VIDHYADEEP UNIVERSITY
Syllabus of B.Sc. Physics
Minor Subject (According to NEP)
Effective from 2023-2024
SEMESTER-I & II

Teaching & Evaluation Scheme

Course name: (Certificate course in Basic Physics)									Semester I	
Grade System:										
Subject			Teaching Scheme		Examination Scheme		Passing Scheme		Total Marks	
Subject Code	Paper No.	Paper Title	Hours/ week	Credit	Theory		Passing Head			
					Internal	External	Internal	External		
004391121	PHY - I	Mathematical Physics & Newtonian Mechanics	2	2	40	60	14	21	100	
004391122	Practical	Mechanical Properties of Matter	4	2	40	60	14	21	100	

Course name: : (Certificate course in Basic Physics)									Semester II	
Grade System:										
Subject			Teaching Scheme		Examination Scheme		Passing Scheme		Total Marks	
Subject Code	Paper No.	Paper Title	Hours/ week	Credit	Theory		Passing Head			
					Internal	External	Internal	External		
004391221	PHY-II	Electricity and Magnetism	2	2	40	60	14	21	100	
004391222	Practical	Demonstrative Aspects of Electricity & Magnetism	4	2	40	60	14	21	100	

Program Outcome	**PO 1**: To obtain knowledge with facts and figures related to various subjects in basic sciencessuch as Physics, Chemistry, Botany, Zoology, Mathematics etc.
	PO2: To understand the fundamental concepts, principles and scientific theories related to variousscientific phenomena and their relevance in daily life.
	PO 3: To acquire expertise in handling scientific instruments, planning and performing laboratoryexperiments with accuracy in observation and logical inferences from it.
	PO4: To aware the faculty and students about environment and sustainability
	PO5: To be able to think innovatively to propose novel ideas in explaining facts or providing newsolution to the problems.

Objective of Program	**Physics Fundamentals:** To build and strengthen the basic foundation of the students in Physics by having interplay between theory and experiment and to inculcate scientific enthusiasm and curiosity among them through the joy of learning.
	Problem solving skills: To provide students with the tools needed to understand and then analyze problems, apply mathematical formalism and experimentation and synthesize ideas of solving them in the best possible way.

Program Specific Outcomes	**PSO1:** demonstrate and understanding of principles and theories of physics. These include: Newtonian Mechanics, Thermodynamics, Electrodynamics, Atomic and Molecular Physics, Electronics, Optics, Nuclear Physics, Quantum Mechanics;
	PSO2: apply vector algebra, differential and integral calculus as well as graphical methods to solve problems;
	PSO3: demonstrate ability to apply knowledge learned in classroom to set and perform simple laboratory experiments;
	PSO4: solve problems using the appropriate methods in mathematical, theoretical and computational Physics.

Mapping between CO and PSO		PSO1	PSO2	PSO3	PSO4
	CO1	✓		✓	
	CO2	✓	✓	✓	✓
	CO3		✓		✓
	CO4	✓		✓	
	CO5		✓		✓
	CO6		✓	✓	
	CO7	✓			✓
	CO8	✓	✓		
	CO9			✓	✓
	CO10	✓			✓
	CO11		✓	✓	
	CO12	✓			✓

Course content

Course name: Bachelor of Science (Certificate course in Basic Physics)	Semester I	hrs
Unit-1	**Vector Algebra** Dot or scalar Product, Cross or vector product. Triple Product, reciprocal sets of vectors. Ordinary derivatives of vectors, space curves, continuity and differentiability, differentials formulae, differential of vectors, differential geometry. Ordinary integrals of vectors, Line integrals, surface integrals and volume integrals. The divergence theorem of Gauss.Stoke's theorem, Green's theorem in the plane, related integral theorem , integrals operator from for del(Theorem statements only)	8
Unit-2	**Force, Newton's laws and Motions** Classical Mechanics, Newton's First law **,** Force, Mass, Newton's Second law, Newton's third law, Weight and Mass ,Application of Newton's Laws in one dimension, Motion in three dimensions with constant acceleration ,Relative motion	7
Unit-3	**Momentum and system of Particles** Collision , Linear momentum, Impulse and momentum , Conservation of Momentum, two body Collisions ,Two particle systems, centre of mass of solid objects, conservation of momentum in a system of partials , system of variables.	7
Unit -4	**Angular momentum until Gravitation** Torques, Rotational inertia and Newton's second law, Rotational inertia of solid bodies, Torque due to Gravity, equilibrium application of Newton's laws for Rotation, Angular momentum of a particle, Newton's law of Universal Gravitation, the Gravitational Constant G,Gravitation Near the Earth's Surface ,the two shell theorem, the Gravitation Field , The general theory of Relativity.	8

