PHY 101	Engineering Physics	L	T	P	C
		3	0	0	3
Co-requisite:	Single variable calculus (MAT ----)				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	CORE				
Course designed by	Department of Physics				
Approval					

PURPOSE	The course aims to cover the fundamental formalism and applications of Physics. It mainly includes basic Newtonian mechanics, Waves and oscillations, Introduction to thermodynamics, Electricity & magnetism with General properties of maters

LEARNING OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	apply the fundamental concepts of mechanics such as force, energy, momentum etc. more rigorously as needed for further studies in engineering and technology							
2.	students' physical intuition and thinking process through understanding the theory							
3.	model simple mechanical systems by correlating it to the real world practical problems							

Session	Description of Topic	Contact hours	C-D-I-O	IOs	Reference
	UNIT I - Review of Newtonian Mechanics	**9**			
1.	Introduction to Vector and Coordinate systems	1	C		1,2,3
2.	Kinematics: Equations of motion for constant acceleration	1	C-D		1,2,3
3.	Dynamics: Contact forces, Static friction, kinetic friction and worked examples.	1	C-D		1,2,3
4.	Free body force diagram; Applications of Newton's law. Worked examples (i.e. pulley, inclined planes)	1	D-I		1,2,3
5.	Momentum and Impulse, Impulse momentum theorem	1	C-D		1,2,3
6.	Center of Mass: Calculation of Center of mass for complex systems	1	D-I		1,2,3
7.	Work and Kinetic Energy Theorem	1	C-D		1,2,3
8.	Motion at Inclined Plane	1	C-D		1,2,3

9.	Conservation of linear and angular momenta, worked example (Fly wheel)	1	C-D		1,2,3
	UNIT II – Waves, oscillations, optics	**9**			
10.	Simple harmonic motion: simple pendulum, compound pendulum	1	C		1,2,3, 6
11.	Damped and driven harmonic oscillations, Quality factor; electrical equivalent (LCR circuit)	1	C-D		1,2,3, 6
12.	Circular motion in analogy of Simple Harmonic Motion	1	C-D		1,2,3, 6
13.	Longitudinal waves, transverse waves; standing waves	1	C-D		1,2,3, 6
14.	Concept of Electromagnetic waves	1	C-D		1,2,3, 6
15.	Optics: Interference, diffraction (qualitative)	1	C-D		1,2,3, 6
16.	Double slit interference and concept of coherence length	1	D-I		1,2,3, 6
17.	Polarization of light (qualitative)	1	C-D		1,2,3, 6
18.	Concept of Lasers	1	C		1, 2, 3, 6
	UNIT III – Classical thermodynamics	**9**			
19.	Thermodynamic systems and equilibrium: example of ideal gas	1	C		1, 2, 3
20.	Zeroth law of thermodynamics and concept of temperature	1	C-D		1, 2, 3
21.	First law of thermodynamics, internal energy and specific heat	1	D		1, 2, 3
22.	Second law of thermodynamics	1	C-D		1, 2, 3
23.	Entropy, reversibility	1	C-D		1, 2, 3
24.	Application of 1^{st} and 2^{nd} law of thermodynamics	1	I		1, 2, 3
25.	Concept of work and free energies	1	C-D		1, 2, 3
26.	Concept of Phases: Example of phase transitions	1	C-D		1, 2, 3
27.	Black body radiation – Stefan's law	1	C		1, 2, 3
	UNIT IV: REVIEW OF ELECTRO-MAGNETISM	**9**			
28.	Properties of charge and Coulomb's law, calculation of electric field and potential	1	C-D		1, 2, 4, 5
29.	Gauss's law (differential and integral form)	1	C-D		1, 2, 4, 5
30.	Application of Gauss's law (line, plane, spherical symmetry)	1	D-I		1, 2, 4, 5
31.	Dielectrics from the concept of dipole movements in material	1	D-I		1, 2, 4, 5
32.	Fields in parallel plate capacitor with dielectric medium	1	C-D-I		1, 2, 4, 5
33.	Biot-Savart Law for magnetic fields, Magnetic field (circular loop).	1	C-D		1, 2, 4, 5
34.	Ampere's circuital law, Examples – Infinite wire and Solenoid.	1	C-D		1, 2, 4, 5
35.	Lenz's Law, Faraday's law.	1	C-D		1, 2, 4, 5
36.	Maxwell's equations	1	C-D-I		1, 2, 4, 5

