APPLIED PHYSICS - I

I B. Tech. - I Semester	L	T	P	C
Course Code: A3HS06	3	1	-	3

PREREQUISITES: Fundamentals in Physics and Mathematics.

COURSE OBJECTIVES:

This AP (Applied Physics) subject is common to CSE, ECE, MECH, AERO & IT branches of UG Engineering. At the end of the course the student is expected to

SUMMARIZE THE DIFFERENT TYPES OF ERRORS.

1. Summarize the different types of errors
2. Describe the structures of crystals and study of different X-ray diffraction methods
3. Explain the origin of Electrical and Magnetic properties of various materials
4. Learn the properties of laser light and how it is used in various fields
5. Comparing the different types of imagining and its importance

COURSE OUTCOMES:

Upon successful completion of the course student will able to:

1. Analyze the propagation of errors using different methods
2. Identify and evaluate crystal structures and other properties of the unit cell by diffraction methods
3. Classify various magnetic, dielectric materials properties and can apply knowledge in engineering application
4. Analyze how laser light is more powerful than normal light and how it is used in engineering applications
5. Evaluate the advantages of imaging techniques based on different optical principles

SYLLABUS

UNIT - I **(10 hours)**

Measurements and Errors : Measurand, Accuracy, Precision, Resolution, certainty; Errors - Types of errors and sources of errors -Systematic error, Random error (definitions and examples), Ambiguity error, Dynamic error, Drift, Noise. Errors based on Magnitude- Absolute, Mean absolute, relative and percentage errors with examples. Combination of errors.

Data Analysis - Elements of statistics including bell shaped curve and Variance. Graphical representation of scientific data.

UNIT - II **(08 hours)**

Crystal Structures: Lattice points, Space lattice, Basis, Bravias lattice, unit cell and lattice parameters, Seven Crystal Systems with 14 Bravias lattices , Atomic Radius, Co-ordination Number and Packing Factor of SC, BCC, FCC, Miller Indices, Inter planer spacing of Cubic crystal system.

X-ray Diffraction: Bragg's Law, X-Ray diffraction methods: Laue Method, Powder Method-Merits and demerits.

UNIT – III **(12 hours)**

Dielectric Properties: Electric Dipole, Dipole Moment, Dielectric Constant, Polarizability, Electric Susceptibility, Displacement Vector, Types of polarizations: Electronic, Ionic and Orientation Polarizations and Calculation of Polarizabilities (Electronic & Ionic) -Internal Fields in Solids, Clausius -Mossotti Equation, Piezo-electricity and Ferro- electricity.

Magnetic Properties: Magnetic Permeability, Magnetic Field Intensity, Magnetic Field Induction, Intensity of Magnetization, Magnetic Susceptibility, Origin of Magnetic Moment-Orbital & Spin magnetic moment-Bohr Magnetron, Classification of Dia, Para and Ferro Magnetic Materials on the basis of Magnetic Moment, Hysteresis Curve on the basis of Domain Theory of Ferro Magnetism, Soft and Hard Magnetic Materials, Ferrites and their Applications.

UNIT – IV **(09 hours)**

Fundamentals of Laser: Characteristics of Laser, Energy levels in atoms, radiation matter interaction, absorption of light, spontaneous emission of light, Stimulated emission of light , population of energy levels, Einstein A and B coefficients, Metastable state, population inversion, resonant cavity, excitation mechanisms, Lasing action.

Types of Lasers & Applications: Solid State Laser- Ruby laser, Gas Laser- He-Ne Laser, Semiconductor Laser. Applications of Lasers: Drilling, welding, micro machining, measurement of long distances, in CD write devices & printers.

UNIT – V **(09 hours)**

Optics: Interference – coherence (spatial, temporal). Interference in thin film of uniform thickness (derivation); Diffraction Grating – use as a monochromator.

Imaging Techniques: Classification (visible, IR, electron, magnetic, UV/X-rays, gamma rays, microwaves); Imaging importance, Types of imaging - Microscopes, Telescopes-Working and Calculation of Magnification factors, Camera; Comparative study of different types of imaging with respect to magnification, resolution, image quality, applications.

TEACHING METHODOLOGIES:

1. Animation videos
2. Assignments uploaded in website.
3. Tutorial questions uploaded in website.
4. Handbook uploaded in website.

PRESCRIBED BOOKS:

1. Modern Engineering physics-I & II : S. Chandralingam, K. Vijayakumar, S Chand Co.
2. Engineering Physics : P.K.Palanisamy, Scitech Publishers.
3. Engineering Physics : S.O.Pillai, New age International.
4. Eugene Hecht & A.R Ganesan (2009), Optics, Pearson
5. Bottaccini M.R, E.E. Merill, Instruments and Measurements, Bell and Howell

REFERENCE BOOKS:

1. Solid State Physics: Charles Kittel, Wiley & Sons (Asia) Pvt. Ltd.
2. Fundamentals of physics: Halliday,Resnick,Walker.
3. Francis A.Jenkins, Harvey E. White, Fundamentals of Optics, McGraw Hill