

Astronomy 1303: Stars and Galaxies
Summer 2024 Syllabus

Lecture

Meeting Times: — Location: Web

Instructor: Anirban Bhattacharjee

Email: anirbanbhattacharjee@gmail.com — axb14ku@sulross.edu

Office Hours: By appointment

Ph No: +13073997657

Course Description:

ASTRO 1303 is an introductory course for non-science majors. It provides a broad introduction to Astronomy including: (1) daily, monthly and yearly patterns in the sky; (2) basic physics of gravity, light, and atoms; (3) stars and stellar evolution; (4) formation of the solar system; (5) galaxies, cosmology, and the evolution of the Universe; and (6) the fundamental tenets of science and the scientific process. The goal of this course is to cover most of the areas of modern astronomy at a level which requires only basic mathematics.

Resources:

Required:

Astronomy Notes (AN) by Nick Strobel (<http://www.astronomynotes.com>)

<https://openstax.org/details/books/astronomy>

– Online textbook for pedagogical development of concepts

Occasionally, you will need a calculator in class. A basic scientific calculator will work well.

Various Wikipedia Articles (WA)

– Supplemental reading for additional declarative knowledge

Loose-leaf paper – for in-class assignments

Optional:

”Universe” (w/ Starry Night Enthusiast CD-ROM) (UN) by Roger Freedman & William Kaufmann III, 8th ed.(9th edition is ok too)

Course Objectives:

We will follow the guidelines set forth by the American Astronomical Society, the National Science Education Standards, the American Association for the Advancement of Science, and the in-class survey. The goals for this class are as follows:

- Appreciate the scientific process, how it works, the notion that physical laws are universal, the elements of scientific theories, what they do and do not tell us.
- Develop familiarity with the night sky and how its appearance changes with time and position on Earth.
- Describe how data is collected from astronomical objects, and what quantities can be measured/inferred.
- Understand basic - yet crucial - physical laws, and the processes that govern astronomical quantities.
- Integrate concepts from related subjects to explain relationships (e.g., physics and math) between astronomical quantities.
- Infer the nature, structure and evolution of the Universe, and objects therein.

Instructional Philosophy of the Course:

The overarching goals of this course are for you to understand the nature of science through the eyes of astronomy; to understand the big ideas in astronomy; and to develop a lifelong interest in astronomy and current events surrounding astronomy. To meet these three goals, the course instructors have carefully designed a sequence of learning tasks and assessment procedures as outlined below.

– – To get the best out of this course, if you are having problems with understanding the course material, is by emailing me or texting me through a free messenger service called WhatsApp or iMessage. PLEASE DO NOT TEXT ME DIRECTLY, I WONT BE ABLE TO RESPOND OR MIGHT NOT EVEN RECEIVE YOUR MESSAGE -*Carefully studying the text is REQUIRED.* The course mini-lectures are designed to focus on the really difficult aspects of astronomy or to provide structure for your out-of-class study. You are accountable for all material, concepts, and interrelationships presented in the mini-lectures and the text. Reading assignments should be completed BEFORE the date listed. Otherwise, the mini-lectures and tutorials will be less useful in helping you develop a deep understanding of the course topics. It is important to remember that the exams or questionnaires will cover material from the text readings that may or may not be discussed in class.

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Assessment and Grading:

In order to promote an active and collaborative learning environment, there will be no curve to assess grades. Each student will only be competing against themselves, and will be responsible for gaining the declarative knowledge and conceptual understanding for performance. This is a three credit class with three credits in the primary lecture section (§1) and one credit from the accompanying lab section. The portion of the grade in the lecture section will come from four sources: (1) Exams and (2) HWs and Quizzes . Midterm exams will account for 25% of the final grade. There will be three midterm exams. The top two will count toward the grade (12.5% each) and **the lowest score will be dropped**. Final exam will will account for 25% of the grade. HWs will account for 50%. Extra credit is provided for meeting with me over Zoom.

		Grading Scheme	
Total points		Total Points	Grade
	$+0.5 \times (\text{Midterm Total})$	85–100	A
	$+0.5 \times (\# \text{ HW and quizzes})$	75–84.999...	B
		65–74.999...	C
		55–64.999...	D
		below 54.999...	F

From the total points, letter grades will be assigned according to the table on the right. There will be no plus or minus grades assigned.

My favorite color is lavender blue.

