Historically, a set of core concepts—space, time, mass, force, momentum, torque, and angular momentum—were introduced in classical mechanics in order to solve the most famous physics problem, the motion of the planets. The principles of mechanics successfully described many other phenomena encountered in the world. Conservation laws involving energy, momentum and angular momentum provided a second parallel approach to solving many of the same problems. In this course, we will investigate both approaches: Force and conservation laws. Our goal is to develop a conceptual understanding of the core concepts, a familiarity with the experimental verification of our theoretical laws, and an ability to apply the theoretical framework to describe and predict the motions of bodies.
1: Introduction to Classical Mechanics

• 2: Units, Dimensional Analysis, Problem Solving, and Estimation

• 3: Vectors

• 4: One Dimensional Kinematics
5: Two Dimensional Kinematics

6: Circular Motion

7: Newton’s Laws of Motion

8: Applications of Newton’s Second Law
9: Circular Motion Dynamics

- 10: Momentum, System of Particles, and Conservation of Momentum

- 11: Reference Frames

- 12: Momentum and the Flow of Mass
13: Energy, Kinetic Energy, and Work

14: Potential Energy and Conservation of Energy

15: Collision Theory

16: Two Dimensional Rotational Kinematics
17: Two-Dimensional Rotational Dynamics

• 18: Static Equilibrium

• 19: Angular Momentum

• 20: Rigid Body Kinematics About a Fixed Axis
21: Rigid Body Dynamics About a Fixed Axis

22: Three Dimensional Rotations and Gyroscopes

23: Simple Harmonic Motion

24: Physical Pendulums
25: Celestial Mechanics

26: Elastic Properties of Materials

27: Static Fluids

28: Fluid Dynamics
29: Kinetic Theory of Gases

- Back Matter