LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Civil Engineering (709)

Bachelor of Engineering (B.E.) – Semester – I

Course Code:	017091102
Course Name:	Physics
Category of Course:	Basic Science Course (BSC)
Prerequisite Course:	---

Teaching Scheme				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
3	0	2	4	30

	Syllabus			
Unit No.	**Topic**	**Prerequisite Topic**	**Successive Topic**	**Teaching Hours**
01	**Basic Physics**			**2 (7%)**
	1.1 Units and dimensions	---	---	
	1.2 Centre of mass	---	Centroid of lines- 1 - Dimensional (017093301- Unit-5.1) Elastic Strain Energy (017093401- Unit-2.1)	
	1.3 Laws of motion (force and inertia)	---	---	
	1.4 Work, energy, power	---	---	
	1.5 Friction and torque	---	Designing rising main and determination of head loss due to friction (017093504-Unit-5.5)	
02	**Properties of Materials**			**4 (13%)**
	2.1 Concept of load, stress, strain	---	Normal/axial stresses- Tensile and Compressive (017093301 - Unit-7.2)	
	2.2 Hooke's law and stress-strain diagram	Concept of Load, stress, strain (017091102-Unit-2.1)	Basics of stress and strain, Hook's Law (017093301- Unit-7.1)	
	2.3 Types of elasticity	---	---	
	2.4 Poisson's ratio and factor of safety	Concept of Load, stress, strain (017091102-Unit-2.1)	Introduction- Strains: Linear, shear, lateral, and volumetric, Modulus of elasticity, Poisson's ratio, Modulus of rigidity and Bulk modulus and relations between them with derivation (017093301 - Unit-9.1)	
	2.5 Mechanical properties	---	---	
	2.6 Factors affecting elasticity	---	---	
03	**Waves and Motion**			**4 (13%)**
	3.1 Types of waves	---	Digital Theodolite, Electronic Distance measurement (017093404 - Unit-9.2)	
	3.2 Simple harmonic motion	---	---	
	3.3 Damped harmonic motion	Simple harmonic motion (017091102-Unit-3.2)	---	
	3.4 Free and forced resonance	---	---	
	3.5 Types of damping	Damped harmonic motion(017091102-Unit-3.3)	---	
04	**Ultrasonics**			**3 (10%)**
	4.1 Definition and properties	Types of waves (017091102-Unit-3.1)	---	
	4.2 Generation methods (magnetostriction and piezoelectric)	---	---	
	4.3 Detection of ultrasonic waves	---	---	
	4.4 Applications- (welding, drilling/cutting, cleaning)	---	---	
05	**Non-Destructive Testing**			**3 (10%)**
	5.1 Definition and objectives of NDT	---	---	
	5.2 Destructive and non-destructive tests	---	---	
	5.3 Types of defects	---	---	
	5.4 Basic equipments in inspection methods	Generation methods (Magnetostriction and Piezoelectric) (017091102-Unit-4.2)	---	
	5.5 Flaw detection system and pulse echo system	Basic equipments in inspection methods (017091102-Unit-5.4)	---	
06	**Laser**			**3 (10%)**
	6.1 Characteristics of Laser	---	---	
	6.2 Einstein's theory	---	---	
	6.3 Basic terms related to laser and three and four level laser	Einstein's theory (017091102-Unit-6.2)	---	
	6.4 Ruby laser and Nd-YAG laser	Basic terms related to laser and three and four level laser (017091102-Unit-6.3)	---	

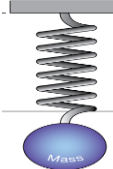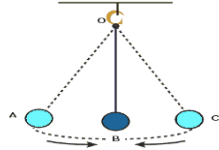|				
	6.5 Applications (Material processing, heat treatment, drilling/cutting, welding)	---	---	
	Pressure Measurement			
	7.1 Barometer	---	Variation of pressure –atmospheric pressure, gauge pressure and vacuum pressure, hydrostatic law, hydrostatic paradox (017093402- Unit-2.1)	
07	7.2 Manometer	---	Types of flow systems (017093504 - Unit-5.1) Types of reservoirs, methods to find the storage capacities (017093504 - Unit-9.3)	**3 (10%)**
	7.3 Pressure gauges and bourdon tube	---	Pressure measuring by different devices (017093402 - Unit-2.3)	
	7.4 Vacuum gauges	---	---	
	7.5 Piezometer (pressure tube)	---	---	
	Basic Mechanics			
	8.1 Friction and types of friction	Friction and torque (017091102 - Unit-1.5)	Designing rising main and determination of head loss due to friction (017093504-Unit-5.5)	
	8.2 Torsion and torsional rigidity	---	---	
08	8.3 Beams and bending of beams	---	Introduction, Types of loads, Types of supports, Types of Beams (017093301 - Unit-3.1)	**3 (10%)**
	8.4 Depression of cantilever	Beams and bending of beams (017091102 - Unit 8.3)	Shear Force (S.F.) and Bending Moment (B.M.) (017093301 - Unit-4.4) Slope and Deflection of Cantilever Beam (017093401 - Unit-3.3) Slope and Deflection of Cantilever Beam (017093401 - Unit-4.3)	
	Acoustics			
	9.1 Introduction and classification of sound	---	---	
	9.2 Characteristics of musical sound	---	---	
	9.3 Absorption coefficient and its measurement	---	---	
09	9.4 Sound absorbing materials	Absorption coefficient and its measurement (017091102 - Unit 9.3)	---	**2 (7%)**
	9.5 Reverberation and reverberation time	---	---	
	9.6 Factors affecting acoustics of building and remedies	---	---	
	Properties of Gases			
	10.1 Gas laws (Boyle's law, Charles law, Avogadro's law)	---	---	
10	10.2 Combined gas law and gas constant	Gas laws (Boyle's law, Charles law, Avogadro's law) (017091102 - Unit-10.1)	---	**3 (10%)**
	10.3 Relation between C_p and C_v	---	---	
	10.4 Various non-flow processes (constant volume, constant pressure, isothermal process)	---	---	
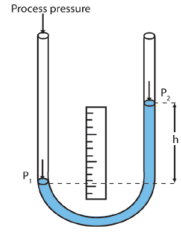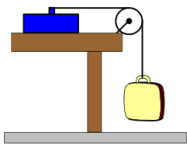
Sr No.	Practical Title	Link to Theory Syllabus
1	To Determine Young's Modulus of Elasticity of the Material of a Given Wire	Unit-2
2	To verify the laws of vibrating stretched string Melde's experiment.	Unit-3
3	To determine the unknown frequency of the tuning fork.	Unit-3
4	To determine (1) Periodic time for bar pendulum (2) To draw resonance curve (3) To find the damping coefficient.	Unit-3
5	To find out the velocity & compressibility of liquid using Ultrasonic Interferometer.	Unit-4
6	To find out the wavelength of LASER source using Diffraction grating.	Unit-6
7	To study the variation in volume (V) with pressure (P) for a sample of air at constant temperature by plotting graphs between P and V, and between P and 1/V.	Unit-7
8	To determine the young's modulus of the material of the given beam by the method of single cantilever.	Unit-8

