Subject Code: 01GS2101
Subject Name: Engineering Physics (Semester I/ II)
Branch: (B. Tech of Civil, Mechanical and Automobile)

Objective: To provide knowledge of basic concepts to resolve many engineering and technological problems.

Credits Earned:4

Course Outcomes: After completion of this course, student will have:

- Obtain knowledge about various Non-Destructive-Testing methods and use it in various engineering fields.
- Acquire knowledge about various crystal structures and important properties of different materials.
- Understand basic properties of superconducting materials and check its industrial applications.
- Prepare Nano materials and use it for various engineering applications.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
3	0	2	4	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
1	**Properties of Matter:** Elasticity:Deforming force, restoring force, elastic and plastic body, stress and strain ,Hooke's law, Classification of elastic modulus, Poisson's Ratio, Relation between elastic moduli, Twisting couple on wire, Torsional pendulum Viscosity: Newton's law of viscosity, Reynolds Number, Poiseuille's law, Determination of viscosity by Poiseuille's apparatus, Comparisons of kinematic viscosities by Oswald viscometer Surface Tension: surface tension force and work done by surface tension, Adhesive and Cohesive forces, Liquid drop under equilibrium and angle of contact, Capillary effect and measurement of surface tension by capillarity	12

2	**Non-Destructive Testing**: Visual inspection, Eddy current testing: principle, advantages and disadvantages, factors affecting eddy current response, limitations and types of probes. Liquid penetrant testing: introduction, principle, equipment, procedures, limitations. Radiographic testing: X-ray and gamma ray radiography, principle, equipment and methodology, radiographic exposure factors, image quality, limitations and radiation hazards.	8
3	**Crystal structure:** Unit cell, Bravais lattice, cubic system, number of atoms per unit cell, coordination number, atomic radius, packing density, relation between lattice constant and density, lattice planes and Miller indices, Interplaner spacing for cubic system, X-ray, Bragg's law	8
4	**Superconductivity:** Introduction of Superconductivity, Properties of superconductor, Effect of magnetic field, Meissner effect, Pressure effect, Impurity effect, Isotopic mass effect, Mechanism of Superconductivity, Josephson's junction and its application, Application of superconductors	8
5	**Lasers:** Properties of Laser, Einstein's theory of matter radiation : A and B coefficients, Amplification of light by population inversion, Different types of lasers, gas lasers (He-Ne) solid-state lasers(ruby), Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles, Applications of lasers in science, engineering and medicine.	8
6	**Nano-Physics:** Introduction of Nano scale, Surface to volume ratio, Synthesis of Nano materials: Top-down; Ball milling, lithography, erosion, Bottom-up; PVD, CVD, PECVD, and sol-gel methods, Structure and types of Carbon Nano tube, Synthesis of CNT; Electrical arc method, CVD, Laser ablation, Properties and applications of CNT, Properties and applications of Nano materials.	10
7	**Basic Quantum Mechanics :** Inadequacy of Classical Mechanics, Introduction to quantum physics, black body radiation, explanation using the photon concept, photoelectric effect: Stopping Potential, Work Function, Compton Effect, Wave nature of matter.	6
	Total Hours	60

References:

1. Engineering Physics by Dattu R. Joshi,Tata McGraw- Hill,New Delih,2010.
2. Fundamentals of Physics by Halliday and Resnick, - Wiley.
3. Quantum Mechanics by Richard Robinett,
4. Introduction to Solid State Physics by Charles Kittel, Wiley India Pvt. Ltd, 7thed.
5. Nanoscience and Nanotechnology by K. K. Chattopadhyay and A. N. Banerjee PHI

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyse	Evaluate	Create
20%	20%	35%	10%	10%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, case studies etc.
b. The internal evaluation will be done on the basis of continuous evaluation of students in the class-room.
c. Practical examination will be conducted at the end of semester for evaluation of performance of students in classroom.
d. Students will use supplementary resources such as online videos

List of Experiments:

1. To determine the Young's modulus of the material of given beam supported on two knife edges and loaded at the middle point.
2. To determination of surface tension of liquid (water) by capillary tube using travelling microscope.
3. To determine co efficient of **statics friction** of the surface.
4. To determine moment of inertia of a disc about the wire as axis and rigidity of the material of wire **Torsional pendulum.**
5. To determine the restoring force per unit extension of a spiral spring. **(Spring Constant)**
6. To determine **g**, the acceleration of gravity at a particular location. **(kater's Pendulum)**
7. To determine the Young's modulus of elasticity of the material of a given wire using Searle's apparatus.

8. To calculate the hkl parameter of given material by power X software.
9. To determine the thermal conductivity of rubber tube.
10. To determine the wavelength of laser light with a diffraction grating.
11. To study & determine the wavelength of monochromatic light using Newton's ring.
12. To calculate the velocity of ultrasonic sound through different liquid media.(Vlab)