



**Physics and  
Astronomy**

**EAST TEXAS A&M**

## **PHYS 151.01E: Physics From Absolute Zero I**

COURSE SYLLABUS: FALL 2026

### **INSTRUCTOR INFORMATION**

Instructor: Dr. Kurtis A. Williams

Office Location: McFarland Science Building Room 106A

Office Hours:

- Tuesday 11am -- Noon,
- Wednesday 1pm -- 2pm
- Friday 2:30pm -- 3:30pm

University Email Address: Kurtis.Williams@etamu.edu

Preferred Form of Communication: **Email**

Communication Response Time: 1 business day

### **COURSE INFORMATION**

#### **Required and Suggested Materials**

Suggested Textbook: The Biggest Ideas in the Universe: Space, Time, and Motion by Sean Carroll. Dutton Publishing. ISBN 978-0-593-18658-9

Required Materials: Scientific calculator (not a smartphone app). Example: [TI-30XS](#)  
Programming and/or graphing capabilities are optional.

#### **Course Description**

Hours: 3

*This course is the first semester of a two-semester introduction for future physicists and those curious about physics. In this semester students are introduced to relativity from Galileo to black holes and modern cosmology using a conceptual and algebra-based approach. Along the way, students will learn about conservation laws, dynamics, special relativity, and general relativity as well as previews of how calculus enables our understanding of physics. In addition, students will practice skills such as estimation,*

*The syllabus/schedule are subject to change.*

*geometry and trigonometry, metacognition, technical reading, writing, and speaking, and positive mental health strategies. The course will discuss challenges and opportunities facing the science and the wide range of career options for physics graduates. First-year physics students are required to take this course; other interested students are welcome.*

## **Student Learning Outcomes**

1. Identify and use fundamental concepts of mechanics
2. Discuss the ideas of curved space time and its consequences such as black holes.
3. Read, write, and speak about current frontiers in the science of physics.
4. Practice basic algebraic, geometric, and trigonometric skills used commonly in undergraduate physics, and recognize physical interpretations of derivatives, integrals, and differential equations.
5. Implement effective strategies to improve learning skills, metacognition, and recognition of one's own physical, mental, and emotional health in a college setting.

## **How to Get Started**

### **myLEO Online Access Information**

This course uses myLEO Online, the learning management system at East Texas A&M. All materials, assignments, and resources will be made available through this system. To access this course, go to: <http://myleoonline.tamuc.edu>. Log in with your myLEO account and password. Then click on the link to [Spring 2026 Stars and the Universe](#) to get to our course.

### **How This Course Is Organized**

This course is organized by week. You should listen in class and check the course page on D2L often to see what activities and assignments are coming due.

### **What Should You Do First?**

After attending class and reading this syllabus, you should proceed to the course page on D2L and familiarize yourself with the resources.

Next, proceed to "Things to Do First" and start to look over the items. If anything confuses you, it can wait until the first day of class.

Finally, show up on the first day of class: Thursday August 20.

### **Minimal Technical Skills Needed**

You will need to be able to access myLEO Online, also known as D2L or Brightspace, and be able to use it. You should be able to read PDF documents. You should be able to create Microsoft Word documents (.docx) or plain text files. You should have minimal knowledge of Microsoft Excel. You must be familiar with Internet usage and safe browsing. You need to be able to watch YouTube videos on a computer.

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## Instructional Methods

### Attendance

Attendance is a crucial part of learning, and so attendance will be taken during most class meetings. If you are absent due to illness or other circumstances such as those listed under section 1.3 of the ETAMU [Class Attendance Policy](#), you will be excused from class with not penalty to your grade. Unexcused absences will hurt your grade.

### Participation

Merely showing up for class is not sufficient for you to learn. Therefore, your participation in class is also part of your grade. For each class, your participation will be rated on a 4-point scale. See [Grading & Assignments](#) below for details. It isn't hard.

### Quizzes

Short quizzes will be given at the start of each week covering stuff we talked about in class the previous week. There are enough of these that if you bomb one or two, your grade will be fine. And these aren't meant to probe your deep knowledge, but the basics. You will be allowed to use a scientific calculator on these quizzes most of the time (there will be a few exceptions, but you'll be warned ahead of time. No notes, books, smart phones, computers, iPads, headsets, tricorders, etc. will be permitted.

*If you are certified as needing special accommodations for examinations, please see me privately with you letter of accommodation from the Student Disability Resources and Services office.*

### Homework

You will have weekly assignments to complete. These will typically be short and straightforward. These will be related to what we have done in class over the past week.