Course Objectives:	**CO1:** understand the difference between vectors and scalars, combinations of vectors, theirproducts and solve Physics problems using them; **CO2:** study vector and scalar fields and functions along with their properties; **CO3:** understand the concept of scalar and vector operators; **CO4:** study gradient, divergence and curl and their examples; **CO5:** understand Newton's laws of motion in detail; **CO6:** use knowledge of Newton's laws and equations of motion to solve problems; **CO7:** study law of conservation of momentum and its applications; **CO8:** understand rotational motion in detail along with its properties; **CO9:** study torque and moment of inertia, relation between them, significance of moment ofinertia, their applications and real life problems related to it; **CO10:** understand the concept of angular momentum; **CO11:** discuss the case of spinning top; **CO12:** understand Newton's law of gravitation, gravitation near the earth's surface,

Mapping between CO and PSO		PSO1	PSO2	PSO3	PSO4
	CO1	✓		✓	
	CO2	✓	✓	✓	✓
	CO3		✓		✓
	CO4	✓		✓	
	CO5		✓		✓
	CO6		✓	✓	
	CO7	✓			✓
	CO8	✓	✓		
	CO9			✓	✓
	CO10	✓			✓
	CO11		✓	✓	
	CO12	✓			✓

	Semester – I
	Subject: Physics (Practical)

Course Code: 004391122	Course Title: Mechanical Properties of Matter (Practical)

Course Outcomes:

1. Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the mechanical properties.
2. Measurement precision and perfection is achieved through Lab Experiments.

Unit	Topic	No. of Lectures
	Lab Experiment List	**hrs**
	1. To study the Motion of Spring and calculate(a) Spring constant,(b) gand(c)Modulus of rigidity. 2. To determine the Moment of Inertia of a Flywheel. 3. To determine g and velocity for a freely falling body using Digital Timing Technique. 4. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille'smethod). 5. To determine the Young's Modulus of aWire by Optical Lever Method. 6. To determine the Young's Modulus by bending of beam. 7. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.To determine the elastic Constants of a wire by Searle's method.	**40**

		PSO1	PSO2	PSO3	PSO4
Mapping between CO and PSO	CO1	✓		✓	
	CO2	✓	✓	✓	✓

REFERENCE BOOKS :	1. R.Resnick and D.Hilliday: Physics Vol-I 2.Berkeley Physics Course: Mechanics Vol-I 3. R.P.Feynmans, R.B.LightanandM.Sand: The Feynman Lectures in Physics 4. D.S.Mathur: Mechanics Murray Spiegel, Seymour Lipschutz, Dennis Spellman,"Schaum's Outline Series:Vector Analysis" Mc GrawHill,2017. 5. J.C.Upadhaya: Mechanics, S.Chand Suggested Online Link: 1). MITOpen Learning-Massachusetts Institute of Technology,https://openlearning.mit.edu/ 2). National Program on Technolog yEnhanced Learning (NPTEL),https://www.youtube.com/user/nptel hrd 3). SwayamPrabha-DTH Channel, https://www.swayamprabha.gov.in/index.php/progrm/current_he/8

