

Astronomy 152 - Fall 2021 Syllabus

Stars, Galaxies, and Cosmology

Fall 2021 Semester

University of Tennessee, Knoxville

Course Details

Instructor: Dr. Sean Lindsay E-mail: slindsay@utk.edu
(he/him/his)

Class Times: 9:15 - 10:05 AM Monday, Wednesday, and Friday (MWF)

Class Location: PHYS 415 in Nielsen Physics and Astronomy Building

Course Number: ASTR 152-001

Dr. Lindsay's Office: PHYS 215 in Nielsen Physics & Astronomy Building
Phone: 865-974-2362 (leave voicemail)

Zoom Office Hours: In-Office:
Mondays: 11 am - 12 pm or by Appointment
Tuesdays: 3 pm – 4 pm or by Appointment
Virtual: Available by appointment.
Zoom Link: <https://tennessee.zoom.us/j/96905649825>
Passcode: **HA6563**

Course TAs:

Jesse Farr jfarr7@vols.utk.edu	Hannah Garrett hgarret4@vols.utk.edu
Michelle Simpson msimps36@vols.utk.edu	

Course Resources:

Fall 2021 Semester Schedule: [Link to Schedule](#)

Textbook: *No Official Course Textbook. No purchase necessary*

I rely on my extensive course notes provided to you for free. ***Going through the PowerPoint version in presenter mode is recommended to see all of the animations.***

Additional Text Resource: Openstax's Astronomy

Link: <https://openstax.org/details/books/astronomy?Book%20details>

(Not required in any way for this course)

Crash Course Astronomy with Dr. Phil Plait (Great for review & reinforcement)

Hyperlink to Youtube Channel: [Link](#)

Course Website: Canvas

Required Course Materials: Calculator

GroupMe: [Invite Link](#)

Discord Server: [Invite Link](#)

Course Policies in Brief

- Attendance is not mandatory
- There is no required textbook or homework platform purchase.
- Must complete weekly exercises called Engagement Exercises (15% of grade)
- Must complete all homework assignments - No homework will be dropped (35% of grade)
- Must complete all 6 quizzes - No quizzes will be dropped, but final quiz grade will be calculated out of 66 instead of the available 72 quiz points. (Quiz Average is 20% of grade)
- Must complete all 3 exams - No exams will be dropped, but each exam scored out of 50 instead of the 55 questions on each exam. (Each exam is worth 10% of the course grade. 3 Exams -> 30% of grade)
- Exams and quizzes will be online and available to you from 9 am to 9 pm on days they are given. Time will be allotted during our lecture period for you to take the exam or quiz in-class if you choose.
- Engagement/Conversation encouraged on GroupMe, Discord, and/or Canvas Discussions. Find what works best for you and your needs, and make use of it!
 - No mandatory participation grade for these conversation/discussion platforms.
- Instead of any grade rounding, I have set the minus of a letter grade to be within 0.5 points of the traditional letter grade. For example, an 89.5 - 89.99 is an A- and a 79.5 - 79.99 is a B-, etc.
- All times/due dates listed on Canvas are Eastern Time. That is the UTK time zone, and so all UTK Canvas operates on Eastern Time.

Course Description

This course is an introduction to astronomy and the stars. Due to the ongoing coronavirus pandemic, the rise of the Delta variant, and a large variance in people's acceptable risk tolerances, this ***class will be done with attendance as 100% optional***. The core of the class content will be delivered through online lecture videos and my version of a textbook, "Dr. Lindsay's Lecture Notes." I will still have live lectures at the scheduled time where you can engage in the course in an in-person format. With this class build, I hope to create a class that is accessible to everyone and gives everyone full opportunity to succeed in the format they choose to engage with. There will be regular due dates for course material throughout the semester for weekly Engagement Exercises (EEs), homeworks, quizzes, and exams. Please check the Astronomy 152 Semester Schedule often.

The course is divided into three broad units.

For a breakdown into Parts and Topics, please see the Course Schedule.

Unit 1: General Astronomy

This unit introduces you to astronomy as a science. It covers what astronomy and science are; the daily, yearly, and longer-period motions of the Earth and how that changes the sky on those timescales; the motions of the Moon and planets; gravity and basic Newtonian mechanics; the electromagnetic spectrum of light; the interaction of light with atoms and molecules; and telescopes.

