

LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Artificial Intelligence and Machine Learning (704)

Bachelor of Engineering (B.E.) – Semester – I

Course Code:	117041192
Course Name:	Physics
Category of Course:	Basic Science Course (BSC)
Prerequisite Course:	---

Teaching Scheme				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Total Hours
3	0	2	4	30

Syllabus				
Unit No.	Topic	Prerequisite Topic	Successive Topic	Teaching Hours
01	Dielectrics			
	1.1 Basic terms related to Dielectrics	---	---	3 (10%)
	1.2 Polarization mechanisms (No derivations)	Basic terms related to dielectrics (117041192 -Unit-1.1)	---	
	1.3 Internal / local field (No derivations) and Clausius-Mosotti equation	Polarization mechanisms (117041192 - Unit-1.2)	---	
	1.4 Types of dielectric materials	---	---	
1.5 Applications (Capacitors & Transformers)	---	Charging and discharging of capacitor (117042291 – Unit-1.4)		
02	Magnetic Materials			
	2.1 Basic terms related to magnetism	---	---	3 (10%)
	2.2 Magnetic moment (No derivations)	Basic terms related to magnetism (117041192 -Unit-2.1)	---	
	2.3 Types of magnetic materials	---	---	
	2.4 Hysteresis and Hard and Soft Magnetic materials (Domain theory not included)	Basic terms related to magnetism (117041192 -Unit-2.1)	---	
2.5 Applications (Magnetic hard disc)	---	---		
03	Ultrasonics			
	3.1 Definition and properties	---	---	3 (10%)
	3.2 Generation methods	---	---	
	3.3 Detection methods	Generation methods (117041192 -Unit-3.2)	---	
3.4 Applications (Welding, drilling/cutting, SONAR, cleaning)	---	---		
04	Laser			
	4.1 Characteristics of Laser	---	---	3 (10%)
	4.2 Einstein's theory	---	---	
	4.3 Basic concepts related to Laser	Einstein's theory (117041192 -Unit-4.2)	---	
	4.4 Types of Laser	Basic concepts related to Laser (117041192 -Unit-4.3)	---	
4.5 Applications (Laser in material processing, cutting, holography)	---	---		
05	Fibre Optics			
	5.1 Introduction	---	---	3 (10%)
	5.2 Advantages of Fibre optic system over conventional system	---	---	
	5.3 Construction and basic principle	---	---	
	5.4 Acceptance angle and Numerical aperture	Construction and basic principle (117041192 -Unit-5.3)	---	
	5.5 Types of fibre optic cables (V-number not to be included)	---	---	
5.6 Fibre optic communication link	---	---		
06	Semiconductors			
	6.1 Properties and types of Semiconductors	---	---	3 (10%)
	6.2 Carrier statistics in Semiconductors (Only intrinsic semiconductors to be covered)	Properties and types of Semiconductors (117041192 -Unit-6.1)	---	
	6.3 Carrier Generation (creation of EHP) and carrier recombination	Properties and types of Semiconductors (117041192 -Unit-6.1)	---	
6.4 Carrier Transport (drift and diffusion)	---	---		
07	Basic Diodes			
	7.1 PN junction diode	Properties and types of Semiconductors (117041192 -Unit-7.1)	Basic idea about forward bias, reverse bias of Diode and VI characteristics (117042291 – Unit-8.1)	3 (10%)

	7.2 Energy band diagrams of PN junction diode	PN junction diode (117041192 -Unit-7.1)	---	
	7.3 Avalanche and Zener breakdown	---	---	
	7.4 Zener diode	---	---	
08	Digital Circuits			3 (10%)
	8.1 Basic gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Universal Gates	---	---	
	8.2 Boolean algebra	---	---	
	8.3 Building AND, OR Gate with diodes	PN Junction Diode (117041192 -Unit-7.1)	---	
09	Measurements			2 (7%)
	9.1 Four probe method	---	---	
	9.2 Hall effect	---	---	
	9.3 Van der Pauw method	---	---	
	9.4 Hot probe method	---	---	
10	Special Purpose Diodes			4 (13%)
	10.1 Light emitting diode	Carrier Generation (creation of EHP) and carrier recombination (117041192 -Unit-6.3)	---	
	10.2 LDR	---	---	
	10.3 Photodiode	Carrier Generation (creation of EHP) and carrier recombination (117041192 -Unit-6.3)	---	
	10.4 Photovoltaic effect and PV cell (solar cell)	---	---	
	10.5 Metal-semiconductor diodes	---	---	