The following are considered cheating and will not be tolerated: Use of generative AI to seek answers to assignments (unless specifically instructed to use it), copying text from a website or other printed source, obtaining copies of solutions to homework questions (whether from past students or other sources), directly copying another student's work, etc. See the section on "Academic Integrity" below for full details.

### Extra Credit:

No extra credit is available for this course.

## Course Schedule

The following is the intended schedule, but will undoubtedly change.

Week 1: Introductions

*The syllabus/schedule are subject to change.*

- Pretest on Trig, vectors, vocab and concepts
- What Can I Do With A B.S. in Physics?
- Who to Talk To, Where, and When? Navigating a university

#### Week 2: Carroll Chapter 1 – Conservation

- Conservation Laws
- Vectors
- Right triangles
- Assignments: Trigonometry skills assessment, vector decomposition

#### Week 3: Carroll Chapter 2 – Change

- Derivatives
- Integrals
- Position/velocity/acceleration vs time diagrams
- Assignments: Trig and vector review, using position / acceleration / velocity vs time diagrams

#### Week 4: Reading and Study Habits

- SQ3R, Digital Textbooks, and Notetaking
- Metacognition
- Assignments: Online reading activity, Notetaking, Study Skills Assessment, review position / acceleration / velocity diagrams

#### Week 5: Carroll Chapter 3 – Dynamics

- Energy and Forces
- Energy diagrams and simple harmonic oscillators
- Principle of least action
- Assignments: Trig in relation to harmonic oscillators, derivatives and least action, vocabulary

#### Week 6: Carroll Chapter 4 – Space

- Coordinates and Galilean transformations
- Hamiltonian physics
- Long-range forces & fields
- Assignments: Cartesian, cylindrical and spherical coordinates (with vector and trig review); vocabulary review

#### Week 7: Carroll Chapter 5 – Time

- Worldlines
- Reversibility
- Entropy
- Assignments: Drawing worldlines, velocity/acceleration/position diagram review, coordinate system review, harmonic oscillatory review

#### Week 8: Technical writing

*The syllabus/schedule are subject to change.*

- Electronic communications (formats, grammar, etc.)
- Technical reading and writing (paper formats, what is included/excluded)
- Generative AI and writing: best practices
- Activities: Writing emails, reading a journal article, writing a short technical report, writing revisions using AI

#### Week 9: Carroll Chapter 6: Spacetime

- Minkowski spacetime
- Light cones, reference frames, and simultaneity
- Four-vectors
- Activities: Special relativity calculations, four-vectors, Taylor series, relativistic worldlines

#### Week 10: Carroll Chapter 7: Geometry

- Euclidian and non-euclidean geometry
- Tensors
- Curvature
- Activities: (Non-)Euclidean Geometry, Matrix creation and manipulation, review special relativity, initial thought experiments for GR.

#### Week 11: Fermi Problems and Estimation

- Order-of-magnitude thinking
- Checking reasonability of answers
- Planning time and budgets
- Activities: Fermi problems in and outside of class, planning final exam studying, budgeting for a summer research trip

#### Week 12: Giving technical presentations

- Using the classic 3-act structure to plan a talk
- Effective use of PowerPoint
- Considering different audiences
- Activities: Selecting and mapping out a talk, developing a powerpoint

#### Week 13: Carroll Chapter 8 – Gravity

- Equivalence Principle
- Stress-Energy Tensor, Einstein/Ricci Tensor
- Observable Consequences: Lensing, redshift, gravitational waves, cosmology
- Activities: Reading and presenting tests of GR (using Week 8 & 12 techniques!)

#### Week 14: Carroll Chapter 9 – Black Holes

- The Schwarzschild Solution
- Schwarzschild Black Holes
- Rotating and Charged Black Holes
- Thermodynamical Black Holes
- Activities: Calculating Schwarzschild radii, Newtonian black holes, calculating black hole evaporation

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### Week 15: The Culture of Physics

- Teaching as a career
- Representation in Physics
- Mental Health
- Activities: considering a career in teaching, class discussions on representation, mental health assessment

### Final Exam:

- Post-test covering trigonometry, vectors, vocabulary and concepts

## Grading

Grading is 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; your percentage earned will never go down if I apply such a curve. Your current grades are available through the gradebook on D2L – look for “Total Calculated Grade.”

Grades are weighted based as follows; within each category, each assignment is weighted equally.

### Attendance: 25%

### Participation: 10%

Rubric: Each day has 4 possible points:

- 1 point for arriving on time
- 1 point for staying through the entire class
- 1 point for making an appropriate comment or question during class
- 1 point for effective group work.