Unit 2: The Sun, Stars, and Interstellar Medium

This unit is all about the stars. It begins with an in-depth look at our nearest-neighbor star, the Sun, and then expands to stars in general. In this unit, we will cover what a star is; how we measure the brightness and distances to the stars; how we classify stars; and how the properties of stars are related. We will also cover the formation and death of stars, including stellar remnants after death such as white dwarfs, neutron stars, and black holes. We round out this important material with nucleosynthesis, which is the generation of elements of the periodic table.

Unit 3: The Life and Death of Stars

Unit 3 deepens our understanding of stars by examining how they form, live, and eventually die. We explore the mass dependency on birth and death. For low-mass stars, we learn they die in white dwarf stars, while high-mass stars die in one of the most energetic events in the universe - a supernova explosion. This unit also explores how stars produce the elements on the periodic table, so-called nucleosynthesis. It ends by covering neutron stars and black holes, which are the exotic relics of dead high-mass stars and a modern view of Einstein's relativity to understand what would happen if you were to fall into a black hole.

Unit 4: Galaxies and Cosmology (If time allows)

Unit 4 begins with an exploration of our own galaxy, the Milky Way and expands to a discussion about galaxies in general. Depending on how much time remains in the semester, we will then discuss the large-scale structure of the universe, its formation, and ultimate fate.

Flow of the Course

There is a regular weekly flow to this class. Keeping up with the material from week to week is paramount to your success, so please be aware of my idealized weekly flow listed below. In order to make things easy to follow, I have set days of the week when homework, quizzes, and exams take place. I hope this helps you build a schedule and remember deadlines.

Weekly Flow

- **Read/Take Notes on Assigned Lecture Slides:** Every week will have a set of lecture slides (see *Course Materials/Dr. Lindsay's Textbook* on Canvas for the slides) that you will read through and take notes about. This is equivalent to reading assignments. Some in-person lectures will assume that you have gone through the material I have asked you to cover. Overall, the class is designed where you can learn all of this course material and be

successful with the homework, quizzes, and exams by simply going through the Lecture Slides.

- **Watch the Lecture Videos posted in the Weekly Module:**
See below for details on lecture videos
- **Watch for Course Announcements on Mondays**, which are sent to you via Canvas and given at the start of Monday's in-person lecture.
- **Do Weekly Engagement Exercise:** Short assignments with infinite attempts to reinforce course concepts and keep you going through the material in a timely manner
 - **Due every Sunday night by 11:59 pm EDT** (there are a few exceptions to this due to holidays/end of classes. These exceptions are indicated on the Semester Schedule). On the course schedule, Weekly EEs are *marked in green*.
- **Check to see if Homework is Due:** These are the larger assignments that engage with the course material at a deeper level and help you prepare for quizzes and exams.
 - **When Assigned, they are due on Wednesdays at 11:59 PM EDT.** Note that there are fewer HW assignments than weeks of class, and therefore, HW will not occur weekly. On the course schedule, the homework assignments are *marked in blue*.
- **Check to see if there is a Quiz or Exam:** Make reminders for yourself based on the schedule. You get to take each Quiz and Exam twice. **Once on a Monday, and a second attempt on the following Thursday.** In the intervening time, learn from your mistakes and use the Canvas Quiz/Exam Discussions. On the course schedule, *quizzes are marked in orange* and *exams are marked in red*
- **Check and Engage with Weekly Canvas Discussions and special release videos, e.g., Astronomy in Context Videos:** While Canvas Discussions are perennially unpopular, they are the easiest way for me to provide feedback to the entire class for exams, quizzes, homework, and the weekly material we cover. The discussions are a great way for you to ask me questions about the material and get responses that the entire class can benefit from. The more active everyone is, the more vibrant this class will be.

Lecture Videos

Every week will have a set of lecture videos for you to watch. The topics covered are the ones listed in the course schedule. The videos cover essentially every topic in the textbook Lecture Slides, and you could fully succeed in this class by watching the videos and treating this class as a fully online one. **Lecture videos can be watched instead of regularly attending class. Please choose the option that is best in line with your Covid-19 risk tolerance**

The Lecture Videos will be released on Canvas Studio and as YouTube links. The Canvas Studio versions will (eventually) be professionally captioned, but will not have the option to hide captions. For the YouTube versions, I use their close captioning system, which is not the best for science topics, but can be toggled on and off.

