

Syllabus for Astronomy 152

Astronomy 152 – A Journey Through the Solar System

Fall 2018 Semester

University of Tennessee, Knoxville

Instructor: Dr. Sean Lindsay

E-mail: slindsay@utk.edu

Office: Room 215 in Nielsen Physics and Astronomy

Note that the Physics and Astronomy Main Office is Room 401 in Nielsen

Office Hours: Tuesday: 11:00 AM – 12:00 PM (or by appointment)

Wednesday: 10:30 – 11:30 AM

CRN – Section: ASTR151 – 001 CRN: 40792

Meeting Time: Monday, Wednesday, and Friday: 9:05 – 9:55 AM

Meeting Location: Nielsen Physics and Astronomy Room 415 (PHYS 415)

Teaching Assistants: *Primary:* Brandon Barker (bbarker5@vols.utk.edu)

Secondaries: Brittney Contreras (bcontrer@vols.utk.edu)

Tara Skiba (tskiba@vols.utk.edu)

Course Description

This course is an introduction to the astronomical study of stars, galaxies, and cosmology. Astronomy is the study of the universe including what it is, what it contains, and what physical principles govern it. As a general astronomy course, we will study the motions of objects in the sky; the historical foundations astronomy; the motion of the planets and stars; the general physical principles of light and how it interacts with matter; and how telescopes operate over the entire wavelength range of the electromagnetic spectrum. With a focus on the astronomical study on objects outside of our Solar System, we will cover the nature of stars; what exists between the stars; the formation, life, and death of all types of stars; exotic objects including white dwarfs, neutron stars, and black holes. We also cover the Milky Way Galaxy, the structure of galaxies, the formation of the large-scale structure in the universe, as well as cosmological issues such as the Big Bang, dark matter, dark energy, and the past, present, and projected future behavior of the universe in the light of modern astrophysics. If time allows, we will expand our study to include planets in orbit around other stars (extrasolar planets) and their planetary systems, and the basic conditions thought to be necessary for life elsewhere in the Universe. As a physical science, the study of astronomy requires mathematical analysis. However, we will keep mathematical analysis to a minimum in this course.

Course Textbook

Astronomy: At Play in the Cosmos 1st Edition by Adam Frank. (***with online SmartWork 5 registration***¹. ISBN: 978-0-393-93522-6

Available at the UT Bookstore and from online vendors. eBook purchases acceptable. If purchased from another vendor, make sure it includes online

Canvas – The Course Website

Our course website is Canvas. I will put information such as this syllabus, course announcements, supplemental materials, exam study materials, and other resources relevant to the class on Canvas. Please check the site regularly, and [enable, at a minimum, course announcements from Astronomy 151.](#)

DO NOT TRUST THE CANVAS GRADE COLUMN ENTITLED “TOTALS”. Canvas has a notoriously difficult to work with gradebook, and as such, I only report scores on Canvas. It is not possible to turn off the gradebook column “Total,” so Canvas will go ahead and calculate a grade there. THIS IS NOT YOUR COURSE GRADE. Please see my grade categories and weights listed in this syllabus for how your course grade is calculated.

Course Learning Objectives

Upon successful completion of this course, students are expected have a mastery of the following:

1. Understand the fundamental ideas of the scientific method as applied to the science of astronomy.
2. Understand how astronomers collect, analyze, and interpret information on objects beyond Earth.
3. Have an increased understanding on the nature of light and how it interacts with matter.
4. Understand the Sun and other stars, including what they are made of, and that stars’ energy source is nuclear fusion.
5. Understand the different types of stars, their life-cycles, and the origins of the elements.
6. Understand that we live in the Milky Way Galaxy, which is a spiral galaxy. Know the different types of galaxies in the context of Hubble’s Tuning Fork
7. Understand the overall structure of the Universe and the relative size scales between stars, clusters of stars, galaxies, galaxy clusters, superclusters, and the observable universe.
8. Understand our current theories on the origins and development of the universe spanning from the past to the present and to the future.

¹ ***SmartWork 5 (There is currently a grading bug with the SmartWork 5 system, so the publisher, W. W. Norton is providing access for free – homework platform only!). This means you can save money by renting or buying a used book.***

An additional, and perhaps the most important, goal of this course is my hope that through the study of astronomy in this course, students will have increased scientific literacy, appreciation for science and astronomy, and an increased public trust in science and scientists. As a technological society built upon our foundations of scientific knowledge, understanding the nature of science is critical to our culture, civilization, and future. As university educated people, we should all have a basic grasp of the amazingly rich human endeavor of science.

