GANPAT UNIVERSITY

FACULTY OF DIPLOMA ENGINEERING

Programme	Diploma Engineering in Mechanical/Mechatronics/Automobile/Chemical/Petrochemical Technology/ Civil/ Electrical/Computer/Information Technology/Agriculture/Electronics & Communication				
Semester	I & II		Version	1.0.0.0	
Effective from Academic Year	2025-26		Effective for the batch Admitted in	JULY 2025	
Course code	1BS1102	Course Name	Applied Physics		

I.TEACHING-LEARNING AND ASSESSMENT SCHEME

Course Type	Course Code	Learning Scheme						Assessment Scheme										
		Actual Contact Hrs./Week			SLH	NLH	Credits	Theory				Practical				Based on SL		Total Marks
		CL	TL	LL				FA-TH	SA-TH	TOTAL		FA-PR	SA-PR	TOTAL		SLA		
								MAX	MAX	MAX	MIN	MAX	MAX	MAX	MIN	MAX	MIN	
DSC	1BS1102	2	-	2	0	4	2	40	60	100	40	30	20	50	25	0	0	150

Abbreviation:	**CL-** Classroom Learning	**TL -** Tutorial Learning	**LL -** Laboratory Learning
	SLH - Self Learning Hours	**NLH -** Notional Learning Hours	**SLA -** Self Learning Assessment
	FA - Formative Assessment (Term work +Mid Sem Exam +Attendance)		**SA -** Summative Assessment

II. PRE-REQUISITES

Basic knowledge of science.

III. INDUSTRY / EMPLOYER EXPECTED OUTCOMES

Ability to apply principles of mechanics, thermodynamics, optics, electricity, and magnetism in technical and engineering contexts. Use physics-based reasoning and calculations to solve real-world engineering problems (e.g., energy efficiency, motion analysis, material properties). Operate and interpret data from basic laboratory instruments (vernier caliper, micrometer screw gauge, ammeter, voltmeter, etc.).

IV. COURSE LEARNING OUTCOMES

At the end of the course, students will be able to achieve the following course learning outcomes:

CO1. Apply principles of measurement and error analysis using standard instruments (Vernier Callipers, Micrometre Screw Gauge) to perform accurate physical measurements.

CO2. Demonstrate an understanding of mechanics by analyzing linear, circular, and rotational motion, applying Newton's laws, and solving problems related to work, energy, and power

CO3. Explain the fundamental concepts of heat and thermodynamics, including modes of heat transfer, temperature scales, thermodynamic processes, and relevant laws.

CO4. Analyse properties of liquids and fluid dynamics, including surface tension, viscosity, Reynolds number, and Stokes' law, and apply them to real-world situations.

CO5. Interpret the principles of electricity and optics by applying Coulomb's law, Ohm's law, resistive networks, laws of reflection/refraction, and wave phenomena (dispersion, interference, and polarization).

V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT:				
Name of Unit	**Theory Learning outcomes (TLO's) aligned to CO's**	**Learning Content mapped with Theory Learning outcomes (TLO's) & CO's**	**Marks**	**Hours**
Unit-1 Unit and Measurement	**TLO1.1:** Explain the need for standardization of units and the advantages of the SI. system. **TLO1.2:** Describe the construction and working principle of Vernier Calipers. **TLO1.3:** Explain the principle and structure of a Micrometre Screw Gauge. **TLO1.4:** Compute absolute, relative, and percentage error in physical measurements.	**1.1** System of units (FPS, CGS, MKS, SI system), Derived physical quantities and their units. **1.2**. Measuring Instruments: (1) Vernier Callipers. **1.3** (2) Micrometre Screw Gauge. **1.4** Errors in measurements	**8**	**4**
Unit-2 Motion, Work And Energy	**TLO2.1**: Define and differentiate between displacement, velocity, and acceleration in linear motion. **TLO2.2**: Analyse conditions for equilibrium and motion using the First Law. **TLO2.3:** State and apply newton's second law of motion, to determine force, mass, or acceleration, differentiate between action and reaction forces and describe their mutual interaction. **TLO2.4:** Explain angular, velocity and angular acceleration; relate them to linear velocity and acceleration. **TLO2.5:** Solve basic problems involving work, energy, and power in mechanical systems.	**2.1** Linear motion, velocity, acceleration, force. Linear momentum and impulse of force. **2.2** Newton's first law of motion. **2.3** Newton's second law of motion, Newton's third law of motion. **2.4** Circular motion, angular velocity, angular acceleration, centripetal and centrifugal force. **2.5** Work, energy, kinetic energy, potential energy, power, Work energy theorem.	**10**	**5**

