

MECH/CIVIL

Course Title	ENGINEERING PHYSICS
Course Code	EP103
Course Credit	Lecture : 02
	Practical : 01
	Tutorial : 00
	Total : 03

Course Learning Outcomes :

After Successful completion of the above course, students will be able to:

- **Understand** the physical quantities and their units in Engineering.
- **Illustrate** the role of Physics in science and society to observe the connections between current science events and physical phenomena.
- **Apply** the basic laws of physics in various areas of Engineering.
- **Analyze** principles of Physics for new and unfamiliar problems of engineering.

Detailed Syllabus

Sr. No.	Name of chapter & Details	Hours Allotted
SECTION-I		
1	Elasticity <ul style="list-style-type: none"> • Introduction to stress, strain, elasticity and Hooke's Law. • Young Modulus, Bulk Modulus and Modulus of rigidity. • Tensile and Shear Stress. Elastic limit. 	2
2	Waves <ul style="list-style-type: none"> • Classification of Waves. • Introduction, Classification and Characteristics of Sound. • Absorption coefficient and sound absorbing material. • Reverberation, Reverberation time and use of Sabine's formula. • Factors affecting acoustic of building and their remedies. • Ultrasonic waves: Introduction. Properties, production and detection. • Determination of velocity of ultrasonic waves in liquids & Applications. 	6

3	Crystal Physics <ul style="list-style-type: none"> • Classification of Solids: Crystalline and Amorphous. • Number of atoms, Atomic Radius and Atomic Packing Factor in Cubic Cell. • Miller indices in Cubic Cell. • Bragg's Law and its applications. 	4
4	Superconductors <ul style="list-style-type: none"> • Introduction to superconductivity. • Properties of superconductors. • Type-I and Type-II superconductors. • High Temperature super conductors and Applications 	2
Total		14
SECTION-II		
5	Thermal and Electrical Conduction <ul style="list-style-type: none"> • Introduction to thermal Conduction, convection and radiation. • Newton's law of cooling for Specific Heat of liquid. • Free electron theory of metals: Electrical conductivity and Thermal conductivity. • Wiedemann-Franz law and its application. • Thermoelectricity: Seebeck Effect, Thermoelectric power and Thermocouple 	3
6	Modern Physics <ul style="list-style-type: none"> • X-rays: Origin of x-ray, production, properties and applications • Introduction to LASER: Einstein coefficients. • Properties of LASER. Population inversion and pumping. • Production of LASER: Semiconductor laser, Nd-YAG laser, CO₂ laser. • Applications of LASER 	5
7	Advanced Engineering Materials <ul style="list-style-type: none"> • Introduction to metallic glasses. Properties, types, preparation and applications. • Nano-materials: Introduction about nano-technology, properties, preparation methods and applications. • Shape Memory Alloys: Shape memory effect, Pseudo-elasticity, applications. 	3

8	Testing and Analysis Methods <ul style="list-style-type: none"> • Objectives of Non Destructive Testing methods. • Various NDT methods: Liquid (Dye) Penetration Test, X-ray Radiography and Fluoroscopy, Ultrasonic Inspection Test. • Scanning Electron Microscopy and Transmission Electron Microscopy. 	3
Total		14

Instructional Method and Pedagogy:

- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Assignments based on course content will be given to the students at the end of each unit/topic and will be evaluated at regular interval.
- Surprise tests/Quizzes/Seminar/Tutorials will be conducted.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Minimum ten experiments shall be there in the laboratory related to course contents.

Reference Books:

1. Arthur Beiser, "Concepts of Modern Physics" Tata Mc-Graw Hill Co. Ltd (2003)
2. Ajoy Ghatak, "Optics" Tata Mc-Graw Hill Co. Ltd (2008)
3. Anuradha, "Optical Fibre & Laser" New Age publication (2009)
4. Halliday, Resnick & Walker, "Fundamental of Physics" John Wiley & Sons, Inc. (2005)
5. M. Ali Omar, "Elementary Solid State Physics" Pearson Education Inc. (1999)
6. Edward Hughes & Christopher Hughes, "Engineering Science" Longman publication (1994)
7. Engineering Physics- Abhijit Nayak; S.K. Kataria & Sons publication, New Delhi (2009)
8. "Oxford Physics Dictionary", 6th Ed. Oxford University Press (2009)

Additional Resources

- <http://www.physicsclassroom.com>
- <http://www.wikipedia.org>
- <http://www.cap.ca>
- <http://focus.aps.org/>
- N.P.T.E.L. Video Lecture Series
- N.I.T.T.I. Instructional Resources Videos.

List of Experiments:

1. **Calculate** the corrected length of the air gap (L) for 1st resonance for different frequencies using Resonance Tube apparatus.
2. **Calculate** the velocity of sound from 1st resonance using Resonance Tube apparatus.
3. **Differentiate** position-A and position-B using Melde's method for frequency of a tuning fork.
4. **Examine** wattage of the bulb in the circuit.
5. **Calculate** the temperature of the tungsten filament of the bulb.
6. **Make** Ammeter of a desired range from Galvanometer.
7. **Make** Voltmeter of a desired range from Galvanometer.
8. **Test** characteristic of a P-N junction diode.
9. **Test** characteristics of a Zener diode.
10. **Analyze** characteristic of a Light Emitting Diode (LED).
11. **Estimate** the thermo emf generated in a thermocouple.
12. **Calculate** the specific heat of a given liquid by using the Newton's law of cooling apparatus.
13. **Illustrate** the dispersive power (D) of the Prism using spectrometer.
14. **Locate** the green wavelength of visible spectrum using spectrometer.
15. **Design** of any small project (e.g. A hydraulic jack on the principle of Pascal's law)