	UNIT V: MATERIAL PROPERTIES	**9**			
37.	States of Matter: Solid, Liquid, Gases and Plasma	1	C		1, 2, 3
38.	Mechanical Properties of solids: linear elasticity (Hooke's Law). Elastic moduli.	1	C-D		1, 2, 3
39.	Shear stress and strain. Rigidity modulus	1	C-D		1, 2, 3
40.	Moment of Cantilevers: Young's Modulus	1	C-D-I		1, 2, 3
41.	Bulk and surface properties of liquid – Adhesion, Cohesion	1	C-D		1, 2, 3
42.	Surface Tension	1	C-D		1, 2, 3
43.	Viscosity of liquids	1	C-I		1, 2, 3
44.	Stoke's equation	1	C-D		1, 2, 3
45.	Bernoulli's principle (Quantitative)	1	C-D		1, 2, 3
	Total contact hours	**45**			

LEARNING RESOURCES		
	TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL	
1	University Physics With Modern Physics with Mastering Physics - D Young, Roger A Freedman And Lewis Ford, XII Edition (2018), Publisher – PEARSON	
2	Physics for Scientist and Engineers - Raymond A. Serway, John W. Jewett XIX Edition (2017), Publisher - Cengage India Private Limited	
3	Concept of Modern Physics - Arthur Besier, Shobhit Mahajan, S Rai, 2017 Edition, Publisher - Tata McGraw Hill	
4	Introduction to Electrodynamics – David J. Griffiths; 4th Edition (2012), Publisher - PHI Eastern Economy Editions	
5	Electricity and Magnetism - A S Mahajan and A A Rangwala, Revised of 1 Edition (2001), Publisher - McGraw-Hill	
6	Advanced Engineering Mathematics - Erwin Kreyszig, X Edition (2016), Publisher - Wiley	

Course nature				**Theory**		
Assessment Method – Theory Component (Weightage 100%)						
In-semester	**Assessment tool**	Mid Term I	Mid Term II	CLA I	CLA II	**Total**
	Weightage	**15%**	**15%**	**10%**	**10%**	**50%**
End semester examination Weightage :						**50%**

PHY 101L	Engineering Physics: LABORATORY	L	T	P	C
		0	0	2	1
Co-requisite:	NIL				
Prerequisite:	NIL				
Data Book / Codes/Standards	NIL				
Course Category	CORE				
Course designed by	Department of Physics				
Approval					

PURPOSE	The course aims to cover the applications related to fundamental formalism of Physics. It mainly includes basic Newtonian mechanics, Waves and oscillations, Introduction to thermodynamics, Electricity & magnetism with General properties of maters

LEARNING OBJECTIVES		**STUDENT OUTCOMES**						
At the end of the course, student will be able to								
1.	Understand basic equipment operation and analysis							
2.	Correlate fundamental concept of physics to laboratory experiments							
3.	Origin and analysis of error							

Sl. No	Description of Experiments	Contact hours	C-D-I-O	IOs	Reference
1a	Revisions of Vernier caliper and Screw Gauge measurement methods	1	I-O		1, 2
1b	Plotting experimental data in graphs and error analysis				
2	To determine the moment of inertia of a flywheel	1	I-O		1, 2
3	(a) Measurement of time period for a given compound pendulum with different lengths (b) To determine radius of gyration of a given pendulum	1	I-O		1, 2
4	Verification of Stefan`s Law	1	I-O		1, 2
5	Measurement of specific heat capacity of any given material	1	I-O		1, 2
6	Verify of Hooke's law and to determine spring contact for given spring combinations	1	I-O		1, 2
7	To determine the rigidity modulus of steel wire by torsional oscillations	1	I-O		1, 2
8	To calculate Young's modulus of a given material by deflection method	1	I-O		1, 2
9	(a) To measure the capacitance as a function of area and distance between the plates. b) To determine the dielectric constant of different dielectric materials.	2	I-O		1, 2
10	(a) Measurement of the induced voltage impulse as a function of the velocity of the magnet. b) Calculation of the magnetic flux induced by a	1	I-O		1, 2

	falling magnet as a function of the velocity of the magnet				
11	(a) To study the magnetic field along the axis of a current carrying circular loop. b) To study the dependency of magnetic field on the diameter of coil	1	I-O		1, 2
12	(a) To investigate the spatial distribution of magnetic field between coils and determine the spacing for uniform magnetic field. b) To demonstrate the superposition of the magnetic fields of the two individual coils.	2	I-O		1, 2
13	Study of B-H-Curve To study permeability curve of a given material	1	I-O		1, 2
	Total contact hours (Including demo and repeat labs)	**15**			

LEARNING RESOURCES	
	TEXT BOOKS/REFERENCE BOOKS/OTHER READING MATERIAL
1	Physics for Scientist and Engineers, Ninth edition (2017) - Raymond A. Serway, John W. Jewett (Publisher - Cengage India Private Limited))
2	Physics laboratory manuals

Course nature			**Practical**		
Assessment Method – Practical Component (Weightage 100%)					
In-semester	**Assessment tool**	Lab performance	Practical model exam	Observation note	**Total**
	Weightage	**20%**	**20%**	**10%**	**50%**
End semester examination Weightage :					**50%**