Unit-3 **Heat And Thermodynamic**	**TLO3.1** Explain the three modes of heat transfer: conduction, convection, and radiation. **TLO3.2** Define and differentiate between heat capacity and specific heat capacity. **TLO3.3** Identify and different temperature scales. arrangement. **TLO3.4** State and explain the zeroth law of thermodynamics and its relevance to thermal equilibrium. **TLO3.5** Explain the physical significance and examples of each thermodynamic process.	**3.1** Heat conduction, heat convection and heat radiation. **3.2** Thermal conductivity, Heat capacity and specific heat. **3.3** Units of temperature and equations of their interrelation, kelvin temperature scale. **3.4** Zeroth law of thermodynamics, First law of thermodynamics. **3.5** Isothermal, isobaric, isochoric and adiabatic process, linear thermal expansion	**10**	**5**
Unit-4 **Surface tension and Fluid dynamics**	**TLO4.1** Define and explain ionic bonds, including their formation through electron transfer, and give suitable examples. **TLO4.2** Explain the phenomenon of capillary action and its applications. **TLO4.3** Explain how temperature and impurities affect the surface tension of a liquid. **TLO4.4** Differentiate between streamline (laminar) and turbulent flow with examples. **TLO4.5** Apply Reynolds number to predict the nature of flow. **TLO4.6** State Stokes' Law and derive the expression for viscous drag on a spherical body.	**4.1** Cohesive and adhesive forces, molecular range, definition, dimension and SI unit of surface tension. **4.2** Angle of contact and capillarity, shape of liquid meniscus in a capillary tube. **4.3** Formula of surface tension, effect of impurity and temperature on surface tension. **4.4** Viscosity, streamline flow and turbulent flow of a fluid. **4.5** Reynolds number, Newton's formula for viscous force. **4.6** Co-efficient of viscosity, stokes law and terminal velocity.	**12**	**6**

Unit-5 **Static and Dynamic Electricity**	**TLO5.1** Define electric charge and explain its basic properties (conservation, additivity, and quantization). **TLO5.2** State and apply coulomb's law for the force between two point charges. **TLO5.3** Define electric potential and potential difference with relevant units. **TLO5.4** Define resistivity and conductivity along with their SI units. **TLO5.5** Derive formulas for Equivalent resistance in series and parallel combinations.	**5.1** Introduction, electric charge, quantization of charge. **5.2** Coulomb's law, electric field and electric field lines. **5.3** Electric potential, electric current, ohm's law. **5.4** Electrical resistivity and conductivity. **5.5** Series and parallel connections of resistors.	**10**	**5**
Unit-6 **Optics**	**TLO6.1** Explain characteristics of each type of wave with relevant examples. **TLO6.2** Describe the general properties of electromagnetic waves and their types. **TLO6.3** State and explain the laws of reflection and refraction. **TLO6.4** Explain dispersion of light through a prism and its application in spectroscopy. **TLO6.5** Apply Sabine's formula to calculate reverberation time in enclosed spaces.	**6.1** Types of waves, (progressive, stationary, mechanical, non-mechanical, transverse, longitudinal). Frequency, wavelength, periodic time and their relations. **6.2** Properties and applications of electromagnetic waves (ordinary light, LASER) and sound waves (ultrasonic wave, audible wave). **6.3** Reflection, refraction, Snell's law, absolute refractive index, relative refractive index, total internal, reflection, critical angle, **6.4** Dispersion, Polarization, Interference of light. **6.5** Reverberation, Reverberation time, Sabine's formula, echo, absorption coefficient.	**10**	**5**

VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL			
Sr. No.	**Practical/Laboratory Learning Outcome (LLO)**	**Practical Titles**	**Relevant COs**
1	**LLO1.1** Perform accurate linear measurements (external, internal, and depth) of given objects using Vernier callipers.	Study of linear measurement by vernier calliper.	CO1
2	**LLO 2.1** Determination of Density of a Liquid using Specific Gravity Bottle	Use a micrometre screw gauge to measure small dimensions precisely.	CO1
3	**LLO 3.1** Calculate the refractive index of a prism based on experimental data.	Study of refractive index of prism using spectrometer.	CO2
4	**LLO 4.1** Determine the gravitational of a simple pendulum for various lengths.	Measurement of gravitational acceleration using simple pendulum.	CO2
5	**LLO 5.1** Calculate the spring's force constant using Hooke's law.	Study of force constant of elastic spring.	CO4
6	**LLO 6.1** Set up a circuit to measure current and voltage.	Measurement of resistance using Ohm's law.	CO5
7	**LLO 7.1** Calculate the viscosity coefficient of the given liquid.	Determination of viscosity of fluid.	CO5
8	**LLO 8. 1** Balance a Wheatstone bridge circuit to measure an unknown resistance.	Measurement of unknown resistance using Wheatstone bridge.	CO5
9	**LLO 9.1** Calculate and interpret the surface area to volume ratio and its physical significance.	Study of SA/V ratio of simple objects.	CO6
10	**LLO 10.1** Use a capillary rise method to measure surface tension.	Determination of surface tension of a liquid.	CO6

VII. SUGGESTED MICRO PROJECT / ASSIGNMENTS / ACTIVITIES FOR SELF LEARNING / SKILL DEVELOPMENT (SELF LEARNING)

Activities For Self-Learning:

- Measure and compare the dimensions of various household objects using Vernier callipers and micrometre screw gauge.
- Collect Information about Various Boiler used in Thermal power plant. Write its Specification and compare to each other.
- Measure household electrical consumption and suggest ways to reduce it.
- Prepare a PPT on applications of lasers in engineering fields.
- Write a report on the use of ultrasonic waves in industry and medicine.
- Prepare a chart showing SI units and their physical significance with real-life examples.

Mini projects:

- Create a working model or simulation to demonstrate types of motion.
- Investigate the change in surface tension of soap solution with concentration.
- Use simulations (PhET, OLabs) to virtually perform physics experiments.

VIII. LIST OF INSTRUMENTS / EQUIPMENT / TRAINER BOARD	
1	Simple Pendulum Setup For measuring acceleration due to gravity.
2	Spring and Weight Set.
3	Prism with Spectrometer.
4	Ohm's Law Apparatus.
5	Experimental setup of heat exchanger.
6	Independently temperature and pressure measuring instruments.

IX. LIST OF REFERENCE BOOKS			
Sr. No	**Title**	**Author**	**Publication**
1	Engineering Physics	H.K. Malik & A.K. Singh	Tata McGraw-Hill
2	Applied Physics for Polytechnic Students	M.N. Avadhanulu & P.G. Kshirsagar	S. Chand
3	Practical Physics	S.L. Gupta & V. Kumar	Pragati Prakashan
4	Fundamentals of Physics	Resnick, Halliday & Walker	Wiley

X. LINK OF LEARNING WEB RESOURCE	
1	https://www.coursera.org/browse/physical- science-and-engineering/physics-and-astronomy
2	https://ndl.iitkgp.ac.in
3	https://vlab.amrita.edu Boiler.aspx
4	https://ocw.mit.edu/courses/physics/

XI. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE							
Unit	**Unit Title**	**Aligned COs**	**Learning Hours**	**R-Level**	**U-Level**	**A-Level**	**Total Marks**
1	Unit And Measurement	CO1	4	3	3	2	8
2	Motion, Work And Energy	CO2	5	3	3	4	10
3	Heat And Thermodynamics	CO3	6	3	4	3	10
4	Surface Tension And Fluid Dynamics	CO3	5	3	4	5	12
5	Static And Dynamic Electricity	CO4	5	4	3	3	10
6	Optics	CO5	5	3	4	3	10
		Grand Total	30	19	21	20	60

XII. COs AND POs AND PSOs MAPPING										
Course outcome (Cos)	**Programme Outcomes (POs)**							**Programme Specific Outcomes (PSOs)**		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	3	3	2	1	1	3	1			
CO2	3	3	3	3	2	2	2			
CO3	3	3	3	2	2	2	2			
CO4	3	3	2	2	2	2	1			
CO5	3	3	3	1	2	3	1			
Legends: - *3- High* *2-Moderate/Medium* *1-Slight/Low* *0-None*										