PHYSICS

Course Code: 15BP1101

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3	0	0	3

Course Outcomes:

At the end of the course, the student will be able to

CO 1 Interpolate the knowledge of elastic and acoustic response of materials for various applications.

CO 2 Summarize the basic theories of electrostatics and electromagnetics to solve a variety of problems.

CO 3 Convert the knowledge of basic principles of dielectrics magnetism to design electrical and storage devices

CO 4 Realize the principles of optics in designing optical devices

CO 5 Resolve the discrepancies in classical estimates through quantum principles and classify the solids.

UNIT-I: (9 Lectures)

ELASTIC PROPERTIES OF MATERIALS & ARCHITECTURAL ACOUSTICS

Introduction – classification of stress, strain and Hooke's law – poisson's ratio and relationship between modulus of elasticity – bending of beams – bending moment – Y by cantilever – uniform bending – reverberation and reverberation time – Sabine's law (quantitative treatment) – determination of absorption coefficient by reverberation time method *Factors affecting the acoustics of buildings and their remedies, Method of testing mechanical properties - hardness.*

(Sec: 1.2 to 1.5, 1.9, 1.10, 1.14, 1.15**;** 4.6, 4.61, 4.62, 4.7, 4.8.1, 4.10 of Text book 1).

UNIT–II: (11 Lectures)

ELECTROSTATICS AND ELECTROMAGNETICS

Gradient of a scalar field – divergence & curl of a vector field – *Coulombs law – Electric flux – Gauss law in electrostatics* – differential form of Gauss law, dipole – electric displacement vector, *Magnetic flux – Biot-Savart Law* – Ampere's law, magnetic scalar potential – magnetic vector potential – auxiliary field H **(**Ampere's law in magnetized materials) – Displacement current density – Maxwell's equations in free space – *Significance of Maxwell's equations.*

(Sec: 1.2.2, 1.2.4, 1.2.5**;** 2.1.2, 2.2.1**;** 6.3.1 of Text book 2, 2.20**;** 3.6, 3.7, 3.12, 3.13, 3.14 of Text book 3).

UNIT–III: (9 Lectures)

DIELECTRIC AND MAGNETIC MATERIALS

Dielectric constant and dielectric polarization in materials – dielectric permittivity and susceptibility – types of polarizabilities – electronic polarizability derivation – internal fields (Lorentz fields) in solids, dielectric loss – dielectric strength and *dielectric breakdown*, ferroelectrics, magnetic permeability, and susceptibility, ferrites, *para magnetism – adiabatic demagnetization – dia magnetism, ferro magnetism and hysteresis* – storage devices and memories

(Sec: 20.8, 20.17, 20.18, 20.19, 20.20 of Text book 1, Sec: 33.2, 33.4, 33.6, 33.14, 33.14.1, 33.14.2, 33.18, 33.20, 33.21, 33.24; 34.2, 34.12 of Text book 3).

UNIT–IV: (11 Lectures)

OPTICS & LASERS

Introduction to optics – interference phenomenon – interference through thin films in reflected light – Newton's rings – determination of wave length of a source – Michelson interferometer – diffraction due to single slit – intensity pattern discussion – diffraction grating (Qualitative), resolving power of grating – basic principle of a LASER - induced absorption, spontaneous and stimulated emissions – Einstein's coefficients – population inversion – *Ruby laser, He-Ne laser and Semiconductor laser – Laser Applications.*

(Sec: 6.1, 6.2, 6.7, 6.8.1, 6.8.2, 6.11, 6.11.1 to 6.11.7, 6.13, 6.14**;** 7.5, 7.9, 7.10**;** 24.2, 24.3, 24.5, 24.11.1, 24.11.3, 24.11.5, 24.13 of Text book 3).

UNIT – V: (10 Lectures)

WAVE MECHANICS & BAND THEORY OF SOLIDS

Introduction to wave mechanics – wave function characteristics and significance – Schrodinger's time dependent and independent wave equation – particle in one dimensional rigid box – Bloch theorem (Qualitative), Kronig-Penny model (Qualitative treatment) – concept of effective mass – origin of energy band formation in solids - *Classification of materials in to conductors, semi-conductors and insulators based on band theory.*

(Sec: 20.1, 20.17, 20.18, 20.22**;** 29.3.1, 29.3.2, 29.4, 29.6, 29.7, 29.12 of Text book 3).

Note: Topics in italics are meant for self study

TEXT BOOKS:

1. V. Rajendran, *"Engineering Physics"*, 6th Reprint, TMH Publishing Company, 2013.
2. J. Griffiths, *"Introduction to Electrodynamics"*, 3rd Edition, PHI (EEE series), 2009.
3. M.N. Avadhanulu & P.G. Kshirsagar *"A Text book of Engineering Physics"*, 10th Edition, S. Chand & Company Limited, 2013.

REFERENCES:

1. A.J. Dekker, *"Electrical Engineering Materials"*, 1st Edition, Macmillan Publishers, 2007.
2. C. Kittel, *"Introduction to Solid State Physics"*, John Wiley Publishers, 2007.
3. M.N. Sadiku, *"Elements of Electromagnetics"*, 4th Edition, Oxford University Press, 2007.
4. V. Raghavan, *"Materials Science"*, 5th Edition, PHI Publishers, 2007.

5. R.K. Gaur, S.L. Gupta, *"Engineering Physics"*, 8th Edition, Dhanapat Rai Publishers, 2003.
6. P.K. Palanisamy, *"Applied Physics"*, 2nd Edition, Scitech Publishers, 2010.
7. M. R. Srinivasan, *"Engineering Physics"*, New Age Publishers, 2012.
8. S. Ramamrutham, "Strength of Materials" Dhanapat Rai Publishers, 2014.