### Homework: 25%

Grading Rubric: 8 points for each problem.

|                                | 2 Points                                               | 1 Point                                                                                       | 0 Points                                                |
|--------------------------------|--------------------------------------------------------|-----------------------------------------------------------------------------------------------|---------------------------------------------------------|
| Attempt                        | Serious attempt at solving                             | Weak or partial attempt at solving                                                            | No serious attempt at solving                           |
| Description of thought process | Thought process clear and well described               | Thought process muddled or only partly described                                              | No serious attempt to explain thought process           |
| Correct procedure              | Solution shows correct procedure as discussed in class | Procedure partially incorrect, or procedure discussed in class not followed (even if correct) | Procedure is completely incorrect, unclear, or not used |

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|                         |                                                               |                                                                                     |                                            |
|-------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------|
| Correctness of solution | Solution is completely correct or has at most one minor error | Solution has multiple minor errors or a significant error but is on the right track | Solution is very, very wrong or not given. |
|-------------------------|---------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------|

### **Quizzes: 20%**

Each week will start with a 15-minute concept- and vocabulary-focused quiz covering the previous week's topic(s). Quizzes will be graded based on correctness and clarity of answers.

### **Other Assignments: 20%**

Other assignments can include group projects, short presentations, and other outside-of-class assignments that are not well evaluated by the homework category.

Within each category, assignments are weighted equally.

Letter grades in this course will be based on the following scale:

A = 90%-100%

B = 80%-89%

C = 70%-79%

D = 60%-69%

F = 59% or Below

## **Student Responsibilities and Tips for Success in the Course**

Students who do well in this course share most of the following common habits:

- Arriving a couple minutes early for class and not leaving until class is dismissed.
- Not using phones, tablets, or computers during class
- Checking myLeo Online (D2L) often for announcements and assignments
- Completing all assignments on time
- Asking for help and advice early in the semester
- Taking responsibility for their own grade.

## **TECHNOLOGY REQUIREMENTS**

### **LMS**

All course sections offered by East Texas A&M University have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are technical requirements

LMS Requirements:

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<https://community.brightspace.com/s/article/Brightspace-Platform-Requirements>

LMS Browser Support:

[https://documentation.brightspace.com/EN/brightspace/requirements/all/browser\\_support.htm](https://documentation.brightspace.com/EN/brightspace/requirements/all/browser_support.htm)

Zoom Video Conferencing Tool

[https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom\\_Account.aspx?source=universalmenu](https://inside.tamuc.edu/campuslife/CampusServices/CITESupportCenter/Zoom_Account.aspx?source=universalmenu)

## **ACCESS AND NAVIGATION**

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or [helpdesk@etamu.edu](mailto:helpdesk@etamu.edu).

**Note:** Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a TAMUC campus open computer lab, etc.

## **COMMUNICATION AND SUPPORT**

If you have any questions or are having difficulties with the course material, please contact your Instructor.

### **Technical Support**

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found here:

<https://community.brightspace.com/support/s/contactsupport>

## **STUDENT RESPONSIBILITIES FOR COURSE**

### **CWID and Password**

You will need your campus-wide ID (CWID) and password to log into the course. If you do not know your CWID or have forgotten your password, contact the Center for IT Excellence (CITE) at 903.468.6000 or [helpdesk@etamu.edu](mailto:helpdesk@etamu.edu).

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## **Technology-Related Issues**

Personal computer and internet connection problems do not excuse the requirement to complete all course work in a timely and satisfactory manner. Each student needs to have a backup method to deal with these inevitable problems. These methods might include the availability of a backup PC at home or work, the temporary use of a computer at a friend's home, the local library, office service companies, Starbucks, a ETAMU campus open computer lab, etc.

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## **TECHNOLOGY REQUIREMENTS AND SUPPORT**

### **Minimal Technical Skills Needed**

Students will need reliable computer and internet access for this course. Students must be able to effectively use myLeo email, myLeo Online D2L, and Microsoft Office.

### **Learning Management System (LMS) – D2L**

All course sections offered by East Texas A&M University have a corresponding course shell in the myLeo Online Learning Management System (LMS). Below are the technical requirements:

- View the [Learning Management System Requirements Webpage](#).
- Learn more on the [LMS Browser Support Webpage](#).

### **Technical Support**

If you are having technical difficulty with any part of Brightspace, please contact Brightspace Technical Support at 1-877-325-7778. Other support options can be found on the [Brightspace Support Webpage](#).