Sr No.	Practical Title	Link to Theory Syllabus
1	To find out the velocity & compressibility of liquid using Ultrasonic Interferometer.	Unit-3
2	To find out the wavelength of LASER source using Diffraction.	Unit-4
3	To find out the Numerical Aperture of a Fiber optic cable.	Unit-5
4	Understanding the working of PN Junction diode & plotting the V-I characteristics.	Unit-7
5	Study and plot the characteristics of Zener diode.	Unit-7
6	To find the bandgap of germanium PN Junction diode.	Unit-7
7	To verify truth table of AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR gates	Unit-8
8	Understanding the characteristics of Photodiode and Solar cell.	Unit-9
9	To find the resistivity of semiconductor using Four probe method.	Unit-10
10	Study and plot the characteristics of Light emitting diode.	Unit-10

Major Components/ Equipment	
Sr. No.	Component/Equipment
1	Ultrasonic Interferometer, measuring cell, frequency generator, given liquid.
2	Optical bench, laser source, Optical screen, Double convex lens, Slit and Diffraction.
3	Patch Cords, Fibre optic Numerical Aperture measurement kit, 1 side connectorised ½ meter fibre cables of different diameters (1mm diameter plastic fibre & 0.5mm diameter plastic at 600nm).
4	PN Junction diode trainer kit.
5	Zener diode trainer kit
6	Diode trainer kit, mercury thermometer.
7	. Logic gates trainer kit
8	Four probe apparatus, sample (a Ge crystal in form of a chip), oven, thermometer, constant power supply, oven power supply, panel meters for measurement of current and voltage.
9	LED trainer kit.
10	Photodiode trainer kit, bulb, Solar cell trainer kit, solar panel, bulb.

**Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)**

L :

3

T:

0

P:

2

**Note : In Theory Group, Total 4 Test (T1+T2+T3+T4) will be conducted for each subject.
Each Test will be of 25 Marks.
Each Test Syllabus Weightage: Range should be 20% - 30%**

Group (Theory or Practical)	Group (Theory or Practical) Credit	Total Subject Credit	Category	% Weightage	Marks Weightage	
Theory	3	4	MCQ	45%	60	
Theory			Theory Descriptive	13%	17	
Theory			Formulas and Derivation	6%	7	
Theory			Numerical	11%	16	
Expected Theory %	75%			Calculated Theory %	75%	100
Practical	1		Individual Project	0%	0	
Practical			Group Project	9%	35	
Practical			Internal Practical Evaluation (IPE)	16%	65	
Practical			Viva	0%	0	
Practical			Seminar	0%	0	
Expected Practical %	25%		Calculated Practical %	25%	100	
Overall %	100%			100%	200	

Course Outcomes

	<i>Upon completion of the course students will be able to</i>
CO 1	Demonstrate a thorough understanding of dielectrics, magnetic materials, and ultrasonics, including their properties, applications, and underlying principles in engineering and technology.
CO 2	Demonstrate proficiency in the principles and applications of laser and fiber optics technologies, enabling them to analyze advanced optical systems for various engineering endeavors.
CO 3	Have a thorough grasp of semiconductor physics, fundamental diode functionalities, and principles of digital circuit design, enabling them to proficiently analyze and resolve issues in electronic circuits
CO 4	Exhibit competence in measurement techniques and specialized diode applications, enhancing their capacity to employ accurate measurement methods and effectively utilize special purpose diodes

Suggested Reference Books

1	Engineering Physics by G Vijayakumari, Vikas Publication
2	Engineering Physics by V Rajendran, Mc Graw Hill Education
3	Engineering Physics by Dattu Joshi, Mc Graw Hill Education
4	Engineering Physics by Dr. Rakesh Dogra, Katson books
5	Solid State Physics by S O Pillai, New Age International publishers

List of Open Source Software/Learning website

1	http://nptel.ac.in/
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Practical Project/Hands on Project

Sr. No.	Practical List	Linked with Unit
1	Design a system showing uninterrupted power regulation in process industry.	Unit 01
2	Design an electric bell for an office.	Unit 02
3	Water enters a typical garden hose of diameter 1.6 cm with a velocity of 3 m/s. Calculate the exit velocity of water from the garden hose when a nozzle of diameter 0.5 cm is attached to the end of the hose. Also specify, what will be the divergence in this case.	Unit 03
4	Design a piezoelectricity-based visitor sensing doormat.	Unit 04
5	Design a basic laser security alarm system for locker system.	Unit 05
6	Design Advance data transfer system for beacon communication system in aircrafts.	Unit 06
7	Design electric protection circuit for power station.	Unit 07, 08, 10
8	Design an Automatic street light.	Unit 08, 09, 10