Course Units/Topics

Over the course of this semester, we aim to cover the following THREE major course units.

- I. **General Astronomy: Chapters 1 – 4.** *What is the study of astronomy, and how do astronomers make sense of the universe? Here we study the tenants of science; the scale and contents of the universe; celestial motions and laws; and the physics of light.*
- II. **Stars: Chapters 10 - 14:** *We begin our study of stars with the one we know the most about: The Sun. In this unit, we will understand what a star is; the energy source for stars, nuclear fusion; the life and death cycle of stars; the interstellar medium, or what exists between the stars; and exotic stars, such as neutron stars and black holes.*
- III. **Galaxies and Cosmology: Chapters 15 – 18:** *We begin our study of galaxies by first exploring the nature of our own “city of stars” called the Milky Way Galaxy. We move from our galactic home to a study of galaxies in general; what we know about dark matter and how it relates to galaxy formation and evolution; and the scale of the universe. If time allows, we end our studies this semester looking at the large-scale structure of the universe, the so-called cosmic web; and the beginnings and fate of our universe.*

Lectures

The purpose of the lectures will be to elucidate to most important aspects of the material covered in the textbook. This will be done through conventional lecturing as well as the use of on-line resources via supplemental “Parallel Lectures” [See below]. This semester, I hope to pilot a series of in-class activities focused on peer discussion, inquiry, curiosity, and scientific thinking. For now, these will be only participation/attendance graded to help me hone what is most effective and concurrently develop useful evaluation metrics.

PowerPoint Slides and PDFs of the lectures will be provided prior to the beginning of each class on Canvas. This provision is NOT meant to be a replacement for note taking or class attendance [See Attendance Policy below], but rather to increase student participation and aid in exam preparation. I **HIGHLY ENCOURAGE** the taking of handwritten notes (either on printed slides or on paper), as there is an

ever-growing body of research indicating improved retention using this method [See this [Scientific American Article](#)].

I will try my best to provide you all the resources you need to succeed in learning the basics of astronomy and becoming more versed in the language of science. The best learning resource, however, is yourself. You control your own learning, and the best way to do that is to engage in the material. To this end, I encourage you to seek out additional resources, study, ask questions, use the Canvas discussions and Google Hangouts, and most importantly have fun. We human are natural learners, why not let yourself enjoy it and have your mind blown about how amazing our universe is?

[Additional Course Resources](#)

Parallel Lectures via Crash Course Astronomy: The lectures of this course are supplemented via the online resource [Crash Course Astronomy](#). In this online short-course, Dr. Phil Plait covers introductory Astronomy. This is not a replacement for my lectures, but rather an entertaining reinforcement tool and a valuable resource. The homework and exams will cover material not included in the videos. The assignment of videos will be given at the same time as the chapter reading assignments.

Canvas Discussions: While interest and activity continue, I will continue to pose interesting questions for us to discuss on Canvas. Participation is voluntary and will not affect your grade. It is, however, encouraged as it can add an extra layer of depth to the material in this course. You are also encouraged to create discussions of your own.

Astronomy 152 Google Hangout: Based on the success of a student-created *Google Hangout* a few semesters ago, I will now create and host a hangout for this class. Look for the invite link in a Canvas announcement (make sure you have them enabled for this class). In the past, students used the hangout to help them study for quizzes and exams. The success of such a platform depends on your use. I want this to be a student driven resource, but I will chime in with extra detail from time to time. If the discussion is lively and the hangout is used often and appropriately, I will also use this platform to give hints for those that are participating.

[Homework \(15% of overall grade\)](#)

Homework in this class is done through W. W. Norton's online platform, Smartwork5, and a few Dr. Lindsay created online Canvas assignments to practice the math analysis questions in this course. *You must access Smartwork5 through this course's Canvas site, which is found under the Modules tab. DO NOT TRY TO ACCESS SMARTWORK5 DIRECTLY FROM THE W.W. NORTON WEBSITE.*

Your textbook comes with a SmartWork5 registration code, but due to a grading error that the Smartwork5 developers have been unable to yet correct, access to

Smartwork5 this semester is free. This means you can save money by renting or buying a used book.

Homework assignments are announced at the beginning of each class. The assignments are listed on the THIRD slide of the Lecture Slides. If you miss class, please check this slide for your missed assignments.

The final score for homework will be calculated as a percentage of total points earned points versus the total obtainable points. The homework score will count **15% towards the final course grade.**

Late Homework Policy: Late Homework assignments can still be completed for credit. There will be a 5% reduction per day for up to 20 days.

