K.S.INSTITUTE OF TECHNOLOGY, BANGALORE

(AFFLIATED TO VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM)

DEPARTMENT OF PHYSICS

ENGINEERING PHYSICS

(Common to all Branches)

Course Title: ENGINEERING PHYSICS

Course Code : 18PHY12/22

Credits: 04 **L-T-P : 3-2-0**

Contact Hours/Week : 04 **Total Hours: 50**

Exam. Marks : 60 **IA Marks : 40**

Exam. Hours : 03

MODULE	RBT Levels	No. of Hrs
Module-I: Oscillations and Waves **Oscillations:** Definition of SHM, Derivation of equation of motion for SHM, Mechanical simple harmonic oscillator, Complex notation and Phasor representation of simple harmonic motion, Equation of motion for free oscillations, Natural frequency of oscillations. Damped and Forced oscillations: Theory of Damped Oscillations, over damping, critical damping and underdamping. Quality factor, Theory of forced oscillations and resonance, Sharpness of Resonance: One example of mechanical resonance. **Shock waves:** Mach number, properties of shock waves, control volume, Laws of conservation of mass, energy and momentum, Construction and working of Reddy shock tube Applications of shock waves, applications of shock waves, numericals.	**L1, L2 & L3**	**10**
MODULE-II: Elastic Properties of Materials **Elasticity:** Concept of elasticity, plasticity, stress, strain, tensile stress, shear stress, compressive stress, strain hardening and strain softening, failure (fracture/fatigue), Hooke's law, different elastic moduli: Poisson's ratio, Expression for Young's modulus (Y), Bulk modulus (K) and Rigidity modulus (n) in terms of α and β. Relation between Y, n and K, Limits of Poisson's ratio. **Bending of beams**: Neutral surface and neutral plane, Derivation of expression for bending moment. Bending moment of a beam with circular and rectangular cross section. Single cantilever, derivation of expression for young's' modulus **Torsion of cylinder**: Expression for couple per unit twist of a solid cylinder (Derivation), Torsional pendulum-Expression for period of oscillation. Numerical problems	**L1, L2 & L3**	**10**
MODULE- III: Maxwell's equations and optical fibres **Maxwell's equations:** Fundamentals of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Description of laws of electrostatics, magnetism and Faraday's laws of EMI. Current density & equation of Continuity; displacement current (with derivation) Maxwell's equations in vacuum **EM Waves**: The wave equation in differential form in free space (Derivation of the equation using Maxwell's equations), Plane electromagnetic waves in vacuum, their transverse nature, polarization of EM waves(Qualitative) **Optical fibers:** Propagation mechanism, angle of acceptance. Numerical aperture. Modes of propagation and Types of optical fibers. Attenuation: Causes of attenuation and Mention of expression for attenuation coefficient. Discussion	**L1 & L2**	**10**

of block diagram of point to point communication. Merits and demerits Numerical problems.		
MODULE IV: Quantum Mechanics and Lasers **Quantum Mechanics:** Introduction to Quantum mechanics, Wave nature of particles, Heisenberg's uncertainty principle and applications (non confinement of electron in the nucleus), Schrodinger time independent wave equation, Significance of Wave function, Normalization, Particle in a box, Energy eigen values of a particle in a box and probability densities **Lasers:** Review of spontaneous and stimulated processes, Einstein's coefficients (derivation of expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of CO2 and semiconductor Lasers. Application of Lasers in Defense (Laser range finder) and Engineering (Data storage) ` Numerical problems	**L1, L2 & L3**	**10**
MODULE-V: Materials Science **Quantum Free electron theory of metals:** Review of classical free electron theory, mention of failures. Assumptions of Quantum Free electron theory, Mention of expression for density of states, Fermi-Dirac statistics (qualitative), Fermi factor, Fermi level, Derivation of the expression for Fermi energy, Success of QFET. **Physics of Semiconductor**: Fermi level in intrinsic semiconductors, Expression for concentration of electrons in conduction band, Hole concentration in valance band (only mention the expression), Conductivity of semiconductors(derivation), Hall effect, Expression for Hall coefficient(derivation) **Dielectric materials:** polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation(Derivation), mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers. Numerical problems	**L1, L2 & L3**	**10**

Course outcomes: On completion of this course, students are able to learn

* Build the concept of shock waves; discover the role of shock waves in various fields. Understand the various types of oscillations and their implications.

* Identify the elastic properties of materials; impart the knowledge to understand its engineering applications.

* Obtain the knowledge of Quantum Mechanics; compute Eigen values, Eigen function, momentum of atomic and sub atomic particles.
Apprehend theoretical background of laser, construction and working of different types of lasers and its application in different fields.

* Make use of different theoretical models to study the electrical and thermal properties of materials like conductors, semi conductors and dielectrics to understand its use in engineering applications.

* Establish the interrelation between time varying electric and magnetic field, transverse nature of electromagnetic waves and realize their role in optical fiber communication.

Question paper pattern:
*The question paper will have **ten** full questions carrying equal marks.
*Each full question consisting of **20** marks.
*There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
*Each full question will have sub question covering all the topics under a module.
*The students will have to answer **five** full questions, selecting **one** full question from each module.

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Problem Analysis
3. Life-Long Learning
4. Accomplishment of Complex Problems

Text Books: -

1. M.N. Avadhanulu and P.G. Kshirsagar: A Text book of Engineering Physics, Ed, S. Chand & Company Ltd, New Delhi, 10th revised Ed., 2015.

2. Arthur Beiser: Concepts of Modern Physics, Ed;Tata McGraw Hill Edu Pvt Ltd, 6th Ed,2006

3. David Griffiths: Introduction to Electrodynamics, Cambridge University Press, 4th Ed2017

4. *BB laud: Lasers and Non Linear Optics, New Age International Publishers, 3rd Ed 201*

Reference Books:

1. Gaur and Gupta: Engineering Physics, Dhanpat Rai Publications-2017

2. MK Verma: Introduction to Mechanics, University Press(India) Pvt Ltd, Hyderabad, 2nd Ed, 2009

3. S O Pillai: Solid State Physics, New Age International Publishers, 8th Ed2018

4. Chintoo S Kumar, K Takayama and KPJ Reddy: Shock waves made simple, Willey India Pvt. Ltd. New Delhi2014

Useful websites:

- ocwhttp://semesters.in/engineering-physics-1st-year-syllabus-notes-pdf-btech/

- http://semesters.in/what-is-laser-for-btech-1st-year-physics/
- http://semesters.in/bardeen-cooper-schriffer-bcs-theory-qualitative-notes-for-engineering-physics-btech/
- http://semesters.in/engineering-physics-1st-year-syllabus-notes-pdf-btech/

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