COEP TECHNOLOGICAL UNIVERSITY, PUNE
A Unitary Public University of Government of Maharashtra
(formerly College of Engineering Pune)
Department of Physics
School of Transdisciplinary Sciences & Management
Wellesley Road, Chhatrapati Shivajinagar, Pune - 411005.

Course Title: Engineering Physics (EP)

Course Code		**Scheme of Evaluation**	Marks
Teaching Plan (L-T-P-S)=TC	2-0-0-1 = 2	**TA/MSE**	20/30
Credits	2	**ESE**	50

Course Objectives:

1] Apply the concepts of Quantum mechanics to one dimensional motion of electrons.
2] Classify solids on the basis of Band theory and to calculate carrier concentrations.
3] Evaluate the electrical conductivity and identify the type of semiconductor.
4] Implement the fundamentals of LASER for different applications.

Syllabus:

Unit	Contents	Lecture
01.	**Quantum Mechanics** Matter waves, Properties of matter waves, Physical significance of wave function. Schrödinger's time dependent and time independent equations, Operators, Eigen values and Eigen functions, Expectation values, Applications of Schrödinger's equation; Motion of a free particle, Electron in an infinite deep potential well (rigid box),	**7**
02.	**Solid State Physics** Band theory of solids , Energy level splitting in a solid as a function of interatomic distance. Band formation in Silicon. Fermi-Dirac probability function, Nearly free electron theory (E-k curve), classification of solids on the basis of band theory	7
03.	**Semiconductor Physics** Electron and hole concentrations in semiconductors, intrinsic density, intrinsic and Extrinsic conductivity, Position of Fermi level in intrinsic and extrinsic semiconductors, Law of mass action, Charge Neutrality Condition, Temperature variation of carrier concentration in extrinsic semiconductors, Effect of variation of impurity concentration in extrinsic semiconductor, Electrical conduction in extrinsic semiconductor, Hall Effect. **OR** **Mechanical Vibrations** Introduction to Mechanical Vibrations, Equation of motion and its solution, Equivalent stiffness of spring combinations, Natural frequency and time period, concepts of damping and critical damping, Free Vibrations of Un-damped and damped SDOF system.	**7**

04.	**Laser Physics** Introduction to laser, Spontaneous and stimulated emission of radiations, Thermal equilibrium, Condition for Light amplification, Population inversion, Pumping (Three level and four level pumping), Optical resonator, Laser beam characteristics, Ruby laser, Nd-YAG Laser, He-Ne Laser, Semiconductor Laser, Engineering applications of Laser (Fiber optics, Laser material interaction).	**7**

Course outcomes:

Students should be able to

1] apply the concepts of Quantum mechanics to one dimensional motion of electrons.

2] classify solids on the basis of Band theory and to calculate carrier concentrations.

3] evaluate the electrical conductivity and identify the type of semiconductor.

4] implement the fundamentals of LASER for different applications.

Suggested learning resources:

1. Introduction to quantum mechanics / David J. Griffiths
2. A text book of Engineering physics, Avadhanulu and Kshirsagar, S. Chand Pub.
3. Concepts of Modern Physics, Arthur Beiser; Tata McGraw – Hill Edition.
4. Introduction to Solid State Physics, Charles Kittel, Wiley.
5. Solid State Physics, S. O. Pillai, New Age International Publishers.
6. Solid state electronic devices, Ben G. Streetman, Sanjay Banerjee Pearson Prentice-Hall.
7. LASERS Theory and Applications, K. Thyagarajan, A. K. Ghatak; Macmillan India Ltd.
8. Mechanical Vibrations Theory and Applications, Francis S. Tse, Ivan E Morse, Rolland T. Hinkle
9. Mechanical Vibrations, by S S RAO

Course Title: Engineering Physics Laboratory

Course Code		**Scheme of Evaluation**	Marks
Teaching Plan (L-T-P-S)=TC	0-0-2-0 = 1	CA	50
Credits	1	**ESE-** Oral+ Experiment	50

Course Objectives:

- To provide an experimental foundation for the theoretical concepts introduced.
- To achieve hands-on experimental skills and the study of practical applications will bring more confidence.

List of Experiments:

1) Frank-Hertz Experiment
2) Planck's Constant
3) To determine the wavelengths of light of a given source using diffraction grating
4) Band gap of a semiconductor by four probe method
5) Hall effect in Semiconductor
6) Magnetoresistance measurement of semiconductor
7) To determine the reverse saturation current and material constant of PN Junction
8) To determine the dielectric constant of material
9) Study of Biot-Savart's law
10) Measurement of magnetic susceptibility by Quinke's method
11) To find the natural frequency of the spring mass system.
12) Equivalent stiffness of springs in series and parallel
13) Determine the spring constant of a spring by two different methods.

Course Outcomes:

Students should be able to

1) Calculate energy gap, carrier concentration and mobility of the given material.
2) Verify quantum mechanical phenomena.
3) Estimate the size of the object using Laser diffraction.
4) Determine the magnetic susceptibility and dielectric constant of the material.