Advice for Homework Success: My homework assignments are designed to reinforce course concepts, and as such, similar questions will appear on the exams. I also design my homework assignments to be the easiest way for you to earn a high grade in this class, so ***make sure you do all the assignments!*** Smartwork5 is an online platform, which means it has both benefits and unfortunate detriments, specifically point deductions for incorrect guesses. The best advice I have to earning a good homework grade is to slow down and take your time with each question. Do not simply start guessing and incur the point penalties. Use my lectures and your textbook to feel confident about your answer before submitting.

Warning to Group Me, Chegg etc. Homework "Collaboration": I am well aware that Group Me & Chegg are popular platforms for students to share homework answers. Taking pictures of answered homework questions and sharing them via a social media platform is a form of cheating. While difficult to catch, I am on the lookout for it, and I will have a few anonymous "student plants" in the course who will report to me if Group Me is being used for homework cheating. If I find out this is occurring, I will reduce all offenders' maximum homework average to a maximum of 75% in the first case and apply my other standard cheating consequences [See "Honor & Statement, Collaboration, Cheating, and Plagiarism" section below. If caught more than once, I will contact the Office of Student Conduct for violations of the Student Honor Statement, and if you are not removed from the university or if I'm advised to not fail you, your homework will not count towards your final grade, and the additional 15% will be distributed amongst your three counted exams (each exam worth 25% of your overall grade).

Examinations (20% per; count 3 highest)

Exams will be done via SCANTRON forms. Forms will be provided to you at the beginning of each exam. I apologize for the inconvenience of using these forms, but with large class sizes, grading is intractable otherwise. There will be three in-class exams and on final comprehensive exam. ***I will take your three highest exam scores to calculate your final average.***

The three in-class exams will be 55 multiple choice questions. Getting 50 correct will earn you a 100%. Each correct response past 50 is worth +1% to your exam score. I will also offer additional, non-multiple-choice extra credit questions. The final exam is comprehensive, and it counts the same course percentage as the three in-class exams. It will have 90 multiple-choice questions and getting 80 correct earns a 100%. Each correct response past 80 earns you +1% to your exam score. Given equal weights, the final exam is treated the same as an in-class exam and can count as your free dropped exam (see Exam Make-Ups below)

Exam Make Ups: THERE ARE NO MAKE-UP EXAMS OFFERED FOR ANY EXCUSE.

Instead of scheduling innumerable make-up exams and answering even more emails, I have the following policy of replacing missed in-class exams with your grade on the comprehensive final.

- **Miss zero in-class exams:** You can either skip the final or take it to replace your lowest in-class exam score if you score higher on the final.
- **Miss one in-class exam:**(including the final). You can take the final to replace the grade of you missed in-class exam.
- **Miss two in-class exams:** Your final exam will replace one of the missed exams at full credit, and the second missed exam at 80% credit.
- **Miss all three in-class exams:** Your final exam will replace one of the missed exams at full credit, the second missed exam at 80% credit, and the third missed exam at 60%.

All tests are closed-book tests. During tests students are required to bring a Number 2 pencil to complete the Scantron form. You are allowed to use a calculator (CELL PHONE ARE NOT CALCULATORS). No other material whatsoever will be allowed including headphones/earbuds, smart phones, laptops, etc.,

During the test students are not allowed to communicate with anybody else, nor are they allowed to try to see the solutions of other students (the exams are scrambled, so your test will be different from your neighbors). Any violation of these exam rules will result in the student receiving a 0 (zero) on the test. A second offense will lead to a grade of F for the course and a report to the Dean of Students and the Student Conduct and Community Standards offices.

Tentative Exam Schedule*		
Test no.	Date & Time	Expected Content
1	Wednesday, 26 Sept.	Chapters 1-4
2	Monday, 29 Oct.	Chapters 10 - 13
3	Wednesday, 28 Nov.	Chapters 13 - END
<i>Final</i>	<i>Fri., 7 Dec. from 10:15 AM – 12:15 PM</i>	<i>Comprehensive (all chapters)</i>
* Exact dates subject to change if the need arises. <i>Dates in red are final</i>		

Each exam counts 20% of your final grade in the course. With my counting 3 out of 4 exams, the exams (see above Exam Make-up Policy), in total, account for 60% of your overall grade. Make sure you study for them!

Quizzes

There will be six (6) in-class quizzes throughout the semester. The purpose of these quizzes is to encourage attendance, check current levels of understanding, and help you prepare for the exams. The quizzes will be 10 question long, and they will be announced in class roughly 1 week before the quiz. However, if class attendance becomes problematic, I will start making these quizzes be pop quizzes. The reason behind this is not to torture or stress you out, but to encourage attendance. If class attendance is systematically high throughout the semester, I will not have pop quizzes.

