ASTRON 3580

Galactic and Extragalactic Astronomy

Course Information

Meeting Time: Monday and Wednesdays, 3 PM – 4:15 PM, Thaw 210

(Note: The 2nd floor of Thaw corresponds to the 5th floor of SRCC or the 3rd floor of OEH.)

Instructor Information

Lecturer: Prof. Jeffrey Newman
Office: 310 Allen Hall
Office Hours: Wednesday 4:15-5:15 PM, Thaw 210; Tuesday 3-4 PM, office (or by appointment)
Email: janewman@pitt.edu (email is generally the best way to contact me)
Phone: (412) 592-3853

Textbook

Galaxy Formation and Evolution, by Mo, van den Bosch, and White

This book is available in electronic (PDF and Kindle) editions as well as hardcover.

Course Description

This course will be an introduction to the study of our Milky Way and other galaxies at a graduate level. This field has advanced greatly in recent years; we will use state-of-the-art datasets to explore the properties of galaxies. We will begin by studying our own galaxy, the Milky Way; then move on to the study of galaxies in general, their formation and evolution; and then spend additional time on topics of particular interest in the field.

Course Objectives

The primary goals of this course are twofold:

1) to provide a basic knowledge of our Milky Way and other galaxies, providing sufficient grounding to engage in research in these fields; and
2) to develop skills in exploring astronomical data and solving problems.

At the end of the course, you should also be able to explain, among other things:

- How the Milky Way Galaxy we live in is similar to (or different from) other galaxies
- The major types of galaxies and how they relate to the underlying web of dark matter
- Where galaxies come from and how they may transform amongst types
- Why we believe many galaxies have black holes at their center
- How to perform basic calculations, file input/output, and plotting in the Python programming language

Course Structure

In recent years, Physics and Astronomy education research has found in a variety of contexts that the most lasting learning comes not from lectures, but from active engagement with material. The course will employ techniques that have proven effective in the past, in particular group problem-solving. I expect that a significant fraction of class time will be devoted to working together in groups of 3 or so students to solve problems or explore data sets.

Students are expected to have read the relevant sections of the textbook or online readings (listed on Courseweb) before class. Lectures and these activities are a supplement to the textbook, not a replacement. The goal is not for you to understand everything after reading, but you should come to class ready to ask questions about the parts that are unclear!

Grade Weighting

I tentatively expect grading to be based on:

50%	Homework
20%	In-class activities
30%	Seminar Presentations / Final group project

Homework:
There will be 5-10 homework assignments during the semester, consisting of a variety of astrophysical problems or, in some cases, exploration of data.

Students are allowed (and encouraged) to collaborate on homework assignments in developing basic algorithms, but must present their own work (programs/plots, results, etc.).

Please provide either code or notes describing how you did a calculation, to help me understand the cause of any errors. I do not expect a detailed writeup of python-based problems (e.g. it is not necessary to spend time on nicely formatted equations) unless I specify otherwise. If I say I want a plot, I want a plot; if I want a particular number, I care more about the process of getting that number (in python or otherwise) than a detailed derivation of the methods. Source code or notes allows me to assess that process and helps me to provide more useful feedback. Conceptual problems are a different case, and I do expect you to explain your reasoning there.

I will accept at most 2 late homeworks from any letter-grade-option student, except in extreme (e.g. medical) circumstances or via prior arrangement more than two days before the deadline. The first late homework will have no penalty, the second one will have a grade penalized by 10%. Late HWs must be turned in within 24 hours of the nominal due date unless otherwise arranged in advance.

In-class activities
The class will be taught in a computer lab; each student will have their own computer to work with. Class time will be a mix of lecturing with activities (e.g. solution of some problem, data reduction) done on these computers. This will often yield some work product which will contribute to your in-class activities grade (as completion/noncompletion, not graded in detail). If you do need more time, submission after class will be acceptable.

Presentations / Final Project:
For the latter part of the semester, the course will be taught as a less formal lecture series / seminar. I expect all letter-grade students will do a presentation on a topic of particular interest at some point in this time. If time allows we will also pursue a class project, done in small groups and presented orally and/or in written form.

Expectations

It will be vital for you to study the material at home, doing reading beforehand so that class time can be used for group work and mini-lectures. I expect you to attend all classes and to come prepared for active participation; failing to do so will not only be sure to impair your performance in the class, but also harm the other members of your group.

I expect you to work in groups to discuss readings and solve problems and to be an active participant in your group. The classroom will be a safe environment for discussing and

challenging ideas and concepts. The students and the instructor are expected to treat each other with respect at all times.

I will post new homework assignments on our *CourseWeb* site site (at http://courseweb.pitt.edu/); I will not hand them out in class. It is your responsibility to check the site and obtain these materials.

You may discuss homework problems with other students in the course, but you must hand in a unique solution that is your own.

Late homeworks will be accepted by prior arrangement with the instructor, with a 50% penalty for the point value of the homework up until the time that I post the solutions on the CourseWeb site for the course. No homework will be accepted after this time unless by explicit arrangement and no make-up assignments are possible unless by prior arrangement. I may post the solutions any time after the due date without warning.

You can expect me to come prepared to give lectures, to explain difficult concepts, to assist your group, to assign relevant readings and homework problems, and to answer any questions you have. I will be a willing listener and advisor in helping you succeed in this class, and with other career questions you might have. You may expect me to be available outside of class to give additional support.

I want this class to be interesting, informative, useful, and fun. I am always open to suggestions and willing to try to modify the topics, etc. to accommodate the interests of the class.

Tentative Calendar

Week begins:	**Planned material**
1/8	Introduction to the Course; Basics of Galaxies and Cosmology (Ch. 1)
1/15	The Milky Way (Ch. 2) **NOTE: NO CLASS ON MONDAY (MLK holiday)**
1/23	The Milky Way; Introduction to Python.
1/30	The Milky Way; Other Galaxies (Ch. 3)
2/5	Galaxies (Ch. 5)
2/12	Exploring galaxy properties
2/19	Exploring galaxy properties; Clusters of Galaxies (Ch. 6)
2/26	Galaxy Evolution

3/5	Spring Recess
3/12	Galaxy Evolution; transition to seminar
3/19	Seminar
3/26	Seminar
4/2	Seminar
4/9	Seminar
4/16	Seminar
4/23	Final projects/presentations due.

Students are expected to have read the relevant sections of the textbook before class.

The schedule and procedures in this course are subject to changes by the instructor which will be posted on the ASTRON 1121 Courseweb site (and announced in class in the case of major changes). Exam dates are not expected to change, but the exact material covered will be adjusted according to the actual pace of the course.

Academic Integrity

Students in this course will be expected to comply with the University of Pittsburgh's Policy on Academic Integrity. Any student suspected of violating this obligation for any reason during the semester will be required to participate in the procedural process, initiated at the instructor level, as outlined in the University Guidelines on Academic Integrity. This may include, but is not limited to, the confiscation of the examination of any individual suspected of violating University Policy. Furthermore, no student may bring any unauthorized materials to an exam, including dictionaries and programmable calculators.

Disabilities

If you have a disability that requires special testing accommodations or other classroom modifications, you need to notify both the instructor and the Disability Resources and Services no later than the 2nd week of the term. You may be asked to provide documentation of your disability to determine the appropriateness of accommodations. To notify Disability Resources and Services, call 648-7890 (Voice or TTD) to schedule an appointment. The Office is located in 216 William Pitt Union.