

15PY101	PHYSICS	L	T	P	C
		3	0	0	3
	Total Contact Hours-45				
	Prerequisite				
	Nil				
PURPOSE					
The purpose of this course is to provide an understanding of physical concepts and underlying various engineering and technological applications. In addition, the course is expected to develop scientific temperament and analytical skill in students, to enable them logically tackle complex engineering problems in their chosen area of application.					
INSTRUCTIONAL OBJECTIVES					
1.	To understand the general scientific concepts required for technology				
2.	To apply the Physics concepts in solving engineering problems				
3.	To educate scientifically the new developments in engineering and technology				
4.	To emphasize the significance of Green technology through Physics principles				

UNIT I– MECHANICAL PROPERTIES OF SOLIDS AND ACOUSTICS (9 hours)

Mechanical properties of solids: Stress-strain relationship – Hooke’s law – Torsional Pendulum – Young’s modulus by cantilever – Uniform and non-uniform bending — Stress-strain diagram for various engineering materials – Ductile and brittle materials – Mechanical properties of Engineering materials (Tensile strength, Hardness, Fatigue, Impact strength, Creep) – Fracture – Types of fracture (Elementary ideas).

Acoustics: Intensity – Loudness – Absorption coefficient and its determination – Reverberation – Reverberation time – Factors affecting acoustics of buildings and their remedies – Sources and impacts of noise – Sound level meter – Strategies on controlling noise pollution – Ultrasonic waves and properties – Methods of Ultrasonic production (Magnetostriction and Piezoelectric) – Applications of Ultrasonics in Engineering and medicine.

UNIT II–ELECTROMAGNETIC WAVES, CIRCUITS AND APPLICATIONS (9 hours)

Del operator – grad, div, curl and their physical significances - displacement current –Maxwell’s equations (derivation) – Wave equation for electromagnetic waves – Propagation in free space – Poynting theorem –

Characteristic of Transverse electric and magnetic waves – Skin depth – Rectangular and circular waveguides – High powered vacuum-based cavity magnetrons – Applications including radars, microwave oven and lighting systems.

UNIT III–LASERS AND FIBER OPTICS (9 hours)

Lasers: Characteristics of Lasers – Einstein’s coefficients and their relations – Lasing action – Working principle and components of CO₂ Laser, Nd-YAG Laser, Semiconductor diode Laser, Excimer Laser and Free electron Laser – Applications in Remote sensing, holography and optical switching – Mechanism of Laser cooling and trapping.

Fiber Optics: Principle of Optical fiber – Acceptance angle and acceptance cone – Numerical aperture – V-number – Types of optical fibers (Material, Refractive index and mode) – Photonic crystal fibers – Fiber optic communication – Fiber optic sensors.

UNIT IV– QUANTUM MECHANICS AND CRYSTAL PHYSICS (9 hours)

Quantum mechanics: Inadequacies of Classical Mechanics – Duality nature of electromagnetic radiation – De Broglie hypothesis for matter waves – Heisenberg’s uncertainty principle – Schrödinger’s wave equation – Particle confinement in 1D box (Infinite Square well potential). **Crystal Physics:** Crystal directions – Planes and Miller indices – Symmetry elements – Quasi crystals – Diamond and HCP crystal structure – Packing factor – Reciprocal lattice – Diffraction of X-rays by crystal planes – Laue method and powder method – Imperfections in crystals.

UNIT V–GREEN ENERGY PHYSICS (9 hours)

Introduction to Green energy – **Solar energy:** Energy conversion by photovoltaic principle – Solar cells – **Wind energy:** Basic components and principle of wind energy conversion systems – **Ocean energy:** Wave energy – Wave energy conversion devices – Tidal energy – single and double basin tidal power plants – Ocean Thermal Electric Conversion (OTEC) – **Geothermal energy:** Geothermal sources (hydrothermal, geo-pressurized hot dry rocks, magma) – **Biomass:** Biomass and bio-fuels – bio-energies from wastages – **Fuel cells:** H₂O₂ – **Futuristic Energy:** Hydrogen – Methane Hydrates – Carbon capture and storage (CCS).

- * One problem sheet consisting of 10 to 15 problems is to be prepared for each unit and discussed in the class.
- * Few problems based on design considerations related to appropriate branches of engineering can be incorporated in each problem sheet.

TEXT BOOKS

1. Thiruvadigal, J. D., Ponnusamy,S.Sudha.D. and Krishnamohan M., “*Physics for Technologists*”, SSS Publications, Chennai, 2015.
2. Dattu R.Joshi, “*Engineering Physics*”,Tata McGraw- Hill,New Delih,2010.

REFERENCES

1. Wole Soboyejo, “*Mechanical Properties of Engineered Materials*”, Marcel Dekker Inc., 2003.
2. Frank Fahy, “*Foundations of Engineering Acoustics*”, Elsevier Academic Press, 2005.
3. Alberto Sona, “*Lasers and their applications*”, Gordon and Breach Science Publishers Ltd., 1976.
4. David J. Griffiths, “*Introduction to electrodynamics*”, 3rd ed., Prentice Hall, 1999.
5. Leonard. I. Schiff, “*Quantum Mechanics*”, Third Edition, Tata McGraw Hill, 2010.
6. Charles Kittel, "*Introduction to Solid State Physics*", Wiley India Pvt. Ltd, 7th ed., 2007.
7. Godfrey Boyle, “*Renewable Energy: Power sustainable future*”, 2nd edition, Oxford University Press, UK, 2004.

15PY101 PHYSICS												
Course designed by		Department of Physics and Nanotechnology										
1	Student Outcome	a	B	c	d	e	f	g	h	i	j	k
		x		x		x						x
2	Mapping of instructional objectives with student outcome	1		4		2						3
3	Category	General (G)		Basic Sciences (B)		Engineering Sciences and Technical Arts (E)			Professional Subjects (P)			
		--		x		--			--			
4	Approval											