

ALLIED PHYSICS I

(For B.Sc., Mathematics, Chemistry and Computer Science students)

Course Objective:

This paper introduces the students to the basic concepts of Elasticity, Rotational motion, Heat and thermodynamics, Sound, Optics, Atomic and Nuclear Physics

Learning Outcome:

On the successful completion of the course, students will be able to

- Explore the fundamental concepts of physics
- Import knowledge about the importance of material properties, heat, sound, optics, atomic and nuclear physics.
- Understand the energy involved in nuclear reaction
- Carry out the practical by applying these concepts
- Get depth knowledge of physics in day today life

Lecture:60 Hours

Tutorial:15Hours

Credits:3

UNIT I: Properties of Matter

Young's modulus – Rigidity modulus – Bulk modulus – Poisson's ratio (definition alone) – Bending of beams – Expression for Bending Moment – Determination of Young's Modulus – Uniform and Non-Uniform bending.

Expression for Couple per unit twist – Work done in twisting a wire – Torsional oscillations of a body– Rigidity modulus of a wire and M.I. of a disc by Torsion Pendulum.

UNIT II: Viscosity

Viscosity – Viscous force – Co-efficient of Viscosity – Units and Dimensions – Poiseuille's formula for co-efficient of viscosity of a liquid – determination of co-efficient of viscosity using burette and comparison of Viscosities - Bernoulli's theorem – Statement and proof – Venturi meter – Pitot tube.

UNIT III: Conduction, Convection and Radiation

Specific heat Capacity of Solids and Liquids – Dulong and Petit's law – Newton's law of Cooling – Specific Heat Capacity of a Liquid by Cooling – Thermal Conduction –Coefficient of Thermal Conductivity by Lee's disc Method.

Convention Process – Lapse Rate – Green House Effect – Black Body Radiation – Planck's Radiation Law – Rayleigh Jean's Law, Wien's Displacement Law – Stefan's Law of Radiation. (No Derivations).

UNIT IV: Thermodynamics

Zeroth and I Law of Thermodynamics – II law of Thermodynamics – Carnot’s engine and Carnot’s cycle – Efficiency of a Carnot’s Engine – Entropy – Change in Entropy in Reversible and Irreversible Process – Change in entropy of a perfect gas – Change in Entropy when Ice is converted into steam.

UNIT V: Optics

Interference – Conditions for Interference Maxima and Minima – Air Wedge – Thickness of A Thin Wire – Newton’s Rings – Determination of Wavelength Using Newton’s Rings.

Diffraction – Difference Between Diffraction and Interference – Theory of Transmission Grating – Normal Incidence – Optical Activity – Biot’s Laws – Specific Rotatory Power – Determination of Specific Rotatory Power Using Laurent’s Half Shade Polarimeter.

Books for Study:

1. Properties of matter, Brijlal and Subramanyam , Eurasia Publishing co., New Delhi, III Edition 1983
2. Element of properties of matter, D.S.Mathur , S.Chand & Company Ltd, New Delhi, 10th Edition 1976
3. Heat and Thermodynamics, Brijlal &Subramanyam, S.Chand& Co, 16th Edition 2005
4. Heat and Thermodynamics, D.S. Mathur, Sultan Chand& Sons, 5th Edition 2014.
5. Optics and Spectroscopy, R.Murugesan, S.Chand and co., New Delhi, 6thEdition 2008.
6. A text book of Optics, Subramanyam and Brijlal, S. Chand and co.. New Delhi, 22ndEdition 2004.
7. Optics, Sathya Prakash, Ratan Prakashan Mandhir, New Delhi, VIIthEdition 1990.

ALLIED PHYSICS II

Course Objective:

This paper introduces the student to the basic concepts of current electricity, electronics and digital electronics.

Learning Outcome:

- Acquire knowledge on elementary ideas of electricity and magnetism
- Emphasize the significance of laws involved in electric circuits
- Understand the basics of operational amplifier
- Apply the principles of electronics in day to life
- Apply the characteristics of electronic devices in practicals.

Lecture:60Hours

Tutorial:15Hours

Credits:3

UNIT I: Current Electricity

Ohm's law – Law of resistance in series and parallel – Specific resistance – capacitors – capacitors in serial and parallel – Kirchoff's laws – Wheatstone's network – condition for balance

Carey-Foster's bridge – measurement of resistance – measurement of specific resistance –determination of temperature coefficient of resistance – Potentiometer – calibration of Voltmeter.

UNIT II: Electromagnetism

Electromagnetic Induction – Faraday's laws – Lenz law – Self Inductance – Mutual Inductance – Experimental Determination-Coefficient of Coupling

A.C. Circuits – Mean value – RMS value – Peak value – LCR in series circuit – impedance – resonant frequency – sharpness of resonance.

UNIT III: Atomic and Nuclear Physics

Bohr's atom model – radius energy – Atomic excitation – Ionization potential – Frank and Hertz Method – Nucleus – Nuclear properties – Mass defect – Binding energy.

Radio isotopes – Uses of radio isotopes – Nuclear fusion and Nuclear fission – X-rays – Production – properties –Derivation of Bragg's law – uses of X-raysin industrial and medical fields.

UNIT IV: Analog Electronics

Semiconductor – PN junction diode – Bridge rectifier – Zener diode – Regulated power supply.

Transistor – Working of a transistor – Transistor characteristics: CE Configuration – current gain relationship between α and β – Transistor Characteristics – CE Configuration only – CE amplifier – feedback – Hartley oscillator – Colpitt's oscillator.

UNIT V: Digital Electronics

Number system – Decimal – Binary – Octal and Hexadecimal system – Double Dabble method – Binary addition, subtraction and multiplication– conversion of binary number to octal and hexadecimal numbers and vice versa.

Logic gates – OR, AND, NOT, XOR, NAND and NOR gates – truth tables – Half adder and Full adder circuits – Laws and theorems of Boolean's algebra – De Morgan's theorems.

Books for Study:

1. Electricity and Magnetism – R. Murugesan, S. Chand & co, 2001.
2. Modern Physics – R. Murugesan, S. Chand & co, 1998.
3. Basic Electronics – B.L. Theraja, S. Chand & co, 2003.

ALLIED PHYSICS –PRACTICALS

(At the end of even Semester - Any Fifteen Experiments) Credits:4

1. Young's Modulus by Non-uniform bending using Pin and Microscope
2. Young's Modulus by Non-uniform bending using Optic lever–Scale and telescope
3. Rigidity modulus by Static torsion method.
4. Rigidity modulus by Torsional oscillations without mass
5. Surface tension and Interfacial Surface tension–Drop Weight method
6. Comparison of Viscosities of two liquids–Burette method
7. Specific heat Capacity of a liquid–Half time correction
8. Sonometer–Determination of a.c frequency
9. Newton's rings–Radius of curvature
10. Air wedge–Thickness of a wire.
11. Spectrometer–Grating–Wavelength of Mercury lines–Minimum deviation method
12. Potentiometer–Voltmeter Calibration
13. P.O. Box–Specific resistance
14. B.G.–Figure of Merit (table galvanometer)
15. Construction of AND, OR, NOT gates–using diodes and Transistor
16. Zener Diode–Characteristics
17. NAND gate as a universal gate

Note: Use of Digital Balance Permitted