In-person Lectures

Every class period, I will have a lecture. For the most part, these lectures will be live versions of the content in the videos. On occasion, however, I will use the class time to work through examples and dig deeper into the most difficult concepts in this class. In those cases, you will

want to have read through the Lecture Slides or watched the related Lecture Videos before coming to class. I will always clearly indicate these special cases.

Office Hours

Every Tuesday from 10 am until 11 am. Office hours are a time for you to get one-on-one time with me. You can use the office hours to get individualized help with the course, talk about astronomy in general, or even just have a chat with me. Office Hour sessions outside of the listed time are also available by appointment. For those choosing to do this class mostly or fully online, I also have office hours available by appointment. In that case, please send me an email to schedule a time to meet via Zoom.

Zoom Link: <https://tennessee.zoom.us/j/96905649825> **Passcode: HA6563**

Live Chat Features: GroupMe & Discord

In the past, I have had a lot of success by being invited into the class GroupMe. I know it might seem wrong or weird to have your professor in a GroupMe, especially considering the answer sharing and other things that frequently happens on them, but my previous class GroupMes and Discord Servers have worked out very well. The benefits of me being a part of the class GroupMe or Discord is tremendous. You can ask questions and get quick responses on class material, due dates, class policies, etc. I will also send reminders of due dates, so you don't accidentally miss one. Then there is the greatest benefit of all: you get to see me as a human who is trying his best to help you succeed.

An additional bonus is that it also keeps these groups clean, which reduces the risk of being pulled into a cheating scandal, having to put up with cheaters, and lowers cyberbullying. In short, it becomes an integral space for the class that is more familiar and less formal than lecture, office hours, email, and Canvas Discussions.

To start, I have created a class GroupMe and Discord. GroupMe is always more popular because it is fast, direct, and easy to use with a casual conversational tone. Discord is less popular, but it has much more utility and ability to navigate than GroupMe. It also is easier for me to organize information and post supplementary images that you can easily find without scrolling up for who knows how long to find an old message. Try using them both, and find the fit that works best for you.

GroupMe: [Invite Link](#)

Discord Server: [Invite Link](#)

Course Components: Homework, Engagement, Quizzes, & Exams

Homework Assignments

Homework assignments count for 35% of your overall course grade.

When assigned, Homework will be due by Wednesday at 11:59 pm.

- I will be actively monitoring the Canvas Discussion related to the homework. Please post your questions about homework there so everyone can benefit from my response.
- ***Do not post questions with an answer (incorrect or correct) marked.*** You can post a question, but make sure all the choices are left blank.

All homework assignments are assigned on Canvas. The assignments are designed by me and are done so in an effort to aid you in learning the material and mastering the skills required to succeed in this course. Please complete all homework assignments by the due date. There is a homework assignment for each part of each unit. They are larger assignments than the engagement exercises and the primary workload for this course. Be sure to ALWAYS do the assignments.

You get three attempts for every assignment. The highest of your three attempts is taken as your grade for that homework assignment. Use them wisely, take notes as you work through each attempt, and engage in the discussions.

- Canvas's homework system has some unfortunate quirks that you will likely find annoying. For each attempt, you have to work every question, even if you got it correct on the previous attempt. It also shows no mercy on the due time. ***You have up until the due time, which is always 11:59 pm EASTERN TIME of the listed due date.*** If you are even a minute late, it will give you a zero. Please be aware of this and start your homework early.

Weekly Engagement Exercises (EEs)

End of the week Engagement Exercises count for 15% of your overall course grade.

Every week will have a set of questions called "engagement exercises." These are shorter assignments that directly relate to the material on the schedule for the week. You will get unlimited tries up until the due date for these assignments. The point of these, and having a grade attached to them, is to keep you working on the material throughout the semester while reinforcing the concepts I find most important for that week's lessons.

Every week of lessons will have a Canvas Discussion associated with it. If you have questions regarding the material and the engagement exercise for that week, please post them there.

