AST 358 - Galaxies and the Universe
Spring 2017 – Unique No. 47855
TTh 9:30 – 10:45 @ WEL 2.140

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Office Hours: Thurs 1-2p, or by appt	M 11a-12p; W 2p-3p

This syllabus will be updated throughout the semester. Please check the version on Canvas for updates.

Course Description:

Galaxies and the Universe is an upper division course designed for majors in the physical sciences. This class will have an emphasis on galaxy evolution – how do galaxies evolve from the tiny clumps we can see in the distant universe to the beautiful, morphologically complex Milky Way we see today? We will start nearby, understanding our Milky Way, from its kinematics to its stellar populations, and then moving out to the nearby universe, studying the wide varieties of galaxies which exist today. We will then venture deep into the past, studying what galaxies looked like at a time not far removed from the Big Bang, and learning about the cosmology which shapes our universe as we do so. We will finish with an eye towards the future, and an understanding of the advances the next generation of observational facilities will bring. This class will be taught with an eye on how the observations we make allow us to learn about the universe, and how theoretical modeling allows us to learn about the underlying physics behind our observations.

Prerequisites and Core Requirements:

The class pre-requisites are upper-division standing, and one of the following: Physics301 and 303L; 301 and 316; 303K and 303L; or 303K and 316. A previous astronomy course, such as AST 307 or AST 352K is strongly recommended, as a basic familiarity with basic astronomy concepts is assumed. To assist with the latter, an overview of the expected astronomy content knowledge will be provided, and early in the class we will spend one day practicing that knowledge. It is *highly recommended* that students review this material, and seek help during office hours if they have any questions, or simply wish for extra practice.

This course will include work designed to develop skills in critical thinking, communication, quantitative analysis, and teamwork. This will involve such activities as peer-to-peer discussions and critical analysis of key concepts, written or oral presentations, and quantitative problem solving. Communication in the course will consist of student questions and subsequent classroom discussions during lecture and may also involve essay exams, and take-home assignments. Teamwork in the course may consist of working in small groups during help sessions and instructor-modeled problem solving that is guided by student decisions and group feedback. The course material will emphasize the synthesis of observation and theory to gain insight into the operation of the natural world, drawing on other fields such as physics, chemistry, geophysics, or biology.

Class Website:

This course will be primarily run through the Canvas system, at canvas.utexas.edu. All class communication will be done through Canvas.

Required Texts and Other Items:

This class has only one required text: Extragalactic Astronomy and Cosmology, Peter Schneider, 2nd edition. The text can be purchased through various online stores, but I highly recommend using the free PDF of this text available at:
http://link.springer.com.ezproxy.lib.utexas.edu/book/10.1007/978-3-642-54083-7
Additionally, students can take advantage of the ability to purchase a black and white printed copy for $25 through the My Copy link on the Springer site for the book.

Occasional other reading will be required, and will be provided online or as printouts in class.

Class Structure:

Rather than a typical college course composed of solely lecturing, this course will combine short lectures with discussions and group activities. You will only learn if you participate, thus attendance and participation are ***required***! A typical class day will be composed of the following:

- Question of the day – I will show you a recent observation, or pose a question, and you will get in groups and discuss, ending with a full class discussion.
- Brief synopsis of previous class; think-pair-share questions about concepts from previous class.
- 30–40 minute lecture (including breaks for discussion and think-pair-share questions).
- In-class activity in groups, followed by whole class discussion.

What to bring to class: Other than a true willingness to learn, please make sure to bring either a calculator or a laptop. We'll do plenty of in-class practice of the concepts we learn about. Please also bring some paper; we will do occasional writing assignments.

Grading Components and Policies:

You will receive the grade you earn. There will be no extra credit awarded at any time, so please be sure to put in the effort throughout the semester to earn the grade you want.

The composition of the course grade is:

- Exams = 40%
- Homework = 25%
- In-class participation = 20%
- Class project = 15%

Participation grading: As discussed, your participation is required! I will frequently have you doing activities in class, and I will collect items with your name on them. Your participation grade will simply be the fraction of such items which you participate in.

The average percentage in each of these grade components will be weighted by the above percentages to derive the final course grade, which will be assigned as follows, where the numbers represent the percentage of total points. As of now, this class will not be graded on a curve; I reserve the right to change this. Rounding will only occur in the second decimal place (i.e., 89.95 will be rounded up to 90.0, but 89.9 will not).

	93–100 = A	90-92.9 = A−
87-89.9 = B+	83-86.9 = B	80-82.9 = B−
77-79.9 = C+	73-76.9 = C	70-72.9 = C−
67-69.9 = D+	63-66.9 = D	60-62.9 = D−
	< 59.9 = F	

Exams: There will be two in-class exams, and no final exam. The exams will take place sometime in March and on May 4th (to-be-finalized soon). If an emergency occurs (death in the family, hospitalization, etc.), you must contact me ***prior*** to the start of the exam. In only these extreme cases will I allow a make-up opportunity.

