GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering
Subject Code: 3110011
PHYSICS
B.E. 1st YEAR
(For Group I Branches)

Type of course: Basic Science (Physics)

Prerequisite: Basic understanding`of Calculus, Physics and Mathematics course on Differentiate equations

Rationale: The basic science - physics program is to prepare students for careers in engineering where physics principles can be applied to the advancement of technology. This education at the intersection of engineering and physics will enable students to seek employment in engineering upon graduation while, at the same time, provide a firm foundation for the pursuit of graduate studies in engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr No	Topic	Teaching Hrs.	Module Weightage
	MODULE 1: Properties of Matter • Concept of Load, Stress and Strain • Hook's Law • Stress-Strain Diagram • Ductility, Brittleness and Plasticity • Elastic behavior of solids • Working stress and factor of safety • Factors affecting elasticity • Types of Elasticity • Twisting couple on a cylinder or wire-shaft • Torsional Pendulum • Cantilever-Depression of Cantilever • Young's modulus by Cantilever • I-shape Griders • Viscosity and comparison of viscosities	**7**	**19**

	MODULE 2: Waves, Motion and Acoustics • Simple Harmonic motion • Free, forced, resonance, damped and undamped vibration • Damped harmonic motion • Force vibration and amplitude resonance • Velocity resonance and energy intake • Wave motion, transverse and longitudinal vibration • Sound absorption and reverberation • Sabine's formula and usage (excluding derivation) • Acoustic of building	**7**	**19**
	Module 3: Ultrasonic and Non distractive testing (NDT) • Ultrasonic waves • Properties of ultrasound • Production of ultrasonic waves : Piezoelectric and magnetostriction method • Detection of ultrasound • Application of ultrasound • Introduction of NDT • Advantages of NDT • NDT through ultrasound	**9**	**25**

	Module 4: Superconductivity
	• Introduction of Superconductivity
	• Properties of superconductor
	  • Effect of magnetic field
	  • Meissner effect
	  • Pressure effect
	  • Impurity effect
	  • Isotopic mass effect
	• Mechanism of Superconductivity : BCS Theory
	• Penetration depth : Magnetic field
	• Josephson's junction and its application
	• Application of superconductors
		6	**17**

	Module 5: Lasers • Properties of Laser • Einstein’s theory of matter radiation : A and B coefficients • Amplification of light by population inversion • Different types of lasers • gas lasers (He-Ne) solid-state lasers(ruby) • Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, laser speckles • Applications of lasers in science, engineering and medicine.	**7**	**20**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30%	**40%**	**30%**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Reference Books

1. Engineering Physics by Dattu R Joshi, McGraw hill Publications
2. Engineering Physics by Shatendra Sharma & Jyotsan Sharma, Pearson Publication
3. Mechanics of Materials, SI Edition, 9th Edition,Barry J. Goodno, James M. Gere,Published: © 2018 Print ISBN: 9781337093354

Course Outcome:

Sr. No.	CO statement	Marks % weightage
CO-1	The student will gain knowledge of theoretical and mathematical concepts associated with properties of matter.	**19**
CO-2	The student will demonstrate understanding the basic principles, properties and applications of associated with Waves, Motion and Acoustics.	**19**
CO-3	The student will demonstrate the understanding of basic principles, properties, various method of production technique of Ultrasonic sound and its applications in NDT.	**25**
CO-4	The student will demonstrate understanding of basic theory, properties and applications of Superconductivity.	**17**
CO-5	The student will demonstrate understanding of basic principles, properties, type and application Lasers.	**20**

List of Experiments:

1. Diffraction and interference experiments (from ordinary light or laser pointers); measurement of speed of light on a table top modulation; minimum deviation from a prism.
2. Measurement of the Distance using Ultrasonic Sensors.
3. Study of Object Detection using Ultrasonic Sensors.
4. Melde's Experiment Transverse and Longitudinal Modes
5. To determine the frequency of given laser source.
6. Frequency of AC Supply-Sonometer method
7. Wavelength of Light -Diffraction GratingUsing LASER
8. Acoustic grating method set up for measurement of velocity of ultrasonic waves in liquid
9. Melde's experiment Resonator
10. Study of Damped Simple Harmonic Motion
11. Newton's rings, Determination of using sodium light.
12. Calibration of Spectrometer & determination of unknown wavelength
13. Dispersive curve of a prism
14. Study of Fabry-Perot Etalon
15. Study of Lloyd's Mirror

16. Study of Double Refraction in Calcite Prism
17. Virtual Heat & Thermodynamics Lab
18. Virtual Advanced Mechanics Lab
19. Virtual Laser Optics Lab
20. Virtual Harmonic Motion & Waves Lab
21. Virtual Optics Lab
22. Virtual Modern Physics Lab
23. Virtual Lab on oscillations
24. Virtual Physical Sciences Lab