

While I enjoy sharing my knowledge and experiences with students, I hope that this class will not be dominated by lectures. I strongly encourage student questions and significant discussion during class. Should our class discussion leave you uncertain about concept or idea, please let me know, so we can arrange a time for further discussion. During this course, the discussions and assignments will build upon the concepts from previous lessons. If you fall behind on understanding material early in the semester, it can be very hard to catch up. The sooner in the semester you talk to me, the better the chance that we can clarify any confusion.

Grades:

Final grades will be based on the weighted average of: exams (30%), homework assignments (30%), an in class presentation on a relevant topic (10%), a mock research proposal (15%), your comments on your peers' proposals (5%), and class participation and/or quizzes (10%). Letter grades will be assigned as follows: A (90%-100%), A- (85%-89.9%), B+ (80%-84.9%), B (75%- 79.9%), B- (70%-74.9%), C+ (65%-69.9%), C (60%-64.9%), C- (55%-59.9%), D+ (50%-54.9%), D (45%-49.9%), , D- (40%-44.9%), E (0%-39.9%). For any students taking the course S/U, at least 60% is required to earn an S. UF grading policies for assigning grade points are online (<https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx>).

Special Accommodations:

If you have a documented disability and anticipate needing accommodations in this course, please see me as soon as possible. You would need to request that the Counselor for Students with Disabilities send me a letter verifying your disability.

Tentative Class Schedule and Reading Materials

Click [here](#).

Assignments**Exams (30% of grade):**

There will be three exams to be completed individually. You may use your personal notes and a calculator. I have listed tentative exam dates. Please let me know ASAP if you have a conflict.

Homework (30% of grade):

There will be two homework assignments. You may discuss these problems with other students. However, each student should complete each problem themselves. Figuring out how to solve the problem in a group and then doing the work individually is allowed. Copying down “the answer” is not allowed.

In-class presentation (10% of grade):

Each student should list at least three topics that they would be interested in preparing a presentation and leading the class discussion for. Possible topics include: Mercury, Venus, Earth, Moon, Mars, Asteroids, Jupiter, Saturn, Uranus, Neptune, Kuiper Belt Objects, Galilean Moons, Titan, Enceladous, Iapetus, the Saturnian ring system, debris disks, hot- Jupiters, eccentric giant planets, small exoplanets, one of the systems with multiple extrasolar planets, etc. You should review all the relevant material on your topic in the text book, and then identify the most interesting aspects to focus discussion on. Presentations should provide an introduction, discuss at least one interesting aspect in some detail and be designed to stimulate significant class discussion. I strongly encourage you to prepare an outline of your presentation and run in by me a couple of weeks in advance, so I can make sure you're headed in a productive direction. Grading will be based on demonstrating a familiarity with the relevant scientific literature, identifying one or more interesting aspects to emphasize, identifying the strengths and weaknesses of previous observations/models, and effectively communicating these ideas to your peers. Please provide me with an electronic copy in ppt, odt or pdf format, so I can review the materials you prepared. If your travel plans exclude any of the days scheduled for student presentations, please let me know as soon as possible.

Mock research proposal (15% of grade):

Everyone should submit a short (~3-4 page) "proposal" for a possible project related to planetary astrophysics. Your proposal could describe some desirable observations, a new instrument that would enable new observations of the system, a numerical method to model the system, etc. While I will not insist on a particular style, we will discuss the key ingredients of strong proposals in class. You'll need to provide me with both an electronic version (pdf) and a hard copy (single spaced, double sided is good) of your proposal by March 30.

Comments on your peers' proposals (5% of grade):

We will have one in-class proposal review session in April (10, 12 or 13; let me know if you have a conflict with any of these ASAP) where we discuss the strengths of each proposal and

how it could be improved. Each student will be assigned to read and review two proposals (due by Apr 6), as well as lead the discussion for these proposals. All students should also quickly skim all the other proposals, so that they will be able to contribute to the discussion.

Class participation and/or quizzes (10% of grade):

If people are typically well prepared for class, then I would be more than happy to have zero quizzes. In this case, points will be earned for regularly making a positive contribution to in-class discussions and/or submitting questions about the readings (via email at least an hour before class). If it is a struggle to generate class discussion and most student's are asking questions, then short reading quizzes at the beginning of class will be used instead.

Course Policies

Prepare for class – Please make a serious effort to read and consider these readings prior to class. You don't need to fully understand everything, but you should at least be able to articulate questions about what you don't understand. The more you put into the class, the more you will get out of it. You should refer to the course webpage for an updated reading schedule, and potentially links to readings beyond the two texts. For some readings, you may need to be authenticated to the UF network. If you want to access these from off-campus, then you will likely need to use VPN software. Please check that you are able to access these well in advance.

Contribute to class – Regular attendance and active participation in the classes is expected and will be important for ensure success in this course. I highly recommend that you take written notes during class. Many students find taking notes helps them maintain focus on class, reinforces concepts in their memory, and provides an excellent reference for homework assignments. As an incentive to take good notes, you will be allowed to bring your own class notes to the exams.

Missed classes – I recognize that some of you have research obligations such as observing runs and/or scientific conferences that necessitate traveling and missing class. In these cases, I expect you to let me know via email in advance of any classes you miss. Be sure to do the reading extra carefully, get and read class notes from a classmate, and arrange to meet with me after your return if you have any questions, so that you do not get behind in class. If assignments are due while you are traveling, you can submit them via email in PDF format.

Respect other students – After the first day, I will aim to begin and end class on time. You should arrive on time with cell phones muted. If we run over time, please let me know promptly. I want students to engage in serious discussion, and sometimes that may include students advancing differing viewpoints. That's great, but we should all be respectful of each other.

Submit all assignments on time – I strongly encourage you to submit all assignments on time. Otherwise, it is very easy to fall behind in class and encounter bigger problems. To encourage timely submission, I expect to impose a modest grade penalty for late homework assignments or a *substantial* grade penalty for a late proposal or comments on your peers' proposal. Obviously, I will make exceptions for unexpected emergencies. Regardless, please let me know as soon as practical, if you will not be submitting an assignment on time.

Academic Honesty – You are expected to be familiar with and always follow the UF student honor code (<http://www.dso.ufl.edu/sccr/honorcode.php>). You are encouraged to discuss all with

other students. However, you are expected to submit only your own work. If there is any doubt as to whether something is acceptable for any assignment, then you should ask *first*.