Homework: Homework will be assigned in class, and will cover material covered in class and in the reading. Late homework will lose 20% of the total number of points for each day it is late. Unless otherwise stated in the instructions, students can collaborate when working on the homework, but the work that is turned in must be original, and in your own words. Submitted assignments must be written neatly and legibly, or be typeset (Word or LaTeX).

Participation: In-class activities play a big role in this class, and **participation is required**. You will mostly work in groups of three, and *everyone* in the group is required to take part. If you are not participating, I reserve the right to ask you to leave class, and you will not receive participation points for that day.

Term Project: The term project will consist of preparing a proposal for the upcoming *James Webb Space Telescope*. In February, I will reserve one class day to discuss this most awesome of upcoming telescopes, and to provide more details on this project. You will form collaborations of 2-3 people, and you will *collaboratively* develop a proposal idea for *JWST*. Your idea must be to perform novel research on an extragalactic theme. You will be expected to provide real quantitative measures of the depth of data you need, and accurate estimates of exposure time using the *JWST* exposure time calculator (http://jwst.etc.stsci.edu). Abstracts of your ideas will be due on March 7th, and I will approve (or suggest improvements) no later than the end of that week. You will then develop a proposal throughout the month of March, culminating with a Time Allocation Committee meeting in early April, where the class will split into two review panels, and you will take on the real-world task of evaluating your peers. Following the TAC meeting, you will have the chance to address these comments, turning in final written proposals on April 25th. Teams will then give ∼5-10 minute presentations on their proposal ideas on April 27th and May 2nd.

Approximate Course Schedule:

This course will roughly follow these topics in this order, though I reserve the right to change the order, and we may not get all the way through the list.

Overview of Extragalactic Astronomy

The Milky Way: structure, kinematics, stellar populations

Galaxies

- Morphologies
- Distance measures
- Kinematics
- Scaling relations
- Stellar populations
- Supermassive black holes
- Distribution functions

Project Discussion

Cosmology

The High Redshift Universe

- Selection techniques
- Surveys
- Physical properties
- Evolution
- Reionization
- The First Stars

Class Project: *James Webb Space Telescope* Proposals

Class Policies:

- The course webpage on the Canvas system will be updated with course announcements, reading assignments, and deadlines. It is **your responsibility to check these on a regular basis.** Please come to class prepared, having read the required reading assignments, also please be prepared to participate in in-class discussions and activities, this is for your benefit.
- Note that the professor is a professional astronomer who has research responsibilities and may be occasionally on travel in order to conduct research, present colloquia, and attend scientific meetings. In such cases, there may be a schedule change and an appropriate replacement lecture or other assignment will be scheduled.
- Do not pack up or leave class early unless you have talked to me in advance, as a consideration to me and your fellow students.
- Phone: Phone use and texting during class will not be tolerated. Make sure your phones are put away during the class (I should not see them!). Students not respecting this policy will be asked to leave, and will not earn participation for that day.
- Laptops/Tablets: I acknowledge that some students prefer to take notes electronically, thus laptops are allowed during the lecture time in class. Students found to be using their computers for non-class activities will be a distraction to those around them, and will be asked to leave, and will not earn participation for that day. If laptop distraction becomes a problem, I reserve the right to reverse this policy.

Academic Dishonesty:

University of Texas Honor Code: The core values of The University of Texas at Austin are learning, discovery, freedom, leadership, individual opportunity, and responsibility. Each member of the university is expected to uphold these values through integrity, honesty, trust, fairness, and respect toward peers and community. Students who violate University rules on scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and/or dismissal from the University. Standards for Academic Integrity are posted at http://deanofstudents.utexas.edu/sjs/acint_student.php

Plagiarism: As a research university, the University of Texas at Austin takes plagiarism very seriously. Do not risk getting involved in a plagiarism infraction - the consequences simply arent work it. Always cite your sources, and when in doubt consult a professor or librarian. You may also read more about plagiarism at the Student Judicial Services website:
http://deanofstudents.utexas.edu/sjs/acamdemicintegrity.html

Documented Disability Statement:

Please notify me of any modification/adaptation you may require to accommodate a disability-related need. The University of Texas at Austin provides upon request appropriate academic accommodations for qualified students with disabilities. For more information, contact Services for Students with Disabilities at 471-6259 (voice) or 232-2937 (video phone) or http://www.utexas.edu/diversity/ddce/ssd

Students with Children: ——————————I recognize the difficulty of being a full time student with children. If you have children, or other family commitments, please come see me to discuss any modifications of the course policies which will maximize your success in this course.

Email: ——————————————————————Email is recognized as an official mode of university correspondence; therefore you are responsible for reading your email for university and course-related information and announcements. Please check your email regularly and frequently.