Course Title: Physics Preparatory Workshop for Engineering Students

Course Overview: This intensive workshop is designed to provide incoming engineering students with a comprehensive review of essential physics concepts. The course will cover topics including systems of units, error analysis, vectors, kinematics (both linear and rotational), and an introduction to derivatives. Emphasis will be placed on hands-on exercises to reinforce understanding and problem-solving skills.

Course Duration: 14 hours

Course Objectives:

1. To review fundamental physics concepts essential for engineering studies.
2. To introduce students to the practical application of physics principles in engineering contexts.
3. To enhance problem-solving skills through exercises related to each topic covered in the workshop.

Course Outline:

Introduction to Systems of Units

- Overview of SI units and their importance in physics and engineering.
- Conversion between different systems of units.
- Practice exercises on unit conversions and dimensional analysis.

Error Analysis in Physical Quantities

- Types of errors and their sources: systematic and random errors.
- Measurement uncertainty and error propagation.
- Practical exercises in error analysis using real-world examples.

Vectors and Vector Operations

- Definition and properties of vectors in cartesian and polar coordinates.
- Vector addition, subtraction, and scalar multiplication.
- Vectorial product.
- Exercises on resolving vectors and vector operations in Cartesian and polar coordinates.

Kinematics: Linear Motion

- Review of displacement, average velocity, and acceleration.
- Instantaneous velocity and acceleration. Velocity and acceleration as derivatives.
- Equations of motion for uniformly accelerated linear motion.

- Problem-solving exercises on linear kinematics.

Kinematics: Rotational Motion

- Introduction to angular displacement, velocity, and acceleration.
- Equations of motion for uniformly accelerated rotational motion.
- Exercises on rotational kinematics and related problem-solving.

Velocity and Introduction to Derivatives and Integrals

- General Introduction to derivatives and their applications in physics.
- Basic exercises on finding derivatives and their interpretations.
- Brief introduction to integrals, e.g., to calculate displacement from a non-uniform velocity.

Review and Application

- Comprehensive review of key concepts covered in the workshop.
- Problem-solving sessions applying physics principles to engineering scenarios.
- Q&A session to address student queries and concerns.

Assessment:

- Weekly quizzes to assess understanding of concepts.
- Participation in hands-on exercises and problem-solving sessions.
- Final assessment based on problem-solving assignments and workshop participation.

Materials:

- Lecture notes and practice problems provided by the instructor.
- Reference materials on physics concepts and problem-solving techniques.
- Calculators and other tools for numerical analysis.

Prerequisites:

- Basic understanding of algebra and trigonometry.

Instructor:

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