

**Course title:** Mechanics and heat for chemists (Phys 2031)

**Contact hrs:** 7 hrs (4hr lecture + 3hr tutorial)

**Prerequisite(s):** General Physics (Phys 1011)

### Course Outline

#### 1) VECTORS (2 hrs)

##### 1.1) Vector algebra

##### 1.2) Geometrical & algebraic representation of vectors

##### 1.3) Vector calculus

#### 2) ONE & TWO DIMENSIONAL MOTIONS (5 hrs)

##### 2.1) Average and instantaneous Velocity

##### 2.2) Average and instantaneous Acceleration

##### 2.3) Motion with Constant Acceleration

##### 2.4) Projectile Motion

##### 2.5) Uniform Circular Motion

#### 3) Particle Dynamics (5 hrs)

##### 3.1) Newton's Laws of Motion

##### 3.2) Friction Force

##### 3.3) Application of Newton's Laws

##### 3.4) velocity dependent forces

#### 4) WORK & ENERGY (7 hrs)

##### 4.1) Work done by constant and variable forces

##### 4.2) the work energy theorem

##### 4.3) Conservative and non-conservative forces, conservative force and potential energy,

##### 4.4) Conservation of mechanical energy

##### 4.5) Power

#### 5) Dynamics of System of Particles (8 hrs)

##### 5.1) Linear Momentum and Impulse

##### 5.2) Conservation of Momentum

##### 5.3) system of particles

##### 5.4) Center of mass

##### 5.5) Center of mass of a rigid body

##### 5.6) Motion of system of particles

##### 5.7) Elastic and Inelastic Collision (1 & 2-D)

##### 5.8) Elastic collisions in one-dimension

##### 5.9) Two-dimensional elastic collisions

##### 5.10) Inelastic collisions

##### 5.11) Systems of variable mass

#### 6) Rotation of Rigid Bodies (7 hrs)

##### 6.1) Rotational motion with constant and variable angular accelerations

##### 6.2) Rotational kinetic energy

##### 6.3) Moment of inertia

##### 6.4) Rotational dynamics

##### 6.5) Torque and angular momentum

##### 6.6) Work and Power in Rotational Motion

##### 6.7) Conservation of Angular Momentum

##### 6.8) Relation between linear and angular motions

#### 7) SIMPLE HARMONIC MOTION (3 hrs)

##### 7.1) Energy in Simple Harmonic Motion

##### 7.2) Equations of Simple Harmonic Motion

##### 7.3) Pendulum

##### 7.4) Damped and forced oscillations

##### 7.5) Resonance

#### 8) Heat and Thermodynamics (8 hrs)

##### 8.1) Temperature, Zeroth law of thermodynamics,

##### 8.2) Heat, work, and Internal energy of a thermodynamic system,

##### 8.3) the first law of thermodynamics, and its consequences

##### 8.4) The second law of thermodynamics, Carnot's engine

##### 8.5) Entropy, the third law of thermodynamics, Kinetic theory of gases

### 6. Recommended Text & References

#### Course Textbook

Raymond A. Serway, Physics: For Scientists & Engineers, 6th ed., Thomson Bruke, 2004

#### References

1. Hugh D. Young and Roger A. Freedmann, University Physics with Modern Physics 12th ed., 2008

2. Douglas C. Giancoli, Physics for scientists and engineers, Printice Hall, 4th, 2005

3. Robert Resnick and David Halliday, Fundamentals of Physics Extended, HRW 8th ed., 2008

4. Paul M. Fishbane, Stephene Gasiorowicz, Stephen T. Thornton, Physics for Scientists and Engineers, 3rd ed., 2005