Lok Jagruti Kendra University

University with a Difference

Diploma in Mechanical Engineering

LJ Polytechnic

Subject Code: 025060103

Applied Physics

Programme/ Branch Name			Diploma in Mechanical Engineering			
Course Name	Applied Physics				**Course Code**	025060103
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
3	0	2	4	50	50	50	150

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Engineering physics majors are expected to have a basic understanding of calculus and physics.

3. Rationale

Physics is a fundamental science that endeavors to explain all the natural phenomena that occur in the universe. As physics is considered as basic science its principles, laws, hypothesis, concepts, ideas are playing important role in reinforcing the knowledge of technology. Physics uses qualitative and quantitative models and theories based on physical laws to visualize, explain and predict physical phenomena. Models, laws and theories are developed from, and their predictions are tested by making, observations and quantitative measurements. Physics has helped to unlock the mysteries of the universe and provides the foundation of understanding upon which modern technologies and all other sciences are based.

4. Objectives

- ✓ Engineering physics includes the study of a large number of diverse topics all related to materials/things that exist in the world around us.
- ✓ It aims to give an understanding of this world both by observation and by prediction of the way in which such objects behave.
- ✓ Concrete use of physical principles and analysis in various fields of engineering and technology are given prominence in the course content.
- ✓ The course will help the diploma engineers to apply the basic concepts and principles to solve broad based engineering problems and to understand different technology based applications.

5. Contents

Unit No.	Topics	Sub-Topics	Learning Outcome	% Weigh tage	Hours
1.	**Physical World, Units and Measurements**	1.1. Need of measurement and unit in engineering and science 1.2. Definition of unit 1.3. Requirements of standard unit, systems of units- CGS, MKS and SI 1.4. Fundamental and derived quantities and their units 1.5. Least count and range of instrument 1.6. Least count of vernier caliper and micrometer screw gauge 1.7. Need of measuring instruments 1.8. Types of measurement (direct, indirect) 1.9. Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures	• Identify physical quantities and select their units to use in engineering solutions. • Distinguish physical quantities as scalar and vectors and solve real life relevant problems. • Describe various system of measurements. • Measurements with accuracy by minimizing different types of errors. • Measure the various dimension of a tiny object using vernier caliper and micrometer screw gauge.	20	09
2.	**Force and Motion**	2.1. Scalar and vector quantities – examples 2.2. Force 2.3. Momentum 2.4. Statement and derivation of conservation of linear momentum 2.5. Impulse and its applications 2.6. Displacement,velocity and acceleration 2.7. Relation between angular and linear velocity 2.8. Linear acceleration and angular acceleration	• Explain the relation between force and motion. • Analyze types of motions and apply the formulation to understand banking of roads/railway tracks. • Derive the law of conservation momentum. • Understand the conservation of momentum principle to describe rocket propulsion and recoil of gun. • Understand the types of acceleration.	20	08
3.	**Properties of Matter**	3.1. Elasticity 3.2. Stress 3.3. Strain	• Describe the phenomenon of surface tension, effects of	20	10

		3.4. Significance of stress-strain curve 3.5. Hooke's law 3.6. Moduli of elasticity 3.7. Poisson's ratio 3.8. Surface tension: concept, units 3.9. Applications of surface tension 3.10. Cohesive and adhesive forces 3.11. Angle of contact 3.12. Effect of temperasture and impurity on surface tension 3.13. Viscosity, coefficient of viscosity & effect of temperature on viscosity 3.14. Stoke's law 3.15. Terminal velocity 3.16. Laminar and turbulent flow 3.17. Reynold's number	temperature on surface tension and solve statics problems that involve surface tension related forces. • Describe the viscosity of liquids, coefficient of viscosity and the various factors affecting its value. • Determine viscosity of an unknown fluid using Stokes' Law and the terminal velocity. • Define stress and strain. • State Hooke's law. • Explain stress–strain diagram and describe (a) the modulus of elasticity, (b) the yield strength (c) the tensile strength and (d) estimate the percent elongation.		
4.	**Heat and Thermometry**	4.1. Concept of heat and temperature 4.2. Modes of heat transfer (conduction, convection and radiation with examples) 4.3. Heat capacity 4.4. Specific heat 4.5. Scales of temperature and their relationship 4.6. Thermal conductivity	• Illustrate the terms; heat and temperature. • Measure temperature in various processes on different scales (Celsius, Fahrenheit, and Kelvin etc.) • Distinguish between conduction, convection and radiation. • Explain different methods for reducing heat losses and mode of heat transfer between bodies at different temperatures. • Measure the specific heat capacity of solids and liquids.	20	07

