



ASTR 503 – Galactic Astronomy Spring 2015 COURSE SYLLABUS

WHO I AM

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Course Location and Time: Science 122, TR 11:00-12:15

WHAT THIS COURSE IS ABOUT

Course Description:

Observations of galaxies provide much of the key evidence supporting the current paradigms of cosmology, from the Big Bang through formation of large-scale structure and the evolution of stellar environments over cosmological history. In this course, we will explore the phenomenology of galaxies, primarily through observational support of underlying astrophysical theory.

Student Learning Outcomes:

1. You will calculate properties of galaxies and stellar systems given quantitative observations, and vice-versa.
2. You will be able to categorize galactic systems and their components.
3. You will be able to interpret observations of galaxies within a framework of galactic and stellar evolution.
4. You will prepare written and oral summaries of both current and fundamental peer-reviewed articles on galactic astronomy for your peers.

WHAT YOU ABSOLUTELY NEED

Materials – Textbooks, Software and Additional Reading:

Required:

- [Galactic Astronomy](#), Binney & Merrifield 1998 (Princeton University Press: Princeton)
- Access to a desktop or laptop computer on which you can install software, read PDF files, compile code, and access the internet.

Recommended:

- [Allen's Astrophysical Quantities](#), 4th Edition, Arthur Cox, 2000 (Springer)

Course Prerequisites: Advanced undergraduate classical dynamics (equivalent of Phys 411) or Phys 511.

HOW THE COURSE WILL WORK

Instructional Methods / Activities / Assessments

Assigned Readings

There is far too much material in the text for us to cover every single topic in class. For this reason, I will assign reading often. To encourage you to complete the readings, simple written assignments will accompany reading assignments and be due before lecture. These written assignments are graded based on whether you address each topic thoughtfully.

Participation

Research into how people learn shows that the best learning comes from interaction. Simply reading material and listening to me drone on won't help you learn anything useful. I therefore will require you to participate actively in the course.

Participation will come in many guises, including in-class discussions, problem-solving exercises and in-class presentations. I expect you not only to attend class, but to contribute thoughtfully to these activities. If you have not done the required reading, you will find this difficult.

For each class in which you attend and are an active participant, you will receive one participation at the point. Your participation grade will be based on the fraction of participation points which you earned.

Absences will be excused on a case-by-case basis.

Homework

Homework will be assigned weekly. These homework sets will consist of qualitative and quantitative questions. Many of these questions will require you to synthesize multiple topics in order to get the correct answer, and some will be quite difficult.

Homework grades will be based not just on correct answers, but also on the thought process behind each answer – rather than turning in pages of manipulations of a formula, do you also describe your overall strategy and your individual steps such that someone who does not know the question can follow what you are doing? This is an important aspect of the scientific method – documenting your thoughts and process so that others can replicate your results.

Due dates for individual assignments will be given with each assignment. Late assignments will be penalized by 10% per day late.

Collaboration is a crucial skill in the sciences, and so I encourage you to work together on homework sets, including strategies of attacking a problem and mathematics. When you work together, it is incumbent on each of you to make sure that you personally understand where these strategies and solutions come from, and what their implications are. This means that you should each turn in your own work, and not simply copy from the person who thinks they got the correct answer! The following are considered cheating and will not be tolerated: Searching for answers on

the internet, obtaining copies of solutions to homework questions (whether from past students, online, or other sources), directly copying another student's work, etc. See the section on "Academic Integrity" below for full details.

Presentations:

At least three times during the course you will be assigned to read a peer-reviewed article to present to the class as a 15-minute talk. These articles will be important papers chosen from past and present astrophysical literature to highlight the development and current state of some of the topics we cover in the course. The goals of these presentations are three-fold: to hone your skills of reading astrophysical research papers, to give you practice in presenting astrophysical research in front of an audience, and to introduce you to seminal papers which any galactic astronomer worth their salt has read.

You will always be given at least one week's lead time on a presentation you will make; all students should read each paper and be prepared to discuss the paper following the presentation.

Literature Review:

You will be required to peruse astronomical literature (both specific articles and new articles) several times a week. To encourage you to do this, you will need to complete a short review of the papers you read. Additional instructions will be provided presently.

Grading

Grading will be done on an absolute scale with no competition. If you all earn an A, you all get an A. I may "curve" grades for specific assignments at my discretion, but your percentage earned will never go down if I apply such a curve.

There will be no extra credit available.