The engagement exercises will be due at 11:59 pm Eastern Time on the Sunday after the week of lessons. Your grade for this category will be the average of all the engagement exercises

Examinations

Each Exam is available online via Canvas and counts for 10% of your course grade. You get two attempts per exam (see 2-attempt policy below). Exams 1 through 2 will occur within the semester. Exam 3 will be during UTK's Final Exam Period. You will still get 2 attempts for Exam 3, but you choose when to take the first and second attempts within a window of 9 am on Friday, 3 December until 11:59 pm on Wednesday, 8 December.

Please read the following carefully:

- ***Exams will be available to you to take from 9 am until 9 pm on the exam days.*** Once you start the exam, you will have 90-minutes to complete it. The time limit makes it so studying for an exam is necessary. It also makes cheating rather difficult.
- ***No lecture will be held on 1st Attempt Exam days.*** You can use the class time to take the exam, but be aware that we only have the lecture room for 50 minutes. The exams are designed to be finished within that time window if you have studied for them.
- ***Two-Attempt Policy: You will get two attempts on the exams. Your exam grade will be the average of the two attempts (even if you score lower on the 2nd attempt).***
 - ***The first attempt*** will be on ***Monday*** of the week we have the exam
 - Based on the results of the 1st Attempt, I will open a discussion where I can address problem areas and give you a space to ask questions of your own. ***This feedback will be given via a Canvas Discussion called Exam X Review - Preparing for you 2nd Attempt***
 - ***The second attempt*** will be the ***Friday*** after the 1st Attempt. You should have used the intervening time to shore up where you had problems.
 - Note that I used pools of questions, so your second attempt will be a different version of the exam and will contain questions not on your first attempt. The goal is for you to learn the concepts; it is not to just memorize answers.
 - ***If you are happy with your first attempt, then you can skip the second.*** Canvas will still show a 0 for your second attempt, but I will ignore that when I calculate your overall Exam Grade, which will be released on Canvas after the 2nd attempt.
 - ***YOU MUST TAKE THE FIRST ATTEMPT! If you skip the first attempt, that will be counted as a 0 making the highest exam grade you can earn a 50%.***
 - ***Philosophy Behind This Method - Opportunity to Learn from Your Mistakes:*** The goal with this method is that I want you to feel comfortable with making mistakes and learning from them. This is why each exam is only 10% of the overall grade, and you get the opportunity to retake the exam. I hope it also encourages you to engage with me through the Canvas discussions. Hopefully, the lower overall grade weight and the multiple attempts brings exams more in line with how I view they should be with respect to education. It is not about catching students out on a single, high-stakes assessment. It is about offering you a way to test what you have learned, giving you the chance to learn from that, and then demonstrate growth.
- ***Exams will be open book and open note.*** With my online exams, I choose to avoid using the Respondus monitoring system. For me, it feels too invasive and too much like a dystopian novel. This opens the door to many forms of cheating, so I build exams (and quizzes) to make traditional cheating methods difficult. This includes large pools of questions where typically every exam has as many, or more, unique versions as there are

stars in the universe (10^{23} versions, or 100,000,000,000,000,000,000,000 versions).

The list of things NOT TO DO:

- Do not work with others on exams. It would be difficult to do so with the time limit and the different versions of the exams. Doing so will likely mean that you all run out of time before completing the exam.
- Do not Google the answers. I write all of my own questions, so this will be hard to do successfully. Plus, with a time limit, trying to sift through Google results will waste precious exam time.
- Do not share exam information with fellow students. If you take the exam earlier than your friends, don't just tell them what was on the exam and the answers to questions. With $\geq 10^{23}$ exam versions, you are probably just giving them bad information anyways and making it harder for them since they will feel like they don't have to study. You will have to study.
- ***Exams are 55 questions long and you get 1.5 hours to complete it.***
- ***50 Questions correct on Exams earn you a 100%. Every question correct past 50 is worth +2% extra credit on the exam.***
- ***There are no dropped Exams***
- If you have testing accommodations, please email me to let me know. I will give all allowances afforded to you on the time limit.
- If you will miss an attempt for a valid reason, please let me know via email prior to the exam. A full day of advanced notification will go a long way in my consideration for a make-up exam.