The lowest quiz grade will be dropped.

Your Quiz Average counts for 15% of the total course grade.

Attendance

Attendance counts 10% of your final grade in the course. Student attendance will be monitored via **TEN** “Notecard Questions” asked during class throughout the semester. Every student can miss **TWO** notecard questions with no penalty applied to your final Attendance Grade. **Every notecard missed after two will negatively affect your Attendance grade in the course.** The attendance grading scale is:

NCQ = Notecard Question

# NCQs	Grade	Comment
10	100+	+2% to final average
9	100	
8	100	
7	90	
6	77.5	
5	65	
4	52.5	
3	37.5	
2	22.5	
1	10	
0	0	

Answering *all ten* notecard questions will earn you +2% to your final average.

The “Notecard Questions” are meant to be fun questions and will not be graded on correctness. In fact, there will be no correct answer to a notecard question. The

questions will all be lighthearted or designed to engage you with the course material in ways that I cannot otherwise monitor given the course structure.

Extra Credit

For details, please see the [Extra Credit Information document on Canvas under the Syllabus tab](#).

I offer up to +5% on your final average in this class, which can be earned through attending extra credit sessions and completing a write-up on the experience.

All of the extra credit sessions are designed to get your eye to a telescope, experience the night sky via observations or our planetarium, and to reinforce course content through full-dome films and demonstrations in our planetarium. Each attended session earns you +1% on your final average with a cap at +5% in total from the extra credit sessions (This cap does not apply to the +2% for perfect attendance. Achieve both, and you earn +7% on your final average).

The following options for extra credit are available:

1. Night observations (1 point per session, can attend 2 session)
2. Day observations (1 point per session, can attend 2 sessions)
3. Planetarium sessions* (1 point per session, can attend 1 planetarium show & 2 planetarium films)
4. Trip to a space science museum, star party, or other planetarium² (1.5 points per)

* No duplicate sessions will be counted toward extra credit.

The MAXIMUM NUMBER OF EXTRA CREDIT POINTS THAT WILL BE COUNTED TOWARD YOUR FINAL AVERAGE IS +5%. Note, the perfect attendance extra credit is added in addition to the +5% for a maximum total of +7%.

Staggered EC opportunities: Past experience has taught me that the last 2 weeks of class always sees a surge of people seeking out extra credit. My observation is that most of the time these are students inherently interested in going above and beyond what is necessary in the course, and hence truly earning extra credit. Instead, this bonus-point-rush is people trying to save their grade without really supplementing their knowledge. This is antithetical to the purpose of extra credit sessions. In response, I have the following policy with extra credit sessions:

- *Prior Monday, 22 October 2018 students can earn up to +5% in any of the ways listed above.*
- *Starting Monday, 22 October 2018 any student can only earn an additional +2.5%* of extra credit. *If you attend 3 sessions during this period, you will earn +2.5% instead of the normal +3%.*

What to do to earn your Extra Credit (EC) in brief:

² You must provide proof of your visit. A selfie at the location will suffice

For details, please see the Extra Credit Information document on Canvas under the Syllabus tab.

To attend and receive credit for a session, you need to do the following:

1. Sign up on our sign-up sheets that are posted weekly outside of Room 108 in Nielsen Physics and Astronomy.
2. Attend your session. You only need to bring something to write with and on. At the session, you will be given an EC session form. Complete the form as instructed and get your EC form stamped by Mr. Lewis.
3. Do an EC session write-up³. Staple your stamped EC session form to your type and printed write-up and turn that packet into your instructor within two weeks of your session.

Reading Check: Every semester, I spend endless hours answering student emails that have their answers contained here in this wonderful syllabus. This leads me to think that most people never actually read this, so I offer the diligent student the following opportunity. I am an enthusiast of urban studies and understanding human society; I find these academic fields endlessly fascinating. As a course of study, understanding the spaces humans occupy and how they interact with each other and their environments offers the potential to address many of the most pressing questions and issues we face as humans living in organized societies. One thing I particularly enjoy is finding those special places in a city that have meaning to individuals or groups. If you go out into Knoxville and take a picture of yourself in your favorite Knoxville spot (that isn't where you live), I will give you +3 quiz points. To receive the points, you must be holding up a sign that reads, "I read the syllabus," and email me the picture with your name, the location, whether you in ASTR 151 or ASTR 152, and, most importantly, why the place is meaningful to you in the message. To receive your points, you must complete this task by 31 August 2018.