Grading is weighted by assignment using the following weights:

Assigned Readings	5%
Participation	15%
Homework	30%
Presentations	30%
Literature Review	20%

The grading scale is:

90% to 100%	A
80% to 89.9%	B
70% to 79.9%	C
60% to 69.9%	D
Below 60%	F

TECHNOLOGY YOU WILL NEED

The science of astrophysics is heavily reliant on technology, and you will be expected to make use of computers and the internet as an integral part of this course. You need to be comfortable with basic computing skills and web browsing, and to be able to access and learn to use new tools and web-

based materials. Some programming and scripting will also be required for certain homework; you may use whatever programming language you are comfortable with.

You will need the following technologies and software to be successful in this course:

- High-speed Internet access/connection
- Access to a computer (Windows or Mac okay) on which you can install and create software
- Software to read PDF files (such as Acroread or Preview)

Additionally, the following hardware and software are necessary to use LearningStudio (eCollege):

- Our campus is optimized to work in a Microsoft Windows environment. This means our courses work best if you are using a Windows operating system (XP or newer) and Internet Explorer (6.0, 7.0 and 9.0).
- LearningStudio (eCollege) claims to support Mac OS X and iPads (iOS 5.1 or later with some features disabled), as well as the Safari browser (on Macs) and Firefox and Chrome on Windows machines. Be advised that there are often problems, especially after a software update.
- I strongly recommend that you check that your computer and browser are compatible with LearningStudio (eCollege) by performing a "Browser Test" prior to the start of your course. To launch a browser test, login in to LearningStudio (eCollege), click on the 'myCourses' tab, and then select the "Browser Test" link under Support Services.

HOW TO GET STARTED AND ACCESS CLASS HANDOUTS

Class Handouts

Class materials such as copies of PowerPoint slides and electronic versions of handouts will be made available through LearningStudio (eCollege), the Learning Management System used by Texas A&M University - Commerce. To access these materials, go to: To access these materials, go to: <https://leo.tamuc.edu/Login.aspx>. You will need your CWID and password to log in. If you do not know your CWID or have forgotten your password, contact Technology Services at 903-468-6000 or helpdesk@tamuc.edu.

HELP!!!!

Are you lost, confused, or worried?

First, **DON'T PANIC!**

Next, step back and try and pinpoint the source of your confusion:

- Have you read the text or other assigned readings? If not, go read them! If you have, maybe you need to try a different reading methods. Advanced science textbooks and scientific journal articles are dense and often difficult to follow. Here are some websites with suggestions on how to read science textbooks; similar tactics are effective for advanced texts and journal articles:
 - How to Read Effectively in the Sciences: <http://academic.cuesta.edu/acasupp/AS/621.htm>
 - Reading Assignments in Science: <http://www.studygs.net/science/readingtexts.htm>
 - The SQ4R Method for Reading: <http://scs.tamu.edu/?q=node/105>
- Do you just need some time away? Our material will be too much to deal with all at once. Work on the assignment over the week and give your brain some time to absorb and mull over the information. In particular, homework assignments are best

completed a bit at a time. If you try to do the entire assignment at once, you will be tired, frustrated, and you will probably not get the best grades.

- If after all of this you are still confused or uncertain, it's time to seek help. Don't wait until the night before the exam! Here you have many options:
 - Talk to your classmates! Use the student lounge or email to solicit help.
 - Attend my office hours. Make an appointment with me if none of the "official" times work.

Are you experiencing technical difficulties?

If your problems are with LearningStudio (eCollege):

Texas A&M University-Commerce provides students technical support in the use of LearningStudio (eCollege). The student help desk may be reached by the following means 24 hours a day, seven days a week.

- **Chat Support:** Click on 'Live Support' on the tool bar within your course to chat with an LearningStudio (eCollege) Representative.
- **Phone:** 1-866-656-5511 (Toll Free) to speak with LearningStudio (eCollege) Technical Support Representative.
- **Email:** helpdesk@online.tamuc.org to initiate a support request with LearningStudio (eCollege) Technical Support Representative.
- **Help:** Click on the 'Help' button on the toolbar for information regarding working with LearningStudio (eCollege) (i.e. How to submit to dropbox, How to post to discussions etc...)
- **Please don't contact me** for LearningStudio (eCollege) problems. I'll just tell you to take the above steps.

HOW TO CONTACT ME AND STAY CONNECTED

Interaction with Instructor

Email: I can be reached by email at Kurtis.Williams@tamuc.edu. Please put "ASTR 5330" in your email subject header. It may take me up to 24 hours to send you a response (48 hours on the weekend or holidays). If you don't hear back from me in that time, please send another email or give me a call. I assume you check your campus email daily, so if I send out a class email, I'll assume you read it.

