Course content

This course provides a comprehensive introduction to the fundamentals of physics, covering key principles from classical mechanics, thermodynamics, and special relativity. It is designed to develop students' ability to identify, analyze, and solve complex engineering problems in the field of computer science by applying mathematical, physical, and computational principles. The course emphasizes the importance of understanding core concepts, scientific methods, and research techniques to solve real-world engineering challenges.

Key topics covered include:

1. Kinematics of particle motion, including reference frames, displacement, acceleration, and uniform motion
2. Newton's laws of motion and their applications, including non-inertial systems and inertial forces
3. Momentum, angular momentum, and related theorems
4. Work, energy, potential energy, and the principle of conservation of mechanical energy
5. Rigid body motion, moment of inertia, and angular momentum conservation
6. Special relativity, Lorentz transformations, and the theory of relativity's implications on mass, energy, and velocity
7. Thermodynamics, including the first and second laws, energy conservation, and the concept of entropy
8. Gas dynamics and the Maxwell distribution law

Course objectives

Knowledge

1. Understand the basic principles of physics, including kinematics, dynamics, thermodynamics, and relativity.
2. Apply mathematical and scientific principles to formulate and solve engineering problems in computer science.
3. Learn the foundations of thermodynamics and statistical mechanics, including energy conservation and the behavior of gases.
4. Explore the effects of special relativity on the motion of objects and its relationship to energy and mass.

Skills

1. Develop the ability to apply physical principles to solve complex computer engineering problems.
2. Use research methods and techniques to gather relevant literature and formulate solutions to real-world issues.
3. Analyze and solve problems involving forces, energy, momentum, and motion using both mathematical and computational tools.
4. Design and conduct experiments to test physical principles and evaluate solutions to engineering challenges.

Competencies

1. Demonstrate the ability to independently and collaboratively identify critical factors in complex engineering problems and propose effective solutions.
2. Apply interdisciplinary knowledge to solve computer science engineering problems through the use of mathematical, scientific, and engineering tools.
3. Communicate complex engineering concepts clearly, both in written reports and verbal presentations, to diverse audiences.
4. Evaluate the effectiveness of different approaches to solving engineering problems, optimizing performance where necessary.