

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD.

APPLIED SCIENCE-I (PHYSICS)

1. RATIONALE :

Science is the foundation for all technician courses. The basic aim of teaching science is to develop in the student the habit of scientific enquiry, ability to establish the cause and effect relationship and logical development of different disciplines.

Thus a good foundation in basic sciences will help the students in their self-development, to cope up with the continuous flow of innovation and discoveries in technology.

2. SCHEME OF TEACHING :

Sr. No.	Name of Topics	Theory Hours
1.	Units & Measurement	3
2.	Surface Tension	3
3.	Sound Waves	7
4.	Optics	4
5.	Radio activity & Nuclear Physics	6
6.	Modern Physics	5
	Total	28

3. OBJECTIVES

1. Understand the System of Units.
 - (i) Define base units
 - (ii) Express derived units in terms of base units.
2. Understand the concept of Wave Motion.
 - (i) Demonstrate sound travells in a medium
 - (ii) Define and distinguish between transverse and longitudinal waves.
 - (iii) Solve problems based on velocity, frequency, wave length, relation.
 - (iv) Explain simple harmonic motion.
 - (v) Understand use of ultrasonic waves in Industries.
 - (vi) Use materials to improve acoustics of buildings.
3. Understand the phenomenon of light.
 - (i) Demonstrate different characteristics of light.
 - (ii) Use lenses to construct optical instruments.

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4. Understand phenomenon of Radio Activity
 - (i) Define radio activity
 - (ii) Describe properties of Alpha, Beta and Gamma rays.
 - (iii) Appreciate that in radio active emission energy is produced.
 - (iv) Gives examples of nuclear fission and nuclear fusion process.
5. Develop awareness about modern topics like X-rays, LASERS, Fluorescence & Phosphorescence.

4. TOPICS & SUB - TOPICS :

TOPIC - 1 UNITS AND MEASUREMENT

03 HRS

- 1.1 Physical Quantities.
- 1.2 Measurement in various systems.
 - 1.2.1 C.G.S.
 - 1.2.2 M.K.S.
 - 1.2.3 S.I.
- 1.3 Basic physical quantities in S.I.
 - 1.3.1 Length
 - 1.3.2 Mass
 - 1.3.3 Time
 - 1.3.4 Current
 - 1.3.5 Temperature
 - 1.3.6 Luminous Intensity
- 1.4 Definitions, Units and Symbols of Basic Physical quantities.
- 1.5 Derived quantities - Definition and Units.
- 1.6 Multiples and Sub-multiples of Standard Units.
- 1.7 Measuring Instruments.
 - 1.7.1 Vernier Callipers.
 - 1.7.2 Micrometer Screw Gauge.
 - 1.7.3 Physical Balance
 - 1.7.4 Determination of Least Count of three instruments.

TOPIC - 2 : SURFACE TENSION

03 HRS

- 2.1 Introduction
- 2.2 Cohesive and Adhesive force
- 2.3 Surface tension
 - 2.3.1 Illustrations of surface tension
 - 2.3.2 Definition, Unit.
 - 2.3.3 Explanation of surface tension by molecular phenomenon.

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- 2.3.4 Effect of temperature on surface tension.
- 2.4 Angle of contact
 - 2.4.1 Definition and illustrations.
- 2.5 Capillary action.
- 2.6 Derivation of expression for surface tension
$$T = \frac{r h \rho g}{2 \cos \theta}$$
 - 2.6.1 Determination of surface tension of a liquid using capillary action.
- 2.7 Relation between surface tension and surface energy of a liquid.
 - 2.7.1 Definition of surface tension in terms of surface energy.
- 2.8 Problems based on surface tension.

TOPIC - 3 : SOUND WAVES

07 HRS

- 3.1 Introduction
- 3.2 Waves
 - 3.2.1 Type of waves
 - Transverse
 - Longitudinal
 - 3.2.2 Distinction between these waves
- 3.3 Definitions - Periodic time, Frequency, Wave Length, Speed of Sound, SHM.
- 3.4 Requirement of medium for propagation of sound waves.
- 3.5 Relation between Velocity, Wave Length & Frequency $V = n\lambda$
 - 3.5.1 Problems based on $V = n\lambda$
- 3.6 Acoustics of building
 - 3.6.1 Importance of Reverberation.
 - 3.6.2 Reverberation time.
 - 3.6.3 Optimum time of Reverberation.
 - 3.6.4 Coefficient of absorption of Sound.
 - 3.6.5 Sabine's formula for Reverberation time
 - 3.6.6 Factors affecting Reverberation time and acoustics of building.
- 3.7 Ultra sonic waves
 - 3.7.1 Definition
 - 3.7.2 Production of ultrasonic waves

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- 3.7.2.1 Magnetostriction method
- 3.7.2.2 Piezo-electric effect method.
- 3.7.3 Application of ultrasonic waves.

