

Lesson Plan: Work & Energy

Lesson Objectives:

By the end of this lesson, students will be able to:

- Define work and potential energy in mechanics.
- Calculate the work done by a force using the force and displacement vectors.
- Explain the concept of gravitational potential energy.
- Apply the work-energy principle to solve problems involving energy conservation.

Lesson Materials:

- Textbook Chapter: Work and Energy (Topic 5 – College Physics by Serway)
- Pre-recorded Lecture Video: Work and Potential Energy (20 minutes)
- Top Hat: Platform for online polling and quizzes.
- Problem Set Online: A series of conceptual and numerical problems on work and energy
- Supplementary Materials: Practice Problems (Hyperphysics Textbook)

Lesson Activities:

Pre-Class:

- Reading Assignment: Students will read the chapter on work and potential energy.
- Pre-recorded Lecture (approx. 20 minutes): Students will watch the introductory video to familiarize themselves with concepts, terminology, and the mathematical definitions of work, the work-energy theorem, and potential energy.

Live Zoom Session (Synchronous):

- Introduction & Review (5 minutes) (student-instructor):
 - Quick review of the last class covering kinetic energy and force.
 - Possible concept quiz.
 - Brief overview of today's learning objectives.
- Interactive Discussion: Defining Work and Potential Energy (15 minutes) (student-student):
 - Students will be split into small breakout rooms to discuss what they understood from the pre-class reading.
 - They will answer the question: "How would you explain work and energy to a kid?"
- Live Problem-Solving: Work Calculation (20 minutes) (student-instructor):
 - Guide students through calculating the work done by a variable force using a simple example (a block being pulled up a cliff or something similar; multiple examples).
 - Students will solve a similar problem individually and share their solution steps with their breakout room.
- Q&A and Concept Clarification (10 minutes) (student-instructor):
 - Open floor for any questions/clarification related to today's topics.

Post-Class:

- Problem Set Submission: Students will complete an online assignment that includes calculations for both work and energy.
- Discussion Board Post: Each student will post a real-world example of work and potential energy, and comment on two other posts by classmates.

Assessment:

Formative Assessment:

- Active participation in breakout room discussions and real-time problem-solving during class.
- Responses to instructor-led questions during class via Top Hat.

Summative Assessment:

- Completion and submission of the problem set, graded based on accuracy and clarity of reasoning.
- Discussion board participation, assessed for relevance and engagement with peers.