Texts and Automated Emails: I have set up an SMS (text and/or email) account for brief messages (like reminders of due dates and updates on class events). I assume you will sign up for this service. To register for text (SMS) updates, text "astr503" (without quotes) to 81010. The service is free, but any standard messaging fees charged by your mobile provider will apply. To get emails instead of texts, go to the following link: <https://www.remind.com/join/astr503>. The service is also private: nobody (including myself) will see your phone number or email, and only I can send messages.

Office Hours: Office hours are times that I set aside when I promise to be in my office so that you can come by and talk to me. During office hours, you can ask questions about the course material, ask about homework, see your current grade, or ask other questions about the class or astronomy in general. Office hours work best if you have your text, class notes, and course work with you.

It's important to realize that office hours are *not* just for students who are having problems in the course. If you are uncertain about anything, please visit, email, phone or drop into virtual

hours before your small problems grow into big ones. If you are worried about what might be on the test, stop in. If you are curious about astronomy jobs and research opportunities, come by.

If you want to talk but cannot come during office hours, please contact me by email in order to set up an individual appointment. By setting an appointment, you both guarantee that I will be in my office (or online) and that I will have plenty of time to talk with you. You may feel free to stop by my office any time my door is open, but if you do not have an appointment and if it is not my scheduled office hours, please understand if I'm not free to talk at that instant.

Facebook: Please don't friend me on Facebook during the semester; my feed is mainly cat videos and reminiscing on the 1980s and 1990s anyway.

Netiquette

I expect all students to behave to basic standards of etiquette both in real life on the web. Abusive or inappropriate comments will be removed and earn a reprimand (or more, depending on the infraction); any additional lapses could result in disciplinary action. For a simple guide to netiquette, see <http://www.albion.com/netiquette/corerules.html>

RULES, RULES, RULES (UNIVERSITY POLICIES)

Academic integrity

A major goal of this and most every university course is for you to learn and appreciate subject material. Academic dishonesty ("cheating") actively prevents you from achieving this goal. Academic dishonesty is taken seriously by the University and by me, and **will not be tolerated**. (See the TAMU-C Code of Student Conduct and the TAMU-C Procedures A 13.04, 13.12, 13.31, and 13.32.)

This conduct is not only considered wrong in this course and at this University, but also in the real world. Engaging in these activities will get you fired from a job and prevent you from getting another job.

Unethical student conduct includes:

- **Plagiarism**, or copying the words of others with the intent of making it look like your own. Whether you use someone else's phrase word for word, or whether you try and change a few words, or even if you just borrow someone else's original idea and don't give them credit, that's unethical. Use your own words whenever possible, give credit to wherever you got an idea, and put direct quotes inside quotation marks.
- **Cheating** involves trying to trick me or others into thinking you did work that you really didn't do, or into thinking you know what you really don't know. This can include stealing exams, changing your answers on a graded exam or assignment and claiming it was graded wrongly, putting your name on someone else's homework, and so on.
 - **Searching the Internet and simply cutting/pasting the text you find is considered cheating.** Searching the Internet for help on a topic is okay. For example, suppose a question asks "Verify that the quantity Q in Equation 3.69 is reddening-independent." Typing that phrase into Google and cutting and pasting the text in the answer box is considered cheating. Typing "photometric index Q reddening independence" into Google, reading a few

web pages, and summarizing the information in your own words is not cheating.

- *Borrowing a previous student's homework, exams, or solution sets is considered cheating.* "Borrowing" includes looking at someone's submitted homework, screen shots, stealing returned homeworks, and so on.
- **Collusion** is working with another person to cheat. This can include copying someone else's answers to an exam or assignment, doing work for another student, buying or otherwise obtaining homework/exam solutions from any source online or off-line, or any other instance of multiple people engaging in some form of cheating or dishonesty. ***Working with other students on an assignment is fine and encourage as long as everyone contributes and each student does their own work.***
- **Any other activity that, to a reasonable person, looks wrong.** If you have any doubt whatsoever whether a certain action is considered dishonest, please ask me *before* engaging in the activity. There is no need to be embarrassed about asking, and I won't penalize you for asking! In this class, if you follow the maxim "it's easier to beg forgiveness than to ask permission", don't expect forgiveness to be forthcoming.

If you engage in academic dishonesty during any graded activity, you will receive no credit for that activity. More than one instance of dishonesty by a student will result in automatic failure of the course and referral of the student for disciplinary action.

For further information, search the Texas A&M-Commerce website for "academic integrity policy".

