PHYSICS
(Common to all branches)

Course Code: 13BP1101

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Course Educational Objectives:

The aim and objective of the course curriculum is to impart learners the basic knowledge that enables effective understanding of various core subjects of engineering branches through principles of physics such as architectural acoustics, wave mechanics, dielectrics, fiber optics, Electromagnetism and so on.

Course Outcomes:

- Students will acquire knowledge of basic physical principles and they can correlate the same to natural environment and social concern.
- Students will be able to apply the knowledge in the selection of materials for various engineering applications.
- Enables students to learn the characteristics and applications of laser devices and enhances information levels on fiber optic communications.
- Enables the students gain a research orientation and innovative spirit.

UNIT-I (10 Lectures)

ELASTIC PROPERTIES OF MATERIALS & ARCHITECTURAL ACOUSTICS:

Introduction – classification of stress, strain and Hooke's law – Elastic behavior of materials – Poisson's ratio and relationship between modulus of elasticity – Twisting couple on a solid shaft – bending of beams – bending moment - Y by cantilever – Uniform bending - Reverberation and reverberation time – absorption coefficient – Sabine's law (quantitative treatment) – Factors affecting the acoustics of buildings and their remedies – Acoustical design of a hall.

UNIT-II (15 Lectures)

ELECTROSTATICS AND DIELECTRICS:

Vectors - unit vectors - Gradient of a scalar field – divergence & curl of a vector field – Coulombs law - Electric flux - Gauss law in electrostatics – differential form of Gauss law – derivation of Coulombs law from Gauss Law – Applications of Gauss Law (Electric Field due to a solid charged sphere and thin sheet of charge) - Gauss law in dielectric medium - Dipole - Electric displacement vector - Dielectric permittivity and susceptibility- Dielectric constant and dielectric polarization in materials - Types of polarizabilities - Electronic polarizability derivation - Internal fields in solids and Claussius - Mosotti equation - frequency dependence of dielectric constant - Dielectric loss - Dielectric Strength and dielectric breakdown - important dielectric materials in electrical engineering.

UNIT-III (10 Lectures)

ELECTROMAGNETICS:

Biot-Savart Law - Magnetic flux – Magnetic scalar potential - Magnetic Vector Potential - Ampere's law – Force and torque on a magnetic dipole due to external magnetic field, Magnetization - Bound volume and surface current densities - auxiliary field H (Ampere's law in magnetized materials) - Magnetic susceptibility and permeability - Force on charged particle under electric and magnetic fields - Faraday's law of electromagnetic induction - Self and mutual Inductances - Displacement current density - Maxwell's equations – Physical Significance of Maxwell's equations.

UNIT-IV (10 Lectures)

WAVE MECHANICS & BAND THEORY OF SOLIDS :

Introduction to wave mechanics – wave particle duality – de-Broglie matter waves – Wave function characteristics and significance – Schrodinger's time independent wave equation – particle in one dimensional rigid box - Fermi-Dirac distribution function – Fermi level - Effect of temperature on Fermi function - 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 number of effective electrons.

UNIT-V (15 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 – Diffraction due to single slit – intensity pattern discussion – Diffraction grating – Resolving Power of grating (qualitative) - Polarization – Law of Malus - Brewster's law – double refraction – Nicol prism - Basic principle of a LASER – Induced absorption, spontaneous and stimulated emissions – Einstein's coefficients – Population inversion – Ruby laser, CO_2 laser and Semiconductor laser – Laser Applications – Introduction to optical fibers – Classification of fibers on the basis of refractive index profile – Acceptance angle and numerical aperture definitions and expression for Numerical aperture – Applications relating to communication and sensors (force and temperature).

TEXT BOOKS:

1. D.J. Griffiths, *"Introduction to Electrodynamics"*, 3rd Edition, PHI (EEE series), 2009.
2. M.N. Avadhanulu, P.G. Kshirasagar, *"A Text book of Engineering Physics"*, 10th Edition, S. Chand & Company Limited, 2013.
3. V. Rajendran, *"Engineering Physics"*, 2011 Edition, TMH Publishing Company, 2011.

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"*, 8^{th} Edition, Dhanapat Rai Publishers, 2003.
6. P.K. Palanisamy, *"Applied Physics"*, 2^{nd} Edition, Scitech Publishers, 2010.
7. M. R. Srinivasan, *"Engineering Physics"*, New Age Publishers, 2012.