Quizzes

Your Quiz Average counts for 20% of your overall course grade.

There will be SIX quizzes, two before each exam. Quizzes will be given online in the same format as the exams [see Exam policy]. You will have two attempts: one on a Monday and a second on a Friday. I will give you 20 minutes at the end of the Monday lecture to take your 1st Attempt if you want to take it in our lecture room.

Quizzes are 12 questions long and you will be given 12 minutes to complete them.

There are no dropped quizzes.

Please make use of the Canvas discussion related to the quiz.

How your quiz average is calculated

- You can earn a total of $6 * 12 = 72$ quiz points over all six quizzes.
- A 66 out of 72 will earn you a 100% Quiz Average
- Every point above 66 counts as 1. $\overline{66}$ % extra credit added to your Quiz Average. This gives a max Quiz Average of 110%.

Extra Credit (EC) Opportunities

You can earn up to 5% added to your course grade via our Astronomy Extra Credit opportunities.

There are a variety of ways you can earn extra credit in this class. For now, they are all online opportunities, but depending on how the pandemic progresses, and if our telescope guru, Paul Lewis offers observation or planetarium nights this semester, we may add in planetarium and observation sessions as opportunities. Please see the Extra Credit Opportunities module on Canvas for details on what is available, and how to earn the points.

Before each exam, you have a chance to earn extra credit. On Canvas, you will see there are EC assignments for each period before class exams. A completed extra credit assignment is worth +1% added to your overall course grade with a cap on the maximum allowed earned points set at +5%.

The way this plays out is that you can earn up to +3% before Exam 1. One point for each completed EC assignment. You have a second opportunity to earn up to +3% between Exams 1 and 2 (+1% for each completed EC assignment). A third, and final, opportunity to earn up to +3% between Exams 2 and 3. Notice that means if you put off doing extra credit until the 11th-hour, you will not be able to earn up to the maximum of +5%.

Please see Canvas for the Extra Credit Opportunity assignments. The instructions are laid out for each assignment there.

Canvas Announcements

Enable at least daily email announcements for this class. I have pinned the most recent announcements to appear at the top of the Canvas page. Make sure you read all of them as this is the most direct way for me to communicate with all of my students at once.

Have A Question about Course Material? Use One of the Canvas Discussions

If you have a general question about the course or the material, then please use one of the Canvas discussions for this class instead of immediately emailing me. If you have a question, the answer to it will likely be a benefit to other students. If you are comfortable with it, please post the question to an appropriate Canvas Discussion. Doing so will centralize and simplify communication.

I am creating Canvas Discussions for Course Policies; Weekly Engagement Exercises; Homework Assignments (one per assignment); Quizzes (one per quiz); Exams (one per exam); and a few other special topics.

If you need to contact me personally, or feel uncomfortable posting your question, then please email me directly.

Tutoring Sessions

Having some trouble with the course concept and material? Our Astronomy TAs are willing to help! If you feel more comfortable communicating with them instead of directly with me, you can ask for help via email, or schedule a Zoom tutoring session. If requesting a Zoom sessions, please have prepared questions ready to go as there is extra labor involved for the TAs and myself to set up these sessions.

Jesse Farr jfarr7@vols.utk.edu	

Course Grades

All grades are calculated according to the following grading weights and on the following grading scale.

Grade Category	Weight Percent
Exams	3 at 10% each Total: 30%
Quiz Average	20%
Homework Average	35%
Engagement Exercises	15%

Course Grading Scale

Letter Grade	Percentage Range
A	90.00 or greater
A-	89.50 – 89.99%
B+	87.50 – 89.49%
B	80.00 – 87.49%
B-	79.50 – 79.99%
C+	77.50 – 79.49%
C	70.00 – 77.49%
C-	69.50 – 69.99%
D+	67.50 – 69.99%
D	60.00 – 67.49%
D-	59.50 – 59.99%
F	Less than 60.00%

Grade Rounding Policy: I do not round grades for any reason or special pleading. I offer enough points in this class for the decimal places to have meaning. I also offer an extraordinary

amount of extra credit that you could have done to boost your grade. I use the extra credit and a 0.5% buffer earning you a “minus” grade at letter grade boundaries as my “grade rounding policy.”