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## **COMMUNICATION AND SUPPORT**

### **Interaction with Instructor Statement**

If you have any questions or are having difficulties with the course material, please contact your instructor. Correspondence will always be through university email (your “myLeo” mail) and announcements in myLeo online (D2L). You will not RECEIVE email through D2L, so be sure to check your ETAMU email for communication. Students are encouraged to check university email daily.

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## **Include the Following in Emails with Instructor:**

- Course name and subject in the subject line
  - Salutation (Good afternoon, Dr. Jackson)
  - Proper email etiquette (no “text” emails – use proper grammar and punctuation)
  - Student name and CWID after the body of the email (possibly add to student signature on email)
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## **COURSE AND UNIVERSITY PROCEDURES/POLICIES**

### **Syllabus Change Policy**

The syllabus is a guide. Circumstances and events, such as student progress, may make it necessary for the instructor to modify the syllabus during the semester. Any changes made to the syllabus will be announced in advance.

### **Student Conduct**

All students enrolled at the University shall follow the tenets of common decency and acceptable behavior conducive to a positive learning environment. The [Code of Student Conduct](#) is described in detail online in the [Student Guidebook](#).

Students should also consult the [Rules of Netiquette Webpage](#) for more information regarding how to interact with students in an online forum.

### **ETAMU Attendance**

For more information about the attendance policy, please view the [Attendance Webpage](#) and the [Class Attendance Policy](#)

### **Academic Integrity**

Students at East Texas A&M University are expected to maintain high standards of integrity and honesty in all their scholastic work. For more details and the definition of academic dishonesty see the following procedures:

[Undergraduate Academic Dishonesty University Procedure 13.99.99.R0.03](#)

[Undergraduate Student Academic Dishonesty Form](#)

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## [Graduate Student Academic Dishonesty University Procedure 13.99.99.R0.10](#)

### [Graduate Student Academic Dishonesty Form](#)

#### Use of Artificial Intelligence

East Texas A&M University acknowledges that there are legitimate uses of Artificial Intelligence, ChatBots, or other software that has the capacity to generate text, or suggest replacements for text beyond individual words, as determined by the instructor of the course.

Any use of such software must be documented. Any undocumented use of such software constitutes an instance of academic dishonesty (plagiarism).

Individual instructors may disallow entirely the use of such software for individual assignments or for the entire course. Students should be aware of such requirements and follow their instructors' guidelines. If no instructions are provided the student should assume that the use of such software is disallowed.

In any case, students are fully responsible for the content of any assignment they submit, regardless of whether they used an AI, in any way. This specifically includes cases in which the AI plagiarized another text or misrepresented sources

#### **Students with Disabilities-- 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**

East Texas A&M University  
Velma K. Waters Library Rm 162

Phone (903) 886-5150 or (903) 886-5835  
Fax (903) 468-8148

Email: [studentdisabilityservices@etamu.edu](mailto:studentdisabilityservices@etamu.edu)

Website: [Office of Student Disability Services](#)

#### **Nondiscrimination Notice**

East Texas A&M University will comply in the classroom, and in online courses, with all federal and state laws prohibiting discrimination and related retaliation on the basis of

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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.

### **Campus Concealed Carry Statement**

Texas Senate Bill - 11 (Government Code 411.2031, et al.) authorizes the carrying of a concealed handgun in East Texas A&M University buildings only by persons who have been issued and are in possession of a Texas License to Carry a Handgun. Qualified law enforcement officers or those who are otherwise authorized to carry a concealed handgun in the State of Texas are also permitted to do so. Pursuant to Penal Code (PC) 46.035 and ETAMU Rule 34.06.02.R1, license holders may not carry a concealed handgun in restricted locations.

For a list of locations, please refer to the [Carrying Concealed Handguns On Campus](#) document and/or consult your event organizer.

Pursuant to PC 46.035, the open carrying of handguns is prohibited on all East Texas A&M University campuses. Report violations to the University Police Department at 903-886-5868 or 9-1-1.

### **East Texas A&M Supports Students' Mental Health – Counseling Services**

The Counseling Center at East Texas A&M University, located in the Halladay Building, Room 203, offers counseling services, educational programming, and connection to community resources for students. Students have 24/7 access to the Counseling Center's crisis assessment services by calling 903-886-5145. For more information regarding Counseling Center events and confidential services, please visit [www.tamuc.edu/counsel](http://www.tamuc.edu/counsel)

### **Mental Health and Well-Being**

The university aims to provide students with essential knowledge and tools to understand and support mental health. As part of our commitment to your well-being, we offer access to Telus Health, a service available 24/7/365 via chat, phone, or webinar. Scan the QR code to download the app and explore the resources available to you for guidance and support whenever you need it.



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