

Astro 358 (Unique 48060)/ Spring 2021

Galaxies and the Universe



Current Announcements

- Welcome to Astro 358 "Galaxies and the Universe" -- an upper division course designed for science and engineering majors, with a particular focus on astronomy and astrophysics majors. This **class website is the one stop shop** where the vast majority of class materials (e.g., video recordings of zoom lectures; copy of presentations; howeworks and other assignments) will be posted, so please bookmark it and visit it regularly. Below are some quick links for frequently accessed parts of this website. You may need the id and password given in class to access secure material.
 - [Zoom links to be used for class and office hours.](#) Please do not share these zoom links with anyone not taking this class.
 - [Repository of Selected Material from Lectures & Assignments](#)
 - [Class/Office Hours and Getting Help](#)
 - [Class Prerequisites](#)
 - [Course Outline/Calendar](#)
 - [Course Assignments and Grade](#)
 - [Class and University Policies](#)
- We are in the midst of an unprecedented pandemic that is adding challenges to our learning, teaching, and research activities. **We are all in this together and we will make it through this together. It is important that we all show extra compassion, empathy, and patience toward each other in these trying times.** All students in this class: please know that we (the professor and teaching assistant of this class) are here to support you in every way we can. We understand that different students may face widely different challenges during a pandemic. Please do not hesitate to reach out to [Professor Shardha Jogee](#) (email: sj@astro.as.utexas.edu) if you are having difficulties. UT Austin COVID-19 resources for students can be found [here](#).

- Check out the [Astronomy Picture of the Day!](#)

Course Overview

- **Class and Office Hours:** During the COVID-19 pandemic, this class will be web-based and will meet weekly on **Tuesday and Thursday from 2.00 to 3.30 pm** via zoom. Please see [this file for relevant zoom links](#) and please do not share these zoom links with anyone not taking this class. The instructor is [Professor Shardha Jogee](#) and the teaching assistant (TA) is graduate student **Adam McCarron**. If you have any questions, please consult us during the office hours listed below, or by appointment, and we will be glad to help. Please allow up to one business day for a response and note that emails sent over the weekend or after business hours (Monday to Friday from 9:00 am to 5:00 pm when the University is open) may not receive an answer till the next business day.

Name: [Prof. Shardha Jogee](#)
 Hours: Wed. 9:30 to 10:30 am
 Zoom: See [this file](#)
 Email: sj@astro.as.utexas.edu

Adam McCarron
 Mon. 11.00 to 12.00
 See [this file](#)
 apm.astro@utexas.edu

- I request that you please attend the class in synchronous mode (i.e., at the time it is offered) so that you can benefit from in-class discussions or activities and get the most out of this course. **During the zoom class and breakout discussions, we require all students to turn their zoom camera on** and we will take online attendance from the participants list. If you cannot attend the class synchronously or have your camera on, please email me to explain your situation and we will see what we can do to support you. I will aim to record and post key sections of the lectures on the [class repository](#) except in situations where unanticipated technological difficulties get in the way.
- **Course Prerequisites:** This is an upper division course designed for science and engineering majors, with a particular focus on astronomy and astrophysics majors. The class pre-requisites are "Upper-division standing, and one of the following: Physics 301 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: if have not taken these courses, **it is your responsibility to contact the professor or TA during the first week AND to make sure that you develop the required background knowledge by covering the [astronomy background pre-requisite reading](#) by the second week of class.**
- **Course Description:** Astronomy 358, "Galaxies and the Universe" is an upper division course designed for majors in the physical sciences. It addresses the properties, contents, origin, and evolution of galaxies; their interaction and mass

assembly history; the properties of their central black holes and starbursts; and the characteristics of the early Universe. The emphasis will be on using the laws of physics to interpret observations and understand how galaxies form and evolve. I will also discuss some of the current/upcoming exciting science from observations conducted or planned with current/next-generation telescopes. We will explore the evolution of galaxies over a wide range of epochs, from the present-day out to epochs when the Universe was a mere few percent of its present age. This class may be counted toward the quantitative reasoning flag requirement.

- **Course Calendar:** The [course outline/calendar](#) provides an approximate sequencing of topics to be covered in class. There may be schedule adjustments based on the learning curve of the class and circumstances tied to the pandemic. The course outline will be updated regularly and the most current version can be found on the class website at the above link.

