



Addis Ababa Science and Technology University

College of Natural and Social Sciences

Department of Physics

General Physics Course Outline

Course Title and Code: General Physics (Phys 1001)

Credits: 3 Cr.hrs

Contact Hrs.: 2

Tutorial Hrs.: 3

Students' Department: Freshman

Year: 1

Program: Undergraduate

Enrollment: Regular

Academic Year: 2021/22

Semester: II

Instructor's Name: Dr. Mesay Tilahun

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Aims

This course provides science and Engineering students the basic concepts of physics that enable them to understand, describe and explain natural phenomena. Emphasis is laid on general principles and fundamental concepts in measurements, mechanical and thermal interactions, fluid mechanics, electromagnetism, oscillations and waves with applications in various fields of science. The course is based on non-calculus treatment.

Synopsis

The course is organized into 7 chapters. The chapters on mechanics introduce the principles and laws governing the motion of objects and the interaction between them as well as conservation laws. The chapter on heat and temperature discusses the interaction between systems through energy transfer and describes some basic thermal properties of such systems. The chapters on oscillations, waves and optics provide basic concepts of periodic motions, how waves transfer energy from one place to the other, and use the concepts of light rays to explain image formation by mirrors and lenses. Electromagnetism and electronics introduces the basic electric

and magnetic phenomena using the concept of field and treats elementary concepts of semiconductors.

Course Policies:

All students are expected to participate actively during the course time; submit and present the assignments on time and attend the course **at least 85%**.

Course Contents

1. Preliminaries

- 1.1 Physical Quantities and Units of Measurement
- 1.2 Uncertainty in Measurement and Significant Digits
- 1.3 Vectors: composition and resolution
- 1.4 Unit Vectors

2. Kinematics and Dynamics of Particle

- 2.1 Displacement, Velocity and Acceleration in 1D and 2D
- 2.2 Motion with Constant Acceleration
- 2.3 Free Fall Motion
- 2.4 Projectile motion
- 2.5 Particle Dynamics and Planetary Motion
 - 2.5.1 The Concept of Force as a Measure of Interaction
 - 2.5.2 Types of forces
 - 2.5.3 Newton's Laws of Motion and Applications
 - 2.5.4 Circular Motion
 - 2.5.5 Newton's Law of Universal Gravitation and Examples
 - 2.5.6 Kepler's laws, satellites motion and weightlessness
- 2.6 Work, Energy and Linear Momentum
 - 2.6.1 Work and Energy
 - 2.6.2 Linear Momentum
 - 2.6.3 Conservation of Energy and Linear Momentum / Collisions
 - 2.6.4 Power
 - 2.6.5 The Concept of Center of Mass

3. Fluids Mechanics

- 3.1 Properties of Bulk Matter /Stress, Strain/
- 3.2 Density and Pressure in Static Fluids
- 3.3 Buoyant Forces, Archimedes' principle
- 3.4 Moving Fluids and Bernoulli's Equation

4. Heat and Thermodynamics

- 4.1 The Concept of Temperature: Zeroth Law of Thermodynamics
- 4.2 The Concept Heat and Work
- 4.3 Specific Heat and Latent Heat
- 4.4 Heat Transfer Mechanism
- 4.5 Thermal Expansion

4.6 Energy Conservation: First Law of Thermodynamics

5. Oscillations, Waves and Optics

5.1 Simple Harmonic Motion

5.2 The Simple Pendulum

5.3 Wave and Its Characteristics

5.4 Resonance

5.5 Doppler Effect

5.6 Image formation by thin lenses and mirrors

6. Electromagnetism and Electronics

6.1 Coulomb's Law and Electric Fields

6.2 Electric Potential

6.3 Current, Resistance and Ohm's Law

6.4 Electrical Power

6.5 Equivalent Resistance and Kirchhoff's Law

6.6 Magnetic Field and Magnetic Flux

6.7 Electromagnetic Induction

6.8 Insulators, Conductors, Semiconductors

6.9 Diodes / Characteristics Curve

6.10 Transistors

7. Cross Cutting Applications of Physics

7.1 Application in Agriculture

7.1.1 Energy balance concept, energy balance in soils, moisture content, soil densities, soil moisture characteristics

7.2 Physics and Industries

7.2.1 Principle of Motor and generator

7.3 Physics in Health Sciences and Medical Imaging

7.3.1 Radiation and its biological effect, x-ray, MRI, Ultrasound

7.4 Physics and Archeology

7.4.1 Radioactive Dating

7.5 Application in Earth and Space Sciences

7.5.1 Geothermal Energy, Seismometer, Radio and TV communications

7.6 Application in Power Generation

7.6.1 Solar and Wind Energy, Nuclear Power Plants, Hydroelectric power

Teaching Methods:

Gaped Lecture, Discussion, Tutorial, and Demonstration and.

Course Assessments:

Laboratory Works (15%)

Assignments/Quiz (10),

Mid-exam (25)

Course Textbooks

1. General Physics Module

References

- 1] Serway, R. A. and Vuille, C., 2018, College Physics, 11th ed., Cengage Learning, Boston, USA
2. Physics for Scientists and Engineers with Modern Physics by Douglas C. Giancoli
3. University Physics with Modern Physics by Young, freedman and Lewis Ford
4. College Physics by Hugh D. Young Sears Zemansky, 9th edition
5. Herman Cember and Thomas A. Johnson, Introduction to Health Physics, 4th ed., (2008).
6. William R. Hendee and E. Russell Ritenour, Medical Imaging Physics, 4th ed., (2002).
7. Tayal D.C. Basic Electronics. 2nd ed. Himalaya Publishing House Mumbai, (1998).
8. Theraja B.L., R.S. Sedha. Principles of Electronic Devices and Circuits, S.Chand and Company Ltd, New Delhi, (2004).
9. Stacey, Frank D.: Physics of the earth. 2nd ed.,Wiley, 1977.
10. R.B.SINGH, Introduction to modern physics, Volume I, 2nd ed. New Age (2009)