Physics (PHYSICS) 1A
Syllabus

Course Name

PHYSICS 1A

Physics I – Semester A

Course Information

PHYSICS 1A is the first semester of this two-semester course.

This course will provide students with opportunities to learn and practice critical scientific skills within the context of relevant scientific questions. Topics include the nature of science, math for physics, energy, kinetics, force and motion, momentum, gravitation, chemistry for physics, thermodynamics, electricity, magnetism, waves, nuclear physics, quantum physics, and cosmology.

Scientific inquiry skills are embedded in the instruction, wherein students learn to ask scientific questions, form and test hypotheses, and use logic and evidence to draw conclusions about the concepts. Lab activities reinforce critical thinking, writing, and communication skills and help students develop a deeper understanding of the nature of science.

Prerequisites

This course is recommended for students in Grades 9-12.

Course Delivery Method

Online. You will access the course by logging into your Blackboard course and clicking the link to the course content (Apex link inside the course).

Contacting Your Instructor

You may contact your instructor through the Blackboard messaging system. Technical support is available 24/7 at TTU K-12.

Course Objectives

After completing this course, you should be able to:

1. conduct investigations using safe, environmentally appropriate, and ethical practices;
2. use a systematic approach to answer scientific laboratory and field investigative questions;
3. use critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom;
4. know and apply the laws governing motion in a variety of situations;
5. understand the nature of forces in the physical world; and
6. understand that changes occur within a physical system and apply the laws of conservation of energy and momentum.

PHYSICS I addresses the required Texas Essential Knowledge and Skills (TEKS). These can be found at the Texas Education Agency website.

Textbook and Materials

Textbook(s)

- No required textbooks
- All course material is found within the Blackboard course

Materials

- No additional materials are required.

Technical Requirements

- Internet access – preferably high speed (for accessing Blackboard)
- Email
- Word processing software such as Microsoft Word
- Adobe Reader (download from Adobe.com)
- Audio and video capabilities (for watching/listening to course content)

Technical Skill Requirements

Be comfortable with the following:

- using a word processor
- Internet search engines and browsers

Course Organization

This course consists of five units with corresponding practice activities, labs, end-of-unit questions, unit quizzes, and a final exam. All lessons will be submitted electronically.

Each lesson contains the following:

- Introduction and Instructions
- Learning Objectives and Curriculum Standards
- Learning Activities
- Assignments

Each lesson includes several activities that present content knowledge. Each lesson also includes multiple graded assignments to ensure that you learn the content that has been presented in the activities. Some of the assignments are automatically-graded quizzes, and some are written assignments or activities that your instructor will grade. Be sure you read all instructions carefully and ask your instructor for help if something is not clear.

Course Outline

Please note that some assignments will be hidden from you when you start the course. As you move through the lessons and complete assignments, more will unlock for you. Items with an asterisk (*) indicate that these are summative assessments for the course.

Unit	Topic	Approximate Time for Completion
Unit 1	Introduction to Physics	Three weeks
Lesson 1	The Process of Science	
Lesson 2	Math in Physics	
Lesson 3	Math for Motion	
Lesson 4	Doing Science: Intro to Physics	
Lesson 5	Wrap-Up	
Unit 2	Energy	Three weeks
Lesson 1	Energy and Forces	
Lesson 2	Conservation of Energy	
Lesson 3	Useful Energy	
Lesson 4	Doing Science: Energy	
Lesson 5	Wrap-Up	
Unit 3	Kinematics	Three weeks

Unit	Topic	Approximate Time for Completion
Lesson 1	Displacement, Velocity, & Acceleration	
Lesson 2	Nonlinear Motion	
Lesson 3	Doing Science: Kinematics	
Lesson 4	Wrap-Up	
Midterm Exam	*Midterm Exam	
	Covers Units 1-3	
Unit 4	Dynamics	Three weeks
Lesson 1	Force and Motion	
Lesson 2	Calculations with Forces	
Lesson 3	Doing Science: Dynamics	
Lesson 4	Wrap-Up	
Unit 5	Momentum and Gravitation	Three weeks
Lesson 1	Momentum	
Lesson 2	Harmonic Motion	
Lesson 3	Planetary Physics	
Lesson 4	Doing Science: Momentum & Gravitation	
Lesson 5	Wrap-Up	
Unit 6	Semester Review & Wrap-Up	Three weeks
Lesson 1	Review – Semester 1	
Final Exam	*Final Exam (Covers Units 1-5)	

Course Detailed Description

1. Unit Overview: Introduction to Physics

1.1. Lesson Overview: The Process of Science

1.1.1. Study: The Nature of Physics

Learn what is and is not science; what the study of physics is; tools used by scientists; and the role of science in society.

Duration: 45 mins

1.1.2. Quiz: The Nature of Physics

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

1.1.3. Study: Scientific Methods

Learn about designing and performing experiments and collecting data.

Duration: 45 mins

1.1.4. Quiz: Scientific Methods

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

1.1.5. Journal: Pseudoscience Around You

Write about topics in physics that connect to daily life.

Duration: 40 mins; Scoring: 20 points

1.2. Lesson Overview: Math in Physics

1.2.1. Study: Algebra in Physics

Review basic algebra skills.

Duration: 45 mins

1.2.2. Quiz: Algebra in Physics

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

1.2.3. Study: Units and Measurement

Review the usefulness of using units in scientific measurement; learn about significant figures and measurement error; learn about SI units; convert between units.

Duration: 45 mins

1.2.4. Quiz: Units and Measurement

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

1.2.5. Study: Graphing

Learn about different types of graphs and their suitability for sets of data; learn how to graph data as well as interpolate and extrapolate data based on a graph.

Duration: 45 mins

1.2.6. Quiz: Graphing

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

1.3. Lesson Overview: Math for Motion

1.3.1. Study: Introduction to Vectors

Learn the difference between scalar and vector quantities and how to use vectors appropriately.

Duration: 45 mins

1.3.2. Quiz: Introduction to Vectors

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

1.3.3. Study: Vector Operations

Learn how to add vector quantities by resolving into their components.
Duration: 45 mins

1.3.4. Quiz: Vector Operations
Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

1.3.5. Study: Trigonometry
Learn how trigonometry is applied to physics problems involving angles.
Duration: 45 mins

1.3.6. Quiz: Trigonometry
Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

1.3.7. Practice: Introduction to Physics
Practice problem-solving skills related to concepts in the lesson.
Duration: 1 hr 30 mins; Scoring: 25 points

1.4. Lesson Overview: Doing Science: Introduction to Physics

1.4.1. Study: Physics and the World
Learn about the process of scientific inquiry.
Duration: 40 mins

1.4.2. Quiz: Physics and the World
Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

1.4.3. Lab: Measuring and Estimating
Use scientific methods and skills to perform a lab experiment.
Duration: 1 hr 30 mins; Scoring: 50 points

1.4.4. Discuss: Measuring and Estimating Lab
Discuss the results of your lab.
Duration: 20 mins; Scoring: 15 points

1.5. Lesson Overview: Introduction to Physics Wrap-Up

1.5.1. Review: Unit Review
Prepare for the unit test by reviewing key concepts and skills.
Duration: 30 mins

Unit 1 Checklist Assignment – to be completed in Blackboard

Unit 1 Test – to be completed in Blackboard

2. Unit Overview: Energy

2.1. Lesson Overview: Energy and Forces

2.1.1. Study: Types of Energy
Learn about different types of energy and examples of each type.
Duration: 45 mins

2.1.2. Quiz: Types of Energy

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.1.3. Study: Forces

Learn about the four fundamental forces and how the strengths of the different forces vary with distance.

Duration: 45 mins

2.1.4. Quiz: Forces

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.2. Lesson Overview: Conservation of Energy

2.2.1. Study: Calculating Energy

Learn how to calculate the kinetic energy of a moving object and the potential energy of a system; learn how temperature is related to the kinetic energy of molecules.

Duration: 45 mins

2.2.2. Quiz: Calculating Energy

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.2.3. Study: Conservation of Energy

Learn how energy transforms and is conserved in simple and complex systems; learn how to perform calculations that illustrate the law of conservation of energy.

Duration: 45 mins

2.2.4. Quiz: Conservation of Energy

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.2.5. Journal: Energy and You

Write about topics in physics that connect to daily life.

Duration: 40 mins; Scoring: 20 points

2.3. Lesson Overview: Useful Energy

2.3.1. Study: Work and Power

Learn how to differentiate between energy and work and between work and power; learn how to calculate work done and power produced in simple systems.

Duration: 45 mins

2.3.2. Quiz: Work and Power

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.3.3. Study: Machines and Efficiency

Learn about different types of simple machines and their mechanical advantages; learn how to calculate work done by simple machines.

Duration: 45 mins

2.3.4. Quiz: Machines and Efficiency

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.3.5. Study: Energy and Sustainability

Learn about the advantages and disadvantages of different energy sources; learn how to apply scientific reasoning to analyze socially relevant energy issues.

Duration: 45 mins

2.3.6. Quiz: Energy and Sustainability

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.3.7. Practice: Energy

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 30 mins; Scoring: 25 points

2.4. Lesson Overview: Doing Science: Energy

2.4.1. Study: Physics Experiments

Learn about the process of scientific inquiry.

Duration: 40 mins

2.4.2. Quiz: Physics Experiments

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

2.4.3. Lab: Conservation of Energy

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins; Scoring: 50 points

2.4.4. Discuss: Conservation of Energy Lab

Discuss the results of your lab.

Duration: 20 mins; Scoring: 15 points

2.5. Lesson Overview: Energy Wrap-Up

2.5.1. Review: Unit Review

Prepare for the unit test by reviewing key concepts and skills.

Duration: 30 mins

Unit 2 Checklist Assignment – to be completed in Blackboard

Unit 2 Test – to be completed in Blackboard

3. Unit Overview: Kinematics

3.1. Lesson Overview: Displacement, Velocity, and Acceleration

3.1.1. Study: Displacement and Velocity

Learn how to solve problems involving distance; speed; time; and velocity; learn how to draw and interpret a position-time graph.

Duration: 45 mins

3.1.2. Quiz: Displacement and Velocity

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

3.1.3. Study: Acceleration

Learn how to solve problems involving acceleration; learn how acceleration relates to velocity; to displacement; and to time.
Duration: 45 mins

3.1.4. Quiz: Acceleration

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

3.1.5. Study: Free Fall

Learn how to solve problems involving the force of gravity acting on an object.
Duration: 45 mins

3.1.6. Quiz: Free Fall

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

3.1.7. Journal: Vectors and Motion

Write about topics in physics that connect to daily life.
Duration: 40 mins; Scoring: 20 points

3.2. Lesson Overview: Nonlinear Motion

3.2.1. Study: Projectile Motion

Learn how to solve problems involving two-dimensional trajectories.
Duration: 45 mins

3.2.2. Quiz: Projectile Motion

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

3.2.3. Study: Circular Motion

Learn how to solve problems involving circular motion.
Duration: 45 mins

3.2.4. Quiz: Circular Motion

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

3.2.5. Study: Relative Motion

Learn about frames of reference; learn how to solve motion problems using a variety of frames of reference.
Duration: 45 mins

3.2.6. Quiz: Relative Motion

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

3.2.7. Practice: Kinematics

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 30 mins; Scoring: 25 points

3.3. Lesson Overview: Doing Science: Kinematics

3.3.1. Study: Organizing and Analyzing Experimental Results

Learn about the process of scientific inquiry.

Duration: 40 mins

3.3.2. Quiz: Organizing and Analyzing Experimental Results

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

3.3.3. Lab: Kinematics

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins; Scoring: 50 points

3.3.4. Discuss: Kinematics Lab

Discuss the results of your lab.

Duration: 20 mins; Scoring: 15 points

3.4. Lesson Overview: Kinematics Wrap-Up

3.4.1. Review: Unit Review

Prepare for the unit test by reviewing key concepts and skills.

Duration: 30 mins

Unit 3 Checklist Assignment – to be completed in Blackboard

Unit 3 Test – to be completed in Blackboard

Midterm Exam (Units 1-3) – to be completed in Blackboard

4. Unit Overview: Dynamics

4.1. Lesson Overview: Force and Motion

4.1.1. Study: Newton's Laws

Learn how Newton's laws can be applied to everyday situations.

Duration: 45 mins

4.1.2. Quiz: Newton's Laws

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

4.1.3. Study: Force Problems

Learn how to construct and interpret free-body diagrams for situations involving both balanced and unbalanced forces.

Duration: 45 mins

4.1.4. Quiz: Force Problems

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

4.2. Lesson Overview: Calculations with Forces

4.2.1. Study: Free-Body Diagrams

Learn how to solve problems using Newton's second law and how to do calculations involving force and work.

Duration: 45 mins

4.2.2. Quiz: Free-Body Diagrams

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

4.2.3. Study: Multiple Forces

Learn how to determine the change of motion of an object acted on by multiple forces; how to solve two-dimensional problems involving balanced forces; and how to calculate the net force on an object.

Duration: 45 mins

4.2.4. Quiz: Multiple Forces

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

4.2.5. Study: Friction

Learn how to differentiate between static and kinetic friction and how to solve problems involving frictional forces.

Duration: 45 mins

4.2.6. Quiz: Friction

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

4.2.7. Journal: Friction and You

Write about topics in physics that connect to daily life.

Duration: 40 mins; Scoring: 20 points

4.2.8. Practice: Dynamics

Practice problem-solving skills related to concepts in the lesson.

Duration: 1 hr 30 mins; Scoring: 25 points

4.3. Lesson Overview: Doing Science: Dynamics

4.3.1. Study: Errors in Experiments

Learn about the process of scientific inquiry.

Duration: 40 mins

4.3.2. Quiz: Errors in Experiments

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

4.3.3. Lab: Force of Friction

Use scientific methods and skills to perform a lab experiment.

Duration: 1 hr 30 mins; Scoring: 50 points

4.3.4. Discuss: Force of Friction Lab

Discuss the results of your lab.

Duration: 20 mins; Scoring: 15 points

4.4. Lesson Overview: Dynamics Wrap-Up

4.4.1. Review: Unit Review

Prepare for the unit test by reviewing key concepts and skills.

Duration: 30 mins

Unit 4 Checklist Assignment – to be completed in Blackboard

Unit 4 Test – to be completed in Blackboard

5. Unit Overview: Momentum and Gravitation

5.1. Lesson Overview: Momentum

5.1.1. Study: Momentum

Learn how to differentiate between force and energy and between energy and momentum; learn how to calculate the momentum of a mechanical system.

Duration: 45 mins

5.1.2. Quiz: Momentum

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

5.1.3. Study: Conservation of Momentum

Learn how to solve problems involving conservation of momentum and elastic/inelastic collision situations.

Duration: 45 mins

5.1.4. Quiz: Conservation of Momentum

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

5.2. Lesson Overview: Harmonic Motion

5.2.1. Study: Harmonic Motion

Learn how to apply the law of conservation of energy to situations involving harmonic motion and how to perform calculations involving Hooke's law.

Duration: 45 mins

5.2.2. Quiz: Harmonic Motion

Take a quiz to assess your understanding of the material.

Duration: 20 mins; Scoring: 20 points

5.2.3. Journal: Rhythm in Your Life

Write about topics in physics that connect to daily life.

Duration: 40 mins; Scoring: 20 points

5.3. Lesson Overview: Planetary Physics

5.3.1. Study: Orbits

Learn how to describe the motion of satellites and planets and how to solve problems involving the gravitational force between two objects.

Duration: 45 mins

5.3.2. Quiz: Orbits

Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

5.3.3. Practice: Momentum and Gravitation
Practice problem-solving skills related to concepts in the lesson.
Duration: 1 hr 30 mins; Scoring: 25 points

5.4. Lesson Overview: Doing Science: Momentum and Gravitation

5.4.1. Study: Evaluating Scientific Conclusions
Learn about the process of scientific inquiry.
Duration: 40 mins

5.4.2. Quiz: Evaluating Scientific Conclusions
Take a quiz to assess your understanding of the material.
Duration: 20 mins; Scoring: 20 points

5.4.3. Lab: Simple Harmonic Motion
Use scientific methods and skills to perform a lab experiment.
Duration: 1 hr 30 mins; Scoring: 50 points

5.4.4. Discuss: Simple Harmonic Motion Lab
Discuss the results of your lab.
Duration: 20 mins; Scoring: 15 points

5.5. Lesson Overview: Momentum and Gravitation Wrap-Up

5.5.1. Review: Unit Review
Prepare for the unit test by reviewing key concepts and skills.
Duration: 30 mins

Unit 5 Checklist Assignment – to be completed in Blackboard

Unit 5 Test – to be completed in Blackboard

6. Unit Overview: Semester 1 Review and Exam

6.1. Lesson Overview: Semester 1 Review and Exam

6.1.1. Review: Semester 1
Prepare for the final exam by reviewing key concepts and skills.
Duration: 1 hr

Final Exam (Covers Units 1-5) – to be completed in Blackboard

Course Credit

Each lesson will consist of completing and submitting one or more assignments. The **Assignment** sections at the end of each lesson will specifically detail what to complete and submit for each lesson. Assignments may include quizzes (multiple choice, true/false, matching), essay or short answer questions, written assignments, laboratory experiments, and/or offline activities.

The course grade will be calculated as follows:

- 50% coursework average;
- 50% summative assessment average, including the final exam;
- A passing course grade is 70 or higher.

Students must attempt all assignments in the course. The final exam will not be available until all assignments have been accepted and graded by the teacher.

Students who score below 70% on the final exam will be eligible for one re-exam opportunity.

Coursework

The graded assignments within each lesson are formative in nature. This means that they are designed to assist you in applying and demonstrating the lesson concepts, as well as identifying areas in which you need additional review. You may use all the lesson's learning activities to assist you as you complete the graded assignments.

Summative Assessments

Summative assessments are those that allow you to demonstrate mastery of the course objectives. For summative assessments, you will NOT be allowed to use the learning materials. These are opportunities for you to show what you have learned by that point in the course.

Summative assessments may be proctored using the online proctoring system Proctorio. Information about Proctorio is provided in **Remote Proctoring** in the Syllabus section of your course. The summative assessments for this course are as follows:

- Summative Assessments **(20% of Course Grade)**
    - Midterm Exam
- Summative Final Exam **(30% of Course Grade)**

Course Completion

- Students may not complete the course in less than 30 days.
- All courses expire six months after the enrollment date.

Academic Integrity

It is the aim of the faculty of Texas Tech University to foster a spirit of complete honesty and high standard of integrity. The attempt of students to present as their own any work not honestly performed is regarded by the faculty and administration as a most serious offense and renders the offenders liable to serious consequences, possibly suspension.

"Scholastic dishonesty" includes, but is not limited to, cheating, plagiarism, collusion, falsifying academic records, misrepresenting facts, and any act designed to give unfair academic advantage to the student (such as, but not limited to, submission of

essentially the same written assignment for two courses without the prior permission of the instructor) or the attempt to commit such an act.

Student Expectations

You will be expected to log into the Blackboard course regularly to be aware of possible announcements/reminders and to pace your progress in the course.

Students are expected to maintain an online environment conducive to learning, which includes "netiquette" (Internet etiquette). Please review the basic rules for Online Discussion Netiquette. Ensure that your email messages, discussion board postings, and other electronic communications are thoughtful and respectful. Diverse opinions are welcome in this course, and you are expected to demonstrate an open mind and courtesy when responding to the thoughts and ideas of others.

The following are prohibited:

- making offensive remarks in email or the discussion board;
- using inappropriate language or discussing inappropriate topics online;
- spamming;
- hacking;
- using TTU or Blackboard email or discussion boards for commercial purposes;
- using all caps (considered shouting in online communications); and
- cyber-bullying or online harassment of any type.

Inappropriate behavior shall result in consequences ranging from a request to correct the problem, to removal from the course or even the university, depending on the severity of the behavior. Disciplinary actions will be taken according to the TTU K-12 Student Handbook.

Communication

- You can expect a reply from your instructor within 2 business days.
- Use the Blackboard Course Messages tool for sending messages to your instructor.

Submitting Assignments

You will submit all assignments through the Blackboard Assignment Tool, rather than by mail or email.

Technical Difficulties

Getting Help

For student assistance with Blackboard, visit TTU K-12 Support.

Computer Problems

A working computer is necessary for online coursework. Computer problems will not be accepted as a valid reason for failure to complete course activities within the allotted time frame. Identify a second computer, before the course begins, that you can use if you experience computer problems.

Server Problems

When the Blackboard server needs to be taken down for maintenance, the Blackboard administrator will post an announcement in your course informing you of the time and date. If the server experiences unforeseen problems, your course instructor will notify you.

Lost or Corrupted Files

You must keep/save a copy of every project/assignment on an external disk or personal computer. In the event of any kind of technology failure (e.g., Blackboard server crash or virus infection, students' own computer problems, loss of files in cyberspace, etc.) or any disputes, the instructor may request or require you to resubmit the files. In some instances, the instructor may need to open another attempt within Blackboard, so communication with your instructor is critical in these circumstances.