Note that as outlined in the [Memo to Undergraduate Astronomy Students regarding Astronomy Courses](#), the professor is a professional astronomer and researcher who has professional responsibilities and may be occasionally be away for reasons tied to these responsibilities (e.g., to participate in international scientific panels and meetings, to present research talks at conferences, etc). In such cases, there may be a schedule change and an appropriate replacement lecture or other assignment will be scheduled.

- **Textbook for Complementary Reading:** The lectures will include material drawn from a wide range of textbooks, as well as from published cutting-edge research results that have not yet made it to standard textbooks. When using textbooks for complementary reading, you can use the book's appendix to locate specific sub-topics covered in a given lecture. These sub-topics are often spread across several chapters in the books, so there is no one-to-one correspondence between the class lectures and the book chapters.

The main book I recommend for complementary reading is "Extragalactic Astronomy and Cosmology" (EAC) by Peter Schneider (Publisher: Springer, copyright 2006). Several desk copies of the textbook are on reserve for this class in the PMA library (on the 4th floor of PMA). However, this class is being held in web-based mode due to the COVID-19 pandemic and we do not recommend going to the campus library. As a UT student, you can also access a free electronic copy by going to the [UT library catalog link](#) and entering the book title. The UT PMA librarian indicates that students can download and print from this Springer book as the PDF files are digital rights management-free. If you want to purchase a hardcopy or electronic copy, please consider the purchase options below or contact local bookstores:

- [Google eBooks](#)
- [Amazon \(Kindle + Hardcopy\)](#)

- [Springer \(Hardcopy + Electronic preview\)](#)

Below are some books for additional reading. You can obtain online copies from the above [UT library catalog link](#).

- "Galactic Astronomy" (GA) by Binney and Merrifield (Publisher: Princeton University Press, copyright 1998),
- "Galaxies in the Universe: An Introduction", by Sparke & Gallagher (Publisher: Cambridge University Press, copyright 2000)
- **Course Assignments and Grade:** While this class is being held in web-based mode, please submit your assignments on [Canvas](#) using the [instructions provided](#) unless otherwise indicated. Your grades will be posted online on [Canvas](#). I strongly recommend that you attend classes as the assignments are primarily based on the lectures. The final grade will consist of:
 - 45% Homeworks
 - 20% Midterm exam
 - 20% End-of-term exam
 - 15% In-class attendance, participation and activities (e.g., quizzes, talks) or equivalent

When converting your final numerical scores to letter grades, I will use the scheme below or one that is more lenient.

Letter Grade	Grade Points	Numerical Score
A	4.00	91% to 100%
A-	3.67	86% to 90%
B+	3.33	81% to 85%
B	3.00	76% to 80%
B-	2.67	71% to 75%
C+	2.33	66% to 70%
C	2.00	61% to 65%
C-	1.67	56% to 60%
D+	1.33	51% to 55%
D	1.00	46% to 50%
D-	0.67	41% to 45%
F	0.00	0% to 40%

- **Class and University Policies**
 - 1) We are in the midst of an unprecedented pandemic that is adding challenges to our learning, teaching, and research activities. **We are all in this together and we will make it through this together. It is important that we all show extra compassion, empathy, and patience toward each other in these trying times.** All students in this class: please know that we (the professor and teaching assistant of this class) are there to support you in every way we can. We understand that different students may face widely different

challenges during a pandemic. Please do not hesitate to reach out to [Professor Shardha Jogee](#) (Email: sj@astro.as.utexas.edu) if you are having difficulties. UT COVID-19 resources for students can be found [here](#)

- 2) **You All Belong Here:** A climate conducive to learning and creating knowledge is the right of every person in our community. As per [UT Austin policy](#), we are committed to providing an educational and working environment that is free of unlawful discrimination, including discrimination on the basis of race, color, religion, national origin, sex, pregnancy, age, disability, citizenship, veteran status, and genetic information. If you have any concerns, please contact me and when appropriate, please report to UT contacts on [nondiscrimination-policy](#) or [sexual harassment and misconduct](#).
- 3) Please turn off your cell phone before the start of class unless you are using it to zoom into the class. I request that you please attend class in synchronous mode (i.e., at the time it is offered) so that you can benefit from in-class discussions or activities and get the most out of this course. **During the zoom class and breakout discussions, we require all students to turn their zoom camera on** and we will take online attendance from the participants list. If you cannot attend the class synchronously or have your camera on, please email me to explain your situation and we will see what we can do to support you.
- 4) If you have to miss a lecture, please email the TA and professor with a valid reason and present some official supporting document (e.g., a doctor's note for medical absences or a note from an academic administrator if your absence is related to participation in official UT events). It is your responsibility to catch up on missing material by getting the lecture notes from your classmates or from the class [repository](#).
- 5) As per [UT Austin policy](#) a student who misses classes or other required activities, including examinations, for the observance of a religious holy day should inform the instructor as far in advance of the absence as possible so that arrangements can be made to complete an assignment within a reasonable period after the absence.
- 6) Students with disabilities may request appropriate academic accommodations from the [UT Austin Services for Students with Disabilities](#).
- 7) Late homeworks will be accepted for partial credit only **if you have been granted an extension prior to the due date**. Requests for correction or re-grade of an assignment (homework, exam or quiz) will be accepted at latest two weeks after it is handed back to you.
- 8) You are encouraged to study with other students, but you must write up your own homework, exams, and quizzes. Cheating will be severely punished: if you copy someone's assignment, quiz, or exam or if you let someone copy yours, both of you will receive zero credit, and I will consider filing a report to the [Office of the Dean of Students](#).
- 9) There will be no final comprehensive exam. There will be makeup exams only for students having a valid excuse and an official note from UT for the

