LOK JAGRUTI UNIVERSITY (LJU)

INSTITUTE OF ENGINEERING AND TECHNOLOGY

Department of Electronics and Communication (707)

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

Course Code:	117071192
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**			3 (10%)
	1.1 Basic terms related to Dielectrics	---	---	
	1.2 Polarization mechanisms (No derivations)	Basic terms related to dielectrics (117071192-Unit-1.1)	---	
	1.3 Internal / local field (No derivations) and Clausius-Mosotti equation	Polarization mechanisms (117071192-Unit-1.2)	---	
	1.4 Types of dielectric materials	---	---	
	1.5 Applications (Capacitors & Transformers)	---	Charging and discharging of capacitor (017012291 – Unit-1.4)	
02	**Magnetic Materials**			3 (10%)
	2.1 Basic terms related to magnetism	---	---	
	2.2 Magnetic moment (No derivations)	Basic terms related to magnetism (117071192-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 (117071192-Unit-2.1)	---	
	2.5 Applications (Magnetic hard disc)	---	---	
03	**Ultrasonics**			3 (10%)
	3.1 Definition and properties	---	---	
	3.2 Generation methods	---	---	
	3.3 Detection methods	Generation methods (117071192-Unit-3.2)	---	
	3.4 Applications (Welding, drilling/cutting, SONAR, cleaning)	---	---	
04	**Laser**			3 (10%)
	4.1 Characteristics of Laser	---	---	
	4.2 Einstein's theory	---	---	
	4.3 Basic concepts related to Laser	Einstein's theory (117071192-Unit-4.2)	---	
	4.4 Types of Laser	Basic concepts related to Laser (117071192-Unit-4.3)	---	
	4.5 Applications (Laser in material processing, cutting, holography)	---	---	
05	**Fibre Optics**			3 (10%)
	5.1 Introduction	---	---	
	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 (117071192-Unit-5.3)	---	
	5.5 Types of fibre optic cables (V-number not to be included)	---	---	
	5.6 Fibre optic communication link	---	---	
06	**Semiconductors**			3 (10%)
	6.1 Properties and types of Semiconductors	---	---	
	6.2 Carrier statistics in Semiconductors (Only intrinsic semiconductors to be covered)	Properties and types of Semiconductors (117071192-Unit-6.1)	---	
	6.3 Carrier Generation (creation of EHP) and carrier recombination	Properties and types of Semiconductors (117071192-Unit-6.1)	---	
	6.4 Carrier Transport (drift and diffusion)	---	---	
07	**Basic Diodes**			3 (10%)
	7.1 PN junction diode	Properties and types of Semiconductors (117071192-Unit-7.1)	Basic idea about forward bias, reverse bias of Diode and VI characteristics (017012291 – Unit-8.1)	

	7.2 Energy band diagrams of PN junction diode	PN junction diode (117071192-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 (117071192-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 (117071192-Unit-6.3)	---	
	10.2 LDR	---	---	
	10.3 Photodiode	Carrier Generation (creation of EHP) and carrier recombination (117071192-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.

<table>
<tr><td colspan="7" align="center">Proposed Theory + Practical Evaluation Scheme by Academicians
(% Weightage Category Wise and it's Marks Distribution)</td></tr>
<tr><td align="center">L :</td><td align="center">3</td><td align="center">T:</td><td align="center" colspan="2">0</td><td align="center">P:</td><td align="center">2</td></tr>
<tr><td colspan="7">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%</td></tr>
<tr><td align="center">Group (Theory or Practical)</td><td align="center">Group (Theory or Practical) Credit</td><td align="center">Total Subject Credit</td><td colspan="2" align="center">Category</td><td align="center">% Weightage</td><td align="center">Marks Weightage</td></tr>
<tr><td align="center">Theory</td><td rowspan="4" align="center">3</td><td rowspan="10" align="center">4</td><td colspan="2">MCQ</td><td align="center">45%</td><td align="center">60</td></tr>
<tr><td align="center">Theory</td><td colspan="2">Theory Descriptive</td><td align="center">13%</td><td align="center">17</td></tr>
<tr><td align="center">Theory</td><td colspan="2">Formulas and Derivation</td><td align="center">6%</td><td align="center">7</td></tr>
<tr><td align="center">Theory</td><td colspan="2">Numerical</td><td align="center">11%</td><td align="center">16</td></tr>
<tr><td align="center">Expected Theory %</td><td align="center">75%</td><td colspan="2">Calculated Theory %</td><td align="center">75%</td><td align="center">100</td></tr>
<tr><td align="center">Practical</td><td rowspan="5" align="center">1</td><td colspan="2">Individual Project</td><td align="center">0%</td><td align="center">0</td></tr>
<tr><td align="center">Practical</td><td colspan="2">Group Project</td><td align="center">9%</td><td align="center">35</td></tr>
<tr><td align="center">Practical</td><td colspan="2">Internal Practical Evaluation (IPE)</td><td align="center">16%</td><td align="center">65</td></tr>
<tr><td align="center">Practical</td><td colspan="2">Viva</td><td align="center">0%</td><td align="center">0</td></tr>
<tr><td align="center">Practical</td><td colspan="2">Seminar</td><td align="center">0%</td><td align="center">0</td></tr>
<tr><td align="center">Expected Practical %</td><td align="center">25%</td><td></td><td colspan="2">Calculated Practical %</td><td align="center">25%</td><td align="center">100</td></tr>
<tr><td align="center">Overall %</td><td align="center">100%</td><td></td><td colspan="2"></td><td align="center">100%</td><td align="center">200</td></tr>
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Course Outcome

	Upon completion of the course students will be able to
CO1	Acquire proficiency in the intricate principles of dielectrics, magnetism and electrodynamics to effectively apply them across diverse engineering context.
CO2	Comprehending the intricate mechanisms behind ultrasound for sensing and communication as well as unraveling the diverse physics, classifications and wide ranging applications of lasers across various fields.
CO3	Grasping the rudiments of Fiber optic communication, delving into the intricacies of Semiconductor properties, types, carrier statistics, generation and transport mechanisms, and gaining a profound insight into the functionality and practical application of basic diodes.
CO4	Deepening understanding of special purpose diodes and their myriad applications, while concurrently exploring an array of management techniques indispensable for precise material selection and electric component design.

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/

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