Course name: Bachelor of Science (Certificate course in Basic Physics)	Semester II	hrs
Unit-1	**Parliclc properties of wavcs:** Blackbody radialion, photoelectric effect, what is light x-rays, x-ray diffraction , Campion effect, pair production, photons and gravity.	8
Unit-2	**Elasticity –I :** Twisting Couple on a cylinder, tensional pendulum, bending of a beam. The cantilever, transverse vibration of a loaded cantilever. depression of a beam supported at the ends, determination of Y by bending of beams.	7
Unit-3	**Elasticity –II :** Introduction. Load, stress and strain. Hooke's law, ductility, brittleness and plasticity, elastic behaviour of solids in general, factors affecting elasticity, three types of elasticity . equivalence of shear to compression and an extension at right angles to each to other, deformation of a cube-bulk modules. Modulus of rigidity , young's modules, relations connecting the elastic constant. Possion's ratio, relations for **K** and **n** in terms of Possion's ratio limiting values of **σ**.	7
Unit -4	**Momentum and system of pareticles:** Collisions, liner momentum, impulse and momentum, conservation of meomentum, to body collisions. Two particle systems. Many particles systems, centre of mass of solid objects, conservation of momentum in a system of particles, system of variable mass.	8

Course Objectives:	**CO1:** obtain knowledge of collision and its types; study some real life examples of collisions. **CO2:** establish relations between linear and angular variables. **CO3:** understand one of the basic properties of a material: elasticity, stress and strain,difference between stress and pressure. **CO4:** study Hooke's law and various types of module. **CO5:** establish relations among elastic constants and problems based on them. **CO6:** study blackbody radiation and photoelectric effect, obtain their experimental results. **CO7:** discuss dual nature of light; **CO8:** study X-rays, their production, their properties and diffraction of X-rays; **CO9:** discuss Compton Effect and establish particle nature of radiation; **CO10:** study pair production and mass-energy relation. **CO11:** understand twisting of a cylinder, tensional pendulum and related problems. **CO12:** study bending of a beam and a cantilever, to discuss real world problems of beams/cantilevers.

Mapping between CO and PSO		PSO1	PSO2	PSO3	PSO4
	CO1	✓		✓	
	CO2	✓	✓	✓	✓
	CO3		✓		✓
	CO4			✓	✓
	CO5	✓	✓		
	CO6			✓	
	CO7			✓	✓
	CO8	✓	✓		
	CO9		✓	✓	
	CO10	✓			✓
	CO11	✓	✓	✓	✓
	CO12		✓		✓

Subject: Physics (Practical)	Semester- II

Course Code: 004391222	**Course Title:** Demonstrative Aspects of Electricity & Magnetism (Practical)

Course Outcomes:

1. Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the electric and magnetic properties.
2. Measurement precision and perfection is achieved through Lab Experiments.

Unit	Topic	No. of Lectures
	Lab Experiment List	
	1. Frequency of A.C. Mains. 2. Calibration of Voltmeter by potentiometer. 3. Calibration of ammeter by potentiometer. 4. Specific resistance determination. 5. Conversion of Galvanometer into a Voltmeter. 6. Conversion of a Galvanometer into Ammeter. 7. De Sauty's bridge-C1/C2 8. R1/R2 by potentiometer. 9. Study of R-C,L-C-R circuits. 10. Determination of self-inductance, mutual inductance. Magnetic field determination by search coil and ballistic galvanometer.	**40**

Mapping between CO and PSO		PSO1	PSO2	PSO3	PSO4
	CO1	✓		✓	
	CO2	✓	✓	✓	✓

REFERENCE BOOKS :	1. Edward M.Purcell: Electricity and Magnetism
	2. J.H.Fewkes & J. Yarwood: Electricity & Magnetism, Vol.I
	3. D.C. Tayal: Electricity and Magnetism", Himalaya Publishing House Pvt.Ltd.2019.
	4. D.J.Griffiths: Introduction to Electrodynamics.
	5. Lal and Ahmed: Electricity and Magnetism
	6. H.K.Malikand ,A.K.Singh, "Engineering Physics",M c Graw Hill Education(India)PrivateLimited,2018.
	7. Richard P.Feynman, Robert B.Leighton, Matthew Sands,"The Feynman Lectures on Physics Vol.2", Pearson Education Limited,2012.
	Suggested Online Link:
	1).MIT Open Learning-Massachusetts Institute of Technology, https://open learning.mit.edu/
	2).National Program on Technology Enhanced Learning (NPTEL),https://www.youtube.co m/user/nptelhrd
	3.) SwayamPrabha- DTH Channel, https://www.swayamprabha.g ov.in/index.php/program/curre nt_he/8