

Course Information Sheet

Programme: UG	Degree: B.Tech (Common for all Branches)	
Course Code:	Course Title: Engineering Physics	
Year: I Sem: I A.Y. : 2025-26	Regulation: IS23 College: ISTS (an Autonomous Institution)	
L T/P/D C: 3/0/0/3	Credits: 3	Contact Hrs: 5
Mid Marks: 30	External Marks: 70	Total Marks: 100
Teaching Hrs:	Exam Duration: 3 hrs.	

Course Information:

Course Code	Course Name	Description	Year-Sem
	Engineering Physics	<ul style="list-style-type: none"> To bridge the gap between the Physics in school at 10+2 level and UG level engineering courses by identifying the importance of the optical phenomenon like interference, diffraction etc. enlightening the periodic arrangement of atoms in crystalline solids and concepts of quantum mechanics, introduce novel concepts of dielectric and magnetic materials, physics of semiconductors.. 	I B.Tech (Common for Group-B Branches) Semester -1

Course outcomes:**Student will able to**

SUBJECT : ENGINEERING PHYSICS		
CO.NO	Course Outcomes	BT Level
After successful completion of this course students will be able to:		
C112.1	CO1: Analyze the intensity variation of light due to polarization, interference and diffraction.	Analyzing
C112.2	CO2: Familiarize with the basics of crystals and their structures	Understanding
C112.3	CO3: Explain fundamentals of quantum mechanics and apply it to one dimensional motion of particles.	Understanding
C112.4	CO4: Summarize various types of polarization of dielectrics and classify the magnetic materials.	Understanding
C112.5	CO5: Explain the basic concepts of Quantum Mechanics and the band theory of solids.	Understanding
C112.6	CO6: Identify the type of semiconductor using Hall effect.	Analyzing

Course Articulation Matrix:

Mapping of Course Outcomes (CO) with Program Outcomes (PO) and Program Specific Outcomes (PSO's):

Course Outcomes (CO)	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	PSO1	PSO2
C112.1	3	3	–	--	2	–	–	–	–	–	–	2	–	–
C112.2	3	2	2	–	–	–	–	–	–	–	–	2	–	–
C112.3	3	3	2	–	–	–	–	–	–	–	–	2	–	–
C112.4	3	2	2	–	–	–	–	–	–	–	–	2	–	–
C112.5	3	2	2	–	–	–	–	–	–	–	–	2	–	–
C112.6	3	2	--	--	--	--	--	--	--	--	--	2	--	--
	3	2,4	2	--	2							2		

Level: 3–Strongly linked | 2–Moderately linked | 1–Weakly linked

JUSTIFICATIONS OF CO –PO MAPPING

C121.1		
C112.1-P01	3	Explain the need of coherent sources and the conditions for sustained interference Identify engineering applications of interference
C112.1-P02	3	Analyze the differences between interference and diffraction with applications
C112.1-P03	--	
C112.1-P04	--	
C112.1-P05	2	Illustrate the concept of polarization of light and its applications
C112.1-P06	--	
C112.1-P07	--	
C112.1-P08	--	
C112.1-P09	--	
C112.1-P010	--	
C112.1-P011	--	
C112.1-P012	2	Classify ordinary polarized light and extraordinary polarized light. In engineering tools, the concepts of light is used

C112.2		
C112.2-P01	3	Understand the basic concepts of crystal structures
C112.2-P02	2	Apply the concepts to learn the various types and planes of crystals Identifies the Engineering applications of crystal planes
C112.2-P03	2	Explain the various types of crystal planes
C112.2-P04	--	
C112.2-P05	--	
C112.2-P06	--	
C112.2-P07	--	
C112.2-P08	--	
C112.2-P09	--	
C112.2-P010	--	
C112.2-P011	--	
C112.2-P012	2	Identify the applications of crystal planes in daily life

C112.3		
C112.3-P01	3	Explain the concept of dual nature of matter and understand the significance of wave function
C112.3-P02	3	Explanation of one dimensional potential well
C112.3-P03	2	Explanation of properties of an electron
C112.3-P04	--	
C112.3-P05	--	
C112.3-P06	--	
C112.3-P07	--	
C112.3-P08	--	
C112.3-P09	--	
C112.3-P010	--	
C112.3-P011	--	
C112.3-P012	2	Applications of quantum mechanical treatment

C112.4		
C112.4-P01	3	Explain the concept of dielectric constant and polarization in dielectric materials and interpret Lorentz field and Claussius- Mosotti relation in dielectrics
C112.4-P02	2	Summarize various types of polarization of dielectrics and apply the concept of magnetism to magnetic data storage devices
C112.4-P03	2	Classify the magnetic materials based on susceptibility and their temperature dependence
C112.4-P04	--	
C112.4-P05	--	
C112.4-P06	--	
C112.4-P07	--	
C112.4-P08	--	
C112.4-P09	--	
C112.4-P010	--	
C112.4-P011	--	
C112.4-P012	2	Explain the applications of dielectric and magnetic materials

C112.5		
C112.5-P01	3	Explanation of classical and quantum free electron theory
C112.5-P02	2	Explanation and expression for electrical conductivity
C112.5-P03	2	Explanation of motion of electrons at Fermi energy level
C112.5-P04	--	
C112.5-P05	--	
C112.5-P06	--	
C112.5-P07	--	
C112.5-P08	--	
C112.5-P09	--	
C112.5-P010	--	
C112.5-P011	--	
C112.5-P012	2	Applications of motion of electrons and electrical conductivity

Justification for Avg CO-PO Mapping		
Mapping	Level	Justification
C112.PO1	3.0	