5.	**Waves and Sound**	5.1. Introduction 5.2. Defination of wave motion 5.3. Types of waves longitudinal and transverse wave 5.4. Principle of superposition of waves 5.5. Resonance 5.6. Formula for velocity of sound in air and various factors affecting it 5.7. Acoustics of building 5.8. Importance of reverberation of sound 5.9. Reverberation time 5.10. Optimum time of reverberation 5.11. Coefficient of absorption of sound 5.12 Sabine's formula for reverberation time	• Comprehend the concept of wave motion. • Distinguish between transverse and longitudinal waves. • Explain principle of superposition of waves and resonance. • State formula for velocity of sound in air. • Understand the importance of reverberation. • State Sabine's formula and factors affecting reverberation time.	20	08
				Total Hours	**42**

6. List of Practicals / Exercises

The practical/exercises should be properly designed and implemented in an attempt to develop different types of skills so that students can acquire the competencies/programme outcomes. Following is the list of practical exercises for guidance.

Note: However, if these practical/exercises are completed appropriately, they would also lead to the development of certain outcomes in an affective domain which would, in turn, lead to the development of course outcomes related to the affective domain. Thus, the overall development of programme outcomes (as given in a common list at the beginning of the curriculum document for this programme) would be assured. Faculty should refer to that common list and should ensure that students also acquire outcomes in an affective domain which are required for the overall achievement of programme outcomes/course outcomes.

Sr. No	Practicals/ Exercises	Key Competency	Hours
1.	To measure length, radius of a given cylinder and rod using a vernier caliper	Use of the vernier calipers	2
2.	To determine the diameter of a given wire using a screw gauge	Use of the screw gauge.	2
3.	Determination of surface tension of a liquid by capillary tube	Angle of contact, and basics of Surface tension	2
4.	Measurement of viscosity of glycerin by stock's method	Definition and formula of Viscosity	2
5.	Measurement of co-efficient of thermal conductivity	Basics of thermal conductivity	2
6.	Determine the specific heat of a solid using the method of mixtures	Concept of heat	2
7.	To determine force constant with the help of periodic time of oscillations of spring	Basics of Oscillation	2
8.	To determine force constant of a spring using hook's law	Hook's law	2
9.	To find the moment of inertia of a flywheel	Application of moment of inertia	2
10.	Verification of the acceleration due to gravity "g" by a simple pendulum	Basics of Nanotechnology	2
		Total Hours	**20**

7. Suggested Specification Table with Hours

Unit No.	Chapter Name	Teaching Hours	Distribution of Topics According to Bloom's Taxonomy					
			R %	U %	App %	C %	E %	An %
1.	Physical World, Units and Measurements	09	30	25	25	10	05	05
2.	Force and Motion	08	30	25	25	10	05	05
3.	Properties of Matter	10	30	25	25	10	05	05
4.	Heat and Thermometry	07	30	25	25	10	05	05
5.	Waves and Sound	08	30	25	25	10	05	05

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Textbooks

1) Concepts in Physics by H C Verma, Vol. I & II, Bharti Bhawan Ltd. New Delhi

9. Reference Books

1) Applied Physics, Vol. I and Vol. II, TTTI Publications, Tata McGraw Hill, Delhi
2) Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
3) Modern approach to Applied Physics-I and II, A S Vasudeva, Modern Publishers
4) Engineering Physics by D K Bhhatacharya & PoonamTandan; Oxford University Press, New Delhi.

10. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/playlist?list=PLSQj2zZx2Kxc-Cep3Esknmi42NfgpvmCN