Annexure-II

VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELAGAVI

PROPOSED SYLLABUS FOR 2018-2022

ENGINEERING PHYSICS

(Common to all branches)
[As per Choice Based Credit System (CBCS) scheme]
(Effective from the academic year 2018-19)

Course Code : 18PHY12/22	**CIE Marks : 40**
Contact Hours/Week : 04(3L+1T)	**SEE Marks: 60**
Total Hours:50 (8L+2T per module)	**Exams. Hours: 03**
Semester: I/II	**Credits: 04**

Course Learning Objectives: This course (**18PHY12/22**) will enable students to learn the basic concepts in Physics which are very much essential in understanding and solving engineering related challenges.

MODULES

MODULE-I :

Oscillations and Waves

Simple harmonic motion: Definition of SHM, derivation of equation for SHM, Mechanical and electrical simple harmonic oscillators (mass suspended to spring oscillator, LC and LCR oscillations), complex notation and phasor representation of simple harmonic motion.

Free, damped and forced oscillations: Equation of motion for free oscillations, Natural frequency of oscillations. Theory of damped oscillations: overdamping, critical & under damping, quality factor. Theory of forced oscillations and resonance, Sharpness of resonance. One example each for mechanical and electrical resonance.

Shock waves: Mach number, Properties of Shock waves, control volume. Laws of conservation of mass, energy and momentum. Mention of Rankine-Hugoniot equations. Construction and working of Reddy shock tube, applications of shock waves.

Numerical problems

(RBT Levels L1, L2, L3)

MODULE-II:

Elastic properties of materials:

Elasticity: Concept of stress, strain, tensile stress, shear stress, compressive stress, concept of elasticity, plasticity, 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, expression for bending moment of a beam with circular and rectangular cross section(Derivation). Single cantilever (derivation).

Torsion of cylinder: Expression for couple per unit twist of a solid cylinder (Derivation), Torsional pendulum-Expression for period of oscillation.Numerical problems

(RBT Levels L1, L2, L3)

MODULE- III:

Maxwell's equations, EM waves and Optical fibers

Maxwell's equations: Review of vector calculus. Divergence and curl of electric field and magnetic field (static), Gauss' divergence theorem and Stokes' theorem. Review 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 Derivation of expression for attenuation coefficient, applications of optical fibers. Discussion of block diagram of point to point communication
Numerical problems
(RBT Levels L1, L2)

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, Free particle, and square well potential.
Lasers: Review of spontaneous and stimulated processes, Einstein's coefficients (expression for energy density). Requisites of a Laser system. Conditions for laser action. Principle, Construction and working of Nd-YAG, CO2 and semiconductor Lasers. Application of Lasers in Defense (Laser range finder), Engineering (Data storage) and medicine (LASIK). `
Numerical problems
(RBT Levels L1, L2, L3)

MODULE-V:

Material science

Quantum Free electron theory of metals: Review of classical free electron theory, mention of assumption and failures. Assumptions of Quantum Free electron theory, Derivation of Expression for density of states, Fermi-Dirac statistics (qualitative), Fermi level, Derivation of the expression for Fermi energy, Success of QFET. Comparison between conductors and superconductors, mention of applications of superconductors
Physics of Semiconductor: Fermi level in intrinsic and extrinsic semiconductors, Expression for concentration of electrons in conduction band (Derivation), Hole concentration in valance band (Mention the expression), Intrinsic carrier concentration Conductivity of semiconductors, Hall effect, Expression for Hall coefficient(derivation)
Dielectric materials: polar and non-polar dielectrics, internal fields in a solid, Clausius-Mossotti equation, mention of solid, liquid and gaseous dielectrics with one example each. Application of dielectrics in transformers.
Numerical problems
(RBT Levels L1, L2, L3)

Course Outcomes:
Upon completion of this course, students will be able to

1. Understand various types of oscillations and their implications, the role of Shock waves in various fields
2. Recognize the elastic properties of materials for engineering applications
3. Realize the interrelation between time varying electric field and magnetic field, the transverse nature of the EM waves and their role in optical fiber communication.
4. Compute Eigen values, Eigen functions, momentum of Atomic and subatomic particles using Time independent 1-D Schrodinger's wave equation
5. Apprehend theoretical background of laser, construction and working of different types of laser and its applications in different fields
6. Understand various electrical and thermal properties of materials like conductors, semiconductors and dielectrics using different theoretical models.

Question paper pattern:

Note:- The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 60.

- 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.

Text Books:

1. Oscillations and waves in physics- Ian G. Main: 3rd Ed, Cambridge University Press-1993(online publication 2012)
2. Engineering Mechanics- MK Harbola: , 2nd Ed. Cengage publications, New Delhi, 2009
3. Lasers and Non Linear Optics – BB laud, 3rd Ed, New Age International Publishers 2011
4. Engineering Physics-Gaur and Gupta-Dhanpat rai Publications-2017

Reference books:

1. Introduction to Mechanics — MK Verma: 2nd Ed, University Press(India) Pvt Ltd, Hyderabad 2009
2. O. Svelto, "Principles of Lasers", Springer Science & Business Media, 2010.
3. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
4. Concepts of Modern Physics-Arthur Beiser: 6th Ed;Tata McGraw Hill Edu Pvt Ltd- New Delhi 2006
5. Shock waves made simple- Chintoo S Kumar, K Takayama and KPJ Reddy: Willey India Pvt. Ltd. New Delhi2014
6. Introduction to Electrodynamics- David Griffiths: 4th Ed, Cambridge University Press 2017