³ 1-page single-spaced for day, night, and planetarium sessions. 1.5 to 2 page single-space for planetarium films. 2 page single-space for trip to a space science museum, star party, or outside planetarium.

Grading

Your final score will be calculated using the following weights. Your lowest exam score will be dropped.

Grading Weights	
<i>First test</i>	20%
<i>Second test</i>	20%
<i>Third test</i>	20%
<i>Final exam (If needed to replace an exam grade)</i>	20%
<i>Homework</i>	10%
<i>Quizzes</i>	15%
<i>Attendance</i>	15%
Total	100%

Grading Scale: The below grading scale is used for this course. There is ***no rounding applied to any final scores.***

Grade	Average % Range
A	> 90
B+	87.5 - 90
B	80 - 87.49
C+	77.5 - 79.99
C	70 - 77.49
D+	67.5 - 69.99
D	60 - 67.49
F	< 59.99

For this course, I report +'s grades, but I do not report -'s.

You are welcome to discuss the grading of a given assignment up to a week after it has been returned to you. *After a week, the score will not be changed.*

Honor & Statement, Collaboration, Cheating, and Plagiarism

As a student in this class you are highly encouraged to interact with other students concerning understanding the material. However, this interaction must be at a level where it increases your general knowledge of astronomy. It can never cross the level to actual plagiarism or cheating. If I judge you have copied other sources (online or other students), found to be cheating on a quiz or exam [looking at another paper, using prohibited materials, etc.], or you have aided others in plagiarizing your work, you will receive a 0 (zero) score on the assignment or test

and your final grade will be reduced by a letter grade (A will be B etc.). A second offense will lead to a grade of F for the course and a report to the Dean of Students and Office of Student Conduct and Community Standards.

Problems with Social Media Apps & Services: In the past semesters, I have dealt with large number of students using Group Me, Chegg, and Google Drive (and other similar services) to take pictures of homework questions and share them with other students, as well as arrange ways to cheat on attendance notecard questions [In one case, one student was offering another student Chik-fil-A in exchange for falsifying their attendance status. Such a bribe puts both parties' future at UTK at risk, and for what, a chicken sandwich?].

Some of you may not see this as cheating, but as a form of research to get the right answer. However, *this is a form of cheating*. Not only is it physically cheating to get the right answers, but it is also cheating yourself. Being told the right answer is not what education is about; it is about learning how to discover the right answer, realize there might not be a "right" answer, and developing the desire and know how to get you towards an answer. This is especially true in the sciences. Bypassing this opportunity to truly learn and better yourself undercuts your education and your ability to learn in this class and others. As an educator and academic that cares deeply about helping students, inspiring the public, education, and helping to produce a better world, I will not tolerate this behavior.

Fighting this is somewhat akin to trying to grab smoke, but I will try my hardest to prevent this from happening in this class. To this end, I will have "student plants" in the class that will report to me if a Group Me or Google Drive crosses the line into cheating. Cheating constitutes taking pictures of correct homework answers and sharing them, having someone turn in Note Card Questions for you, putting exact copies of any of my materials on Chegg or other so-called "study" platforms, or anything that is obviously worse than those violations.

In the case you and others are caught, I will reduce all offenders' maximum homework average to 75% in the first case and apply my other standard cheating consequences. If caught more than once, I will contact the Office of Student Conduct for violations of the Student Honor Statement, and if you are not removed from the university or if I'm advised to not fail you, your homework will not count towards your final grade, and the additional 15% will be distributed amongst your three counted exams (each exam worth 25% of your overall grade).

In response to this problem (which is hopefully one of the past), I will be active in the Canvas Discussion sections of this course, and I will also create a Google Hangout for you all to discuss materials and study for exams. I highly encourage you to make use of those resources.

Email

You are required to have an official UT email address (name@utk.edu or name@tennessee.edu) and read your email on a daily basis, since some of the needed information for this class that cannot be transmitted to you during the lectures, this information will be given to you via email. Examples of this type of information include cancellation of classes or last minute changes in assignments. Please remember, that if you are using an existing non-UT email account (AOL, Yahoo, etc.) it is your own responsibility to re-route your UT email to your preferred account.

Disability Students

Any student who feels s/he may need an accommodation based on the impact of a disability should contact me privately to discuss your specific needs. Additionally, please contact Student Disability Services (SDS) at 865-974-6087 in 2227 Dunford Hall to coordinate reasonable accommodations for students with documented disabilities.