specific date and time of the missed exam. Makeup exams may be based on any part of the course.

- 10) Please contact the [Behavior Concerns and COVID-19 Advice Line \(BCCAL\)](#) (phone: 512-232-5050) to address concerns about COVID-19 or another individual's behavior.

- **Academic Integrity and the University Code of Conduct:** A fundamental principle for any educational institution, academic integrity is highly valued and seriously regarded at The University of Texas at Austin. More specifically, you and other students are expected to maintain absolute integrity and a high standard of individual honor in scholastic work undertaken at the University.

The University Honor Code states: "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." Academic dishonesty includes cheating, plagiarism, unauthorized collaboration, falsifying academic records, misrepresenting facts, multiple submissions, and any other acts or attempted acts that violate the basic standard of academic integrity. Consequences of academic dishonesty can be severe. Grade-related penalties are routinely assessed but students can also be suspended or even permanently expelled from the University for scholastic dishonesty. Other potential consequences can be particularly far-reaching, such as the creation of a disciplinary record that may very well impact future opportunities. Furthermore, incidents of scholastic dishonesty diminish the overall value of scholastic achievements on this campus and reflect poorly on the University. Helpful resources:

- [Office of the Dean of Students](#)
- [Guide to Avoiding Plagiarism](#)

Selected Material from Lectures/Assignments

The repository below will be updated throughout the semester with important class materials (e.g., a description of some of the prerequisite materials you need to know; video recordings of zoom lectures; pdf versions of powerpoint presentations made during the lecture; scans of materials that would usually be handwritten on the blackboard or document camera; homeworks and other assignments). However, I strongly recommend that you do not only rely on this posted material and do your best to attend class in synchronous mode (i.e., at the time it is offered) so that you can benefit from in-class discussions or activities and get the most out of this course.

- **Astronomy Prerequisite material that you need to know (covered in AST 307/352K)**
 - [List of topics to review and example questions to study](#) and [figures and plots illustrating the key concepts](#)
 - [Essential background material, including:](#)
 - Electromagnetic Radiation; Radiative Transfer; Blackbody Radiation; The Magnitude Scale.
 - Properties of Stars; HR Diagram ; Structure, Evolution and Death of Stars.

These extracts are based on Appendix A-C of "Extragalactic Astronomy and Cosmology"(EAC)by Peter Schneider (Publisher: Spinger, copyright 2006)]
 - Due to past delays from suppliers selling the primary course textbook "Extragalactic Astronomy and Cosmology" (EAC) by Peter Schneider (Publisher: Spinger, copyright 2006) on time, we are providing the scanned versions of first few chapters:
 - [Chapter 1](#)
 - [Chapter 2](#)
 - [Chapter 3](#)
 - [Course Syllabus](#)
-

Extra Class Resources

Useful Links

- [NED \(NASA/IPAC Extragalactic Database\)](#) (with links to images and catalogs, such as RC3, ESO, UGC)
 - [Notes](#) on how to convert coded revised Hubble types in RC3
 - [Original table from RC2](#) on how to convert coded revised Hubble types in RC3
- [Atlas of Peculiar Galaxies](#) (Halton Arp, 1966; Images and data on 338 peculiar galaxies).
- [References for Handbooks of Mathematical Functions](#)

Journal Articles and Popular Articles

- [NASA ADS Abstract Services](#)
 - [Astrophysics Preprint server](#)
 - [CNN Space](#)
 - [NY Times Science](#)
 - [BBC Science](#)
 - [Sky and Telescope](#)
-