LearningStudio (eCollege) provides me with tools that check for common forms of online cheating and collusion. These include, but aren't limited to: time stamps, location stamps, and automated comparison of essay answers. I will use these tools.

Administrative Withdrawal

Although I have the right to drop you for excessive absences, I won't do so. You have a right to get an F if you decide to quit working but don't withdraw.

Assignment Policy and Due Dates

All assignments will be posted at least one week before they are due. Assignments and due dates will be posted in the main page for each unit. Submission requirements for each assignment will also be given on that page.

Dropping The Course

A student may drop this course by logging into their myLEO account and clicking on the hyperlink labeled 'Drop a class' from among the choices found under the myLEO section of the Web page.

Incompletes

I only offer incompletes in extraordinary circumstances. Any student interested in an incomplete should contact me as soon as possible after the situation arises, and should keep in mind that I am not required to give you an incomplete and so may not offer you the opportunity. You should also know that you only have access to an LearningStudio (eCollege) course for two weeks following the final day of term.

Late Work

Late assignments are penalized 10% for each day late.

University Specific Procedures

ADA Statement

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you have a disability requiring an accommodation, please contact:

**Office of Student Disability Resources and Services
Texas A&M University-Commerce**

Gee Library

Room 132

Phone (903) 886-5150 or (903) 886-5835

Fax (903) 468-8148

StudentDisabilityServices@tamuc.edu

Student Conduct

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. (See *Code of Student Conduct from Student Guide Handbook*).

Nondiscrimination Affirmation

Texas A&M University-Commerce will comply in the classroom and in online courses with all federal and state laws prohibiting discrimination and related retaliation on the basis of race, color, religion, sex, national origin, disability, age, genetic information or veteran status. Further, an environment free from discrimination on the basis of sexual orientation, gender identity, or gender expression will be maintained.

COURSE OUTLINE / CALENDAR

The course will cover many of the topics outlined below. The dates below may change (never earlier, but possibly later) so pay attention to announcements in class for precise dates.

- *Week 1*: Introductions
 - Read Chapter 1 Galaxies: an overview
 - No homework assignment
- *Week 2*: Positions, motions, and distances
 - Read Chapter 2 Sections 2.1 and 2.2
 - Homework #1 assigned
 - First student presentations assigned
- *Week 3*: Magnitudes, colors, and reddening
 - Read Chapter 2 Section 2.3 and Chapter 3 Section 3.7
 - Homework #1 due
 - Homework #2 assigned
 - Student presentations begin
- *Week 4*: Properties of stars: Masses, radii, and spectral classification
 - Read Chapter 3, Sections 3.1–3.4

- Homework #2 due
 - Homework #3 assigned
- *Week 5:* Properties of stars: Color-magnitude diagrams and luminosity functions
 - Read Chapter 3, Sections 3.5 and 3.6
 - Homework #3 due
 - Homework #4 assigned
- *Week 6:* Galaxy morphology and photometry
 - Read Chapter 4, Sections 4.1–4.4
 - Homework #4 due
 - Homework #5 assigned
- *Week 7:* Stellar evolution, nucleosynthesis, and chemical evolution
 - Read Chapter 5
 - Homework #5 due
 - Homework #6 assigned
- *Week 8:* The cosmic distance scale: distance estimators
 - Read Chapter 7, sections 7.1–7.3
 - Homework #6 due
 - Homework #7 assigned
- *Week 9:* The cosmic distance scale: Results
 - Read Chapter 7, section 7.4
 - Homework #7 due
 - Homework #8 assigned
- *Week 10:* The interstellar medium
 - Read Chapter 8
 - Homework #8 due
 - Homework #9 assigned
- *Week 11:* The bulge and disk of the Milky Way
 - Read Chapter 10, sections 10.1-10.4
 - Homework #9 due
 - Homework #10 assigned
- *Week 12:* The galactic halo and the formation and evolution of the Milky Way
 - Read Chapter 10, sections 10.5-10.7
 - Homework #10 due
 - Homework #11 assigned
- *Week 13:* A ridiculously short introduction to stellar and galactic kinematics
 - Read Chapter 11
 - Read selections from Binney & Tremaine [Galactic Dynamics](#)
 - Homework #11 due
 - Homework #12 assigned
- *Week 14:* Galaxy interactions and AGN
 - Read Chapter 4, section 4.6
 - Read selections from Binney & Tremaine [Galactic Dynamics](#)
 - Homework #12 due
 - Homework #13 assigned
- *Week 15:* Star clusters
 - Read Chapter 6
 - Homework #13 due
 - Homework #14 assigned (due on day of final exam)