Other Course Policies

Cheating/Academic Dishonesty

Cheating of any kind will not be tolerated. This includes my finding out of any collaboration while taking the open book quizzes and exams. I have given you a lot with how I am administering those. Please respect that and do not resort to cheating. Remember that the point of all of this is to gain an education and grow as an individual. Cheating is the opposite of that, and a big pet peeve of mine. I will report you to Student Conduct if caught.

I am probably more tech-savvy than you guess, and I am aware of many of the social media platforms commonly used for cheating (GroupMe, Google Drive, Chegg, Quizlet, etc.). I will actively be trying to gain access to any of these groups through trusted people in my classes who dislike cheating as much as I do. If you are interested in keeping academic fairness and honesty alive and well, please contact me privately, and we can discuss secure and anonymous ways to do so.

Consequences for getting caught cheating are severe. First time offenders will receive no credit for the assignment cheated on and will have their maximum grade in that grade category reduced to 65%. Cheating on exams will result in a 0 on that exam. Second offenses result in failure of the course and, without exception, a report to the Office of Student Conduct.

Regarding Coronavirus and UTK - Currently Masks are Required to Attend In-Person

As we are all aware, the coronavirus pandemic is not going away. I personally chose to have a way where you can take this entire course without needing to expose yourself to a lecture hall full of students with unknown vaccination status.

In line with University policy, masks are currently required to attend my in-person lectures. If you are not wearing a mask, I will ask you to leave the lecture hall.

Please refer to the UTK Coronavirus – Information for Students page to be fully aware of responsibilities that apply to you personally, the faculty and staff, and the campus.

<https://www.utk.edu/coronavirus/students/>

UTK’s COVID-19 Guidelines

With the spread of the Delta variant of COVID-19, students, faculty, and staff will be required to wear masks in classrooms, labs, and for indoor academic events required for students such as orientation. This requirement will remain in place until conditions improve and the university communicates new instructions.

The university strongly recommends that all members of the campus community be vaccinated for their own protection, to prevent disruption to the semester, and to prevent the spread of COVID-19. Vaccination information and appointment signups are available at tiny.utk.edu/vaccine. The Student Health Center medical staff is available to students to answer questions or discuss concerns about vaccines, and the center provides vaccines free of charge for anyone 18 years or older who would like one.

If you think you are sick or have been exposed to COVID-19, you should contact the Student Health Center or your preferred health care provider. You can also contact the university's COVID-19 support team for guidance by filling out the COVID-19 self-isolation form at covidform.utk.edu.

You must not attend class if you have tested positive for COVID-19 and are in the isolation period, if you have COVID-19 symptoms and have not been cleared by a medical provider, or if you are an unvaccinated close contact in the quarantine period.

If you need to miss class for illness, [INSERT INFO FOR CONTACTING THE INSTRUCTOR].

You can find more information and updates at utk.edu/coronavirus.

Student Issues

If you have any concerns that you would like me to know about, please see me or email me early in the semester. I understand that many of you have jobs, complicated family circumstances, private personal struggles, or a whole host of other factors that could affect your performance in this course. This is exacerbated by several orders of magnitude this semester. If you can let me know early, and before it becomes a problem in the course, I am almost always happy to work with you in order to foster an optimal educational experience. Please feel free to approach me during my office hours or via email.

Technology Concerns

If you are having any limitations due to technology, please let me know as early as you can. I am collecting a set of resources that UTK is providing. Until I have that gathered and released, please contact UTK OIT (<https://oit.utk.edu/>) and ask how they might be able to help you. I will work with you from my end while solutions are found.

Student Disability Service

I always work fully with the Student Disability Services (SDS: <https://sds.utk.edu/> or by phone at 875-974-6087) in 915 Volunteer Blvd/100 Dunford Hall. If you have a known or suspected disability, please contact SDS to establish accommodations. The offices have a wonderful staff

that are extraordinarily helpful. If you do have SDS accommodations, they will let me know, but I encourage you to contact me to discuss how we can work with the accommodations to make your astronomy experience the best for your needs.

Course Schedule

See Canvas and the Canvas Page ***Astronomy 152 Semester Schedule*** in the ***Course Materials*** Module

Google Version of Schedule: [Link](#)