Major Components/ Equipment

Sr. No.	Component/Equipment
1	Experimental set up, a spirit level, a meter scale, a screw gauge and a Vernier callipers.
2	Melde's apparatus, rubber hammer, thin string, pan, weight box, meter rule.
3	A Resonator, a set of tuning forks, graduated measuring cylinder.
4	Bar pendulum, mass, scale and stop watch.
5	Ultrasonic Interferometer, measuring cell, frequency generator, given liquid.
6	Optical bench, laser source, Optical screen, Double convex lens, Slit and Diffraction grating.
7	Boyle's law apparatus, Fortin's Barometer, Vernier Callipers, thermometer, set square and spirit level.
8	Single cantilever setup, slotted weights, travelling microscope, reading lens and lamp.

Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)

L :	3	T:	0	P:	2

Note : In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage
Theory			MCQ	49%	65
Theory	3		Theory Descriptive	11%	15
Theory			Formulas and Derivation	4%	5
Theory			Numerical	11%	15
Expected Theory %	**75%**	4	**Calculated Theory %**	**75%**	**100**
Practical			Individual Project	0%	0
Practical			Group Project	9%	35
Practical	1		Internal Practical Evaluation (IPE)	16%	65
Practical			Viva	0%	0
Practical			Seminar	0%	0
Expected Practical %	**25%**		**Calculated Practical %**	**25%**	**100**
Overall %	**100%**			**100%**	**200**

Course Outcome

	Upon completion of the course students will be able to
CO1	Gain knowledge of theoretical and mathematical concepts associated with properties of matter.
CO2	Demonstrate understanding the basic principles, properties and applications of associated with Waves, and Motion.
CO3	Demonstrate the understanding of basic objectives, and its applications in NDT along with properties, type and application of Lasers. Also, ability to solve numerical problems related to pressure measurement using various devices.
CO4	Solve numerical problems related to rigidity of the material of the wire and depression of the cantilever beam, understanding the concept of acoustics and factors affecting acoustics of building and their remedies. Also, ability to understand various processes related to first law of thermodynamics.

Suggested Reference Books

1	Engineering Physics by G Vijayakumari, Vikas Publication
2	Engineering Physics by V Rajendran, Mc Graw Hill Education
3	Engineering Physics by Dattu Joshi, Mc Graw Hill Education
4	Physics by Jim Breithaupt, Palgrave foundations
5	Engineering Mechanics by R S Khurmi, S Chand
6	Industrial Instrumentation and control, S.K.Singh, Tata Mc Graw Hill
7	Concept of Physics 1 by H C Verma, Bharati Bhawan Publishers

List of Open Source Software/Learning website

1	http://nptel.ac.in

Real Practical Problem/ Hands on Project		
Sr. No.	**Project List**	**Linked with Unit**
1	There is a well of depth 'd'. You have a bucket of mass 'm'. How much energy will be required to pull the bucket till the top of well? Assume required data.	Unit 01
2	Draw Stress-strain diagram for a basic set-up including elastic spring of any length and weight suspended from it. Assume suitable data.	Unit 02
3	Consider a pendulum that is making certain oscillations per minute. What will be its velocity and acceleration at the centre of oscillation?	Unit 03
4	Discuss how Non-destructive testing is used in quality control. Assume any real time application of your choice.	Unit 04, 05
5	Consider three different applications of laser and design parameters like a) Type of laser to be used b) Mode of laser beam to be used Power requirement for that application	Unit 06
6	Design a U-tube manometer to find out unknown pressure.	Unit 07
7	One end of a light inextensible string is attached to a tool box of mass 'x' kg which is lying on a horizontal table. The string passes over a smooth pulley and is tied at the other end to a bag of mass 'y' kg. If the tool box is just on the point of sliding, find the value of coefficient of friction?	Unit 08
8	Find the reverberation time of your classroom and suggest ways to minimize the effect of reverberation.	Unit 09
9	Pressure of a sealed can is 'x' Pa at a certain temperature. If the temperature of can is increased by 'y' °C, what will be the new pressure in the can?	Unit 10