

**Code: 1BPHCV102****Credits: 3****SEE: 50 Marks****SEE Hours: 3****Course: Applied Physics for Civil Engineering****L:T:P: 2:2:0:0****CIE: 50 Marks****Max. Marks: 100**

Learning objectives	1. Learn the basic principles of Physics pertaining to Engineering field. 2. To understand and explain the concepts of Physics relevant to Engineering and Technology 3. Applying the knowledge of Physics in solving problems.
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Course Outcomes:*On the successful completion of the course, the student will be able to*

COs	Course Outcomes	Bloom's level
CO1	Discuss the fundamental concepts of oscillations, elasticity, modern physics, lasers, optical fibers, and acoustics relevant to structural systems.	Understand
CO2	Apply principles of oscillations, elasticity, and material physics to derive expressions and solve engineering problems in structural applications.	Apply
CO3	Analyze the behavior of physical systems using the concepts of modern physics phenomena, optical technologies, and acoustical properties, in engineering contexts.	Analyze

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		PSO1	PSO2	PSO3
CO1	3	2											3		
CO2	3	2											3		
CO3	3	3											3		

Mapping Strength: Strong– 3 Medium – 2 Low – 1**Course Structure**

Module 1: Oscillations		No. of Lecture Hours	No. of Tutorial Hours
1.1	Simple Harmonic motion (SHM), the differential equation for SHM Vibration of Spring mass system (Derivation), series and parallel combination of springs (derivation), Numericals	1	1
1.2	Theory of damped oscillations (Derivation), Types of damping	1	0
1.3	Theory of forced oscillations (Derivation), amplitude resonance, condition for amplitude resonance.	1	0
1.4	Numerical problems	0	1
1.5	Production of Ultrasonic waves using piezoelectric oscillator,	1	0



	Ultrasonic interferometer,		
1.6	Applications of Ultrasonics: Non Destructive Testing (NDT)	1	1
Module 2: Elasticity			
2.1	Stress-Strain Curve. Elastic Moduli, Poisson's ratio and its limiting values.	1	0
2.2	Relation between Y , n and σ (with derivation), beams, I section girder and their applications	1	1
2.3	Rigid body motion – Moment of Inertia and its expression, Moment of inertia of rectangular plate with axis parallel to one of its sides passing through center. Moment of inertia of a circular disk – axis passing through center perpendicular to plane, about its diameters.	1	1
2.4	Failures of engineering materials - ductile fracture, brittle fracture, stress concentration, fatigue and factors affecting fatigue (only qualitative explanation)	2	0
2.5	Numerical problems.	0	1
Module 3: Modern Physics for Civil Engineers			
3.1	Special theory of relativity: Introduction, Postulates of relativity, Lorentz transformation equations in one dimension, Lorentz - Fitzgerald length contraction,	1	0
3.2	Time dilation, variation of mass with velocity, velocity addition theorem, Einstein's mass energy relation.	1	1
3.3	Application of Special theory of relativity in GPS, Differential GPS	0	1
3.4	Numerical problems.	0	1
3.5	Particle nature of radiation: EM Spectrum, Blackbody radiation spectrum, Wien's law, Rayleigh-Jeans law, Planck's law, reduction of Planck's law to Wien's law, Rayleigh Jeans Law and Stefan's Law	2	1
Module 4: Lasers and Optical Fibers			
4.1	Properties of a LASER Beam, Interaction of radiation with matter: absorption, spontaneous emission and stimulated emission	1	0
4.2	Einstein's coefficients (expression for energy density), Requisites of a Laser system.	1	0
4.3	Condition for Laser action, Principle, Construction and working of Ruby Laser	1	0
4.5	Applications of Laser: LIDAR, Road Profiling, Speed Checker.	1	0
4.6	Numerical Problems.	0	1
4.7	Principle and Construction of Optical Fibers, Acceptance angle and NA,	1	0
4.8	Expression for NA, Modes of Propagation, types of fibers. Attenuation and Fiber Losses, Fiber Optic Displacement Sensor,	1	0



	Fiber Optic Temperature Sensor,		
4.9	Numerical problems.	0	1
Module 5: Acoustics			
5.1	Introduction to acoustics, Types of acoustics, reverberation and reverberation time, Sabine's formula	1	0
5.2	Eyring's formula (no derivation), comparison of Eyring's and Sabine's formula,	1	0
5.3	absorption coefficient, measurement of absorption coefficient, factors affecting the acoustics and remedial measures, requisites for acoustics in auditorium,	1	0
5.4	Noise and its Measurements, Sound Insulation and its measurements. Impact of Noise in Multi-storied buildings	0	1
5.5	Numerical problems	0	1
5.7	Radiometry and Photometry: Radiation quantities, Spectral Quantities, Relation between luminescence and radiant quantities,	1	0
5.8	Reflectance and Transmittance, Photometry: cosine law and inverse square law,	1	0
5.10	Numerical problems.	1	0
Total No. of Lecture Hours		26	-
Total No. of Tutorial Hours			14

Text Books:

1. Concepts of Modern Physics by Arthur Beiser, Shobhit Mahajan & S. Rai Choudhury, TataMcGraw–Hill Publication, 7th Edition, 2017
2. Solid State Physics by S O Pillai, New Age International, 9th Edition, 2020

Reference Books:

1. Photometry Radiometry and Measurements of Optical Losses, MichealBuksthab, Springer, 2nd edition.
2. Engineering Physics by R. K. Gaur and S. L. Gupta, 2010 edition, Dhanpat Rai Publications Ltd., New Delhi-110002.
3. A textbook of Engineering Physics by M .N. Avadhanulu, P G. Kshirsagar and T V S Arun Murthy, Eleventh edition, S Chand and Company Ltd. New Delhi-110055.
4. Laboratory manual for Engineering Physics Lab by Department of Physics, NIE, Mysuru.

Online Resources**Web links:**

Simple Harmonic motion: <https://www.youtube.com/watch?v=k2FvSzWeVxQ>

Stress-strain curves: <https://web.mit.edu/course/3/3.11/www/modules/ss.pdf>

Stress curves: <https://www.youtube.com/watch?v=f08Y39UiC-o>

Oscillations and waves : <https://openstax.org/books/college-physics-2e>

Acoustics: <https://www.youtube.com/watch?v=fHBPvMDFyO8>

Modern Physics & Semiconductors: <https://nptel.ac.in/courses/122/101/122101002/#>



Department YouTube Channel:

https://www.youtube.com/channel/UC6_wc9qDjUU6EBicaTeckjQ

Virtual labs: <https://www.vlab.co.in/>

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

<http://nptel.ac.in>

<https://swayam.gov.in>

https://virtuallabs.merlot.org/vl_physics.html

<https://phet.colorado.edu>

<https://www.myphysicslab.com>