TOPIC - 4 : OPTICS

04 HRS

- 4.1 Properties of light.
 - 4.1.1 Electromagnetic waves.
 - 4.1.2 Rectilinear motion
 - 4.1.3 Velocity of light (in vacuum 3×10^8 m/s)
 - 4.1.4 Reflection.
 - 4.1.5 Refraction
 - 4.1.6 Interference
 - 4.1.7 Polarisation
- 4.2 Lenses
 - 4.2.1 Types of Lenses
 - 4.2.2 Definitions
 - 4.2.2.1 Focal Point
 - 4.2.2.2 Optical Centre
 - 4.2.2.3 Focal Length (F)
 - 4.2.2.4 Object Distance (Do)
 - 4.2.2.5 Image Distance (Di)
 - 4.2.2.6 Lens formula $\frac{1}{F} = \frac{1}{Do} + \frac{1}{Di}$
- 4.3 Magnification and Magnifying power.
- 4.4 Uses of Lenses.
- 4.5 Optical Instruments.
 - 4.5.1 Simple Microscope.
 - 4.5.1.1 Magnifying Power.

TOPIC - 5 : RADIOACTIVITY AND NUCLEAR PHYSICS

06 HRS

- 5.1 Radioactivity.
 - 5.1.1 Definition.
 - 5.1.2 Kinds of radioactivity. (Natural & Artificial)
 - 5.1.3 Units of radioactivity.
 - 5.1.4 Laws of radioactivity.
 - 5.1.5 Half Life, Average Life & Decay Constant.

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- 5.2 Radioactive Rays.
 - 5.2.1 Properties and uses of alpha particles
 - 5.2.2 Properties and uses of beta particles.
 - 5.2.3 Properties and uses of gama rays.

- 5.3 Nuclear Physics.
 - 5.3.1 Structure of nucleus.
 - 5.3.2 Mass defect.
 - 5.3.3 Binding Energy.

- 5.4 Nuclear fission.
 - 5.4.1 Phenomenon of fission.
 - 5.4.2 Elements undergoing fission.
 - 5.4.3 Chain reactions and multiple chain reactions.
 - 5.4.4 Application of nuclear fission.

- 5.5 Nuclear fusion.
 - 5.5.1 Phenomenon of fusion.
 - 5.5.2 Elements undergoing fusion.
 - 5.5.3 Application of nuclear fusion.

- 5.6 Nuclear reactor
 - 5.6.1 Uses of nuclear reactor.
 - 5.6.2 Waste disposal of nuclear reactor.

TOPIC - 6 : MODERN PHYSICS

05 HRS

- 6.1 X – Rays.
 - 6.1.1 Production.
 - 6.1.2 Properties.
 - 6.1.3 Applications.

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6.2 LASER

6.2.1 Meaning of LASER.

6.2.2 Production.

6.2.3 Properties.

6.2.4 Applications.

6.3 Fluorescence.

6.3.1 Phenomenon.

6.3.2 Materials.

6.4 Phosphorescence

6.4.1 Phenomenon

6.4.2 Materials

5. SUGGESTIVE INSTRUCTIONAL STRATEGIES :

Sr. No.	Objective Number	Instructional Strategy
1.	1 (ii)	Practice conversion of Derived Units in terms of Base Units
2.	2 (i) 2(ii) 2(iii)	Demonstrate sound does not travel in vacuum. Transparency to (a) Show types of waves phase and phase difference (b) Simple harmonic motion
	2 (ii) 2 (iv)	Show materials used to improve Acoustics of halls, auditoriums
	2 (v)	Film to show ultrasonic waves and its applications.
3.	3 (i)	Demonstrate, (i) rectilinear motion of light reflection (ii) refraction (iii) interference (iv) polarization of light by ripple tank or smoke box.
	3 (ii)	Construct a simple microscope using lens.

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4.	4 (i)	Transparency showing radioactive decay curves, halflife and formation of new element.
	4 (ii)	Show chart related to alpha, beta and gamma ray properly, video or 16mm film on nuclear energy (TTTI)
	4 (iii)	Video 16mm film on chain reaction fission and fusion.
5.	5	Transparencies showing LASER Action stimulation emission popluation inversion etc. Video film on LASER.

6. REFERENCES :

- | | | | |
|----|------------------------|---|-----------------|
| 1. | Principles of Physiscs | — | T.T.T.I. Bhopal |
| 2. | Modern Physics | — | H.G. White |
| 3. | Intermediate Physics | — | D.S. Jog |

7. ASSESSMENT SCHEME :

Sr. No.	Name of Topic	Percentage weightage
1.	Units & Measurement	5
2.	Surface Tension	5
3.	Sound Waves	10
4.	Optics	10
5.	Radio activity & Nuclear Physics	10
6.	Modern Physics	10
Total		50