Students with disabilities: If you require any special accommodations to participate in the class or complete assignments, please contact the instructor as soon as possible.

Students enrolled in distance education courses have equal access to the university's academic support services, such as library resources, online databases, and instructional technology support. For more information about accessing these resources, visit the SRSU website. Students should correspond using Sul Ross email accounts and submit online assignments through Blackboard, which requires secure login. Students enrolled in distance education courses at Sul Ross are expected to adhere to all policies pertaining to academic honesty and appropriate student conduct, as described in the student handbook. Students in web-based courses must maintain appropriate equipment and software, according to the needs and requirements of the course, as outlined on the SRSU website. Directions for filing a student complaint are located in the student handbook.

Academic Honesty:

University Student Conduct and Discipline defines Academic Dishonesty:

"The University expects all students to engage in all academic pursuits in a manner that is beyond reproach and to maintain complete honesty and integrity in the academic experiences

both in and out of their classroom. The University may initiate disciplinary proceedings against a student accused of any form of academic dishonesty, including but not limited to, cheating on an examination or other academic work, plagiarism, collusion, and the abuse of resource materials. 1. Cheating includes:

- a. Copying from another student's test paper, laboratory report, other report, or computer files, data listings, and/or programs, or allowing another student to copy from same.
- b. Using, during a test, materials not authorized by the person giving the test.
- c. Collaborating, without authorization, with another person during an examination or in preparing academic work.
- d. Knowingly, and without authorization, using, buying, selling, stealing, transporting, soliciting, copying, or possessing, in whole or in part, the contents of an unadministered test.
- e. Substituting for another student; permitting any other person, or otherwise assisting any other person to substitute for oneself or for another student in the taking of an examination or test or the preparation of academic work to be submitted for academic credit.
- f. Bribing another person to obtain an unadministered test or information about an unadministered test.
- g. Purchasing, or otherwise acquiring and submitting as one's own work any research paper or other writing assignment prepared by an individual or firm. This section does not apply to the typing of the rough and/or final versions of an assignment by a professional typist.
- h. "Plagiarism" means the appropriation and the unacknowledged incorporation of another's work or idea in one's own written work offered for credit.
- i. "Collusion" means the unauthorized collaboration with another person in preparing written work offered for credit.
- j. "Abuse of resource materials" means the mutilation, destruction, concealment, theft or alteration of materials provided to assist students in the mastery of course materials.
- k. "Academic work" means the preparation of an essay, dissertation, thesis, report, problem, assignment, or other project that the student submits as a course requirement or for a grade.
- l. "Falsification of Data" means the representation, claim, or use of research, data, statistics, records, files, results, or information that is falsified, fabricated, fraudulently altered, or otherwise misappropriated or misrepresented.

Procedures for discipline due to academic dishonesty shall be the same as in other disciplinary actions, except that all academic dishonesty cases shall be first considered and reviewed by the

faculty member. If, after reviewing the case, the faculty member believes that disciplinary action is necessary, he/she may recommend a penalty but must notify the student of his/her right to appeal to the academic department chair and, eventually, to the dean before imposition of the penalty. If the student does not accept the decision of the academic department chair or dean, the student may then follow the normal disciplinary procedures. No disciplinary action shall become effective against the student until the student has received substantive and procedural due process except as provided under Interim Disciplinary Action.

In addition, during the course of the semester, each student will be asked to carry out exercises in collaboration with other students. To nurture such an environment, we will consider any disruptive or disrespectful acts (such talking on a cell phone, or texting during class) to be a form of cheating. We consider academic dishonesty to be a serious offense and the maximum punishments allowed will be pursued in all scenarios. This includes completing any quizzes, or scantron forms with the help of another student or for scantron forms completed by another student who is not you. If similar work is submitted, all parties involved will receive a zero for their assignment. Make your work your own, be original. Good luck and enjoy your semester!

Tentative Schedule of Topics, Assignments, and Exams

Date	Topic/Assignments
Week 1	
	Introductions, Astronomy Survey, Pre-assessment, Office Hours, Tour of Universe Discussion of Syllabus, Popsicles, Day-to-day class structure Watch <i>Cosmic Voyage</i> : https://www.youtube.com/watch?v=qxXf7AJZ73A AN: Math Review, Section 3 — http://www.astronomynotes.com/mathrev/s3.htm AN: Chapter 1, all sections — http://www.astronomynotes.com/chapter1/ WA: http://en.wikipedia.org/wiki/Scientific_notation WA: http://en.wikipedia.org/wiki/Names_of_large_numbers LT: Sun size (105-107), Milky Way Scales (123-125)
Week 2 – Patterns in the Sky	
	AN: Chapter 3, all sections EXCEPT Angles, Coordinates, Planetary Motions AN: – http://www.astronomynotes.com/nakedeye/chindex.htm WA: http://en.wikipedia.org/wiki/Celestial_sphere WA: http://en.wikipedia.org/wiki/Circumpolar_star
9/8	LT: Position, Motion LT: Seasonal Stars
	WA: http://en.wikipedia.org/wiki/Sidereal_day (“Sidereal time and solar time” section only)
9/13	LT: Solar vs. Sidereal Day, Ecliptic WA: http://en.wikipedia.org/wiki/Moon_phases LT: The Cause of Moon Phases, Predicting Moon Phases LT: Path of the Sun
	WA: http://en.wikipedia.org/wiki/Seasons LT: Seasons AN: Chapter 4, section on Kepler’s Laws of Planetary Motion AN: – http://www.astronomynotes.com/history/s7.htm#A5 LT: Kepler’s Second Law LT: Kepler’s Third Law
Week 3 – Gravity, Light, Midterm Exam	
	AN: Chapter 5, all sections – http://www.astronomynotes.com/gravappl/chindex.htm (AN: Chapter 6, all sections – http://www.astronomynotes.com/relativity/chindex.htm)

Date	Topic/Assignments
	LT: Newton's Laws and Gravity Review Session Midterm Exam 1 – Scales, Patterns in the Sky, Gravity
	AN: Chapter 11, section 4 only – http://www.astronomynotes.com/starprop/s4.htm WA: http://en.wikipedia.org/wiki/Magnitude_(astronomy) WA: http://en.wikipedia.org/wiki/Apparent_magnitude WA: http://en.wikipedia.org/wiki/Absolute_magnitude (Introduction and prologue to WA: Stars and Galaxies sections only) LT: Apparent and Absolute Magnitudes of Stars AN: Chapter 7, sections 1–3 – http://www.astronomynotes.com/light/chindex.htm LT: Electromagnetic Spectrum of Light LT: Telescopes and Earth's Atmosphere
	AN: Chapter 7, section 4 – http://www.astronomynotes.com/light/s4.htm LT: Blackbody Radiation LT: Types of Spectra AN: Chapter 7, sections 7–10 – http://www.astronomynotes.com/light/chindex.htm LT: Light and Atoms
	Week 4 – Nature of Light, Evolution and Structure of the Solar System, Stars, exam
	LT: Analyzing Spectra LT: Doppler Shift LT: Observing Retrograde Motion
	WA: http://en.wikipedia.org/wiki/Solar_system WA: http://en.wikipedia.org/wiki/Portal:Solar_System LT: Temperature and Formation of Our Solar System WA: http://en.wikipedia.org/wiki/Extrasolar_planets (esp. Detection Methods section) LT: Motion of Extrasolar Planets AN: Chapter 9, section 1-12 Watch “ <i>The Great Planet Debate</i> ” between Niel DeGrasse Tyson and Mark Sykes, moderated by Ira Flato
	Review Session Midterm Exam 2 – Solar System AN: Chapter 11, sections 1–11 – http://www.astronomynotes.com/starprop/chindex.htm LT: Luminosity, Temperature, and Size

Date	Topic/Assignments
Week 5 - Sun and Stars	
	AN: Chapter 11, sections 12–15 – http://www.astronomynotes.com/starprop/chindex.htm LT: H-R Diagram AN: Chapter 12, all sections – http://www.astronomynotes.com/starsun/chindex.htm LT: Star Formation and Lifetimes AN: Chapter 13, all sections – http://www.astronomynotes.com/evolutn/chindex.htm LT: Stellar Evolution
Week 6 – Stars and Milky Way, Exams	
	LT: Parallax and Distance AN: Chapter 15, all sections – http://www.astronomynotes.com/galaxy/chindex.htm LT: Galaxy Classification AN: Chapter 16, all sections – http://www.astronomynotes.com/cosmolgy/chindex.htm LT: Looking at Distance Objects
	LT: Expansion of the Universe Big Bang Dark Matter Dark Energy
Finals Week	