Topic 2: Mechanics

Learning Objectives:

1. Understand and apply the concepts of position, displacement, velocity, and acceleration.
2. Master Newton's laws of motion and their applications.
3. Analyze problems involving forces, friction, and tension.
4. Apply the concepts of work, energy, and power to solve problems.
5. Understand and apply the principles of linear momentum and collisions.
6. Analyze circular motion and its applications.
7. Understand simple harmonic motion and its applications.

Pedagogical Approaches:

* Constructivism: Relate the concepts in mechanics to students' everyday experiences.
* Inquiry-Based Learning: Have students investigate motion and forces through experiments and simulations.
* Cognitive Load Theory: Break down complex problems into simpler components.
* Zone of Proximal Development and Scaffolding: Gradually increase the difficulty of problems as students gain mastery.

Real-World Examples and Applications:

* Analyzing the motion of a car or a bicycle.
* Investigating the forces acting on a bridge or an elevator.
* Understanding the energy transformations in a roller coaster ride.

Laboratory Activities:

* Measure the acceleration due to gravity using free-fall experiments.
* Investigate the relationship between force, mass, and acceleration using a dynamics track and carts.
* Analyze collisions using air tracks or motion sensors.

Formative Assessments:

* In-class quizzes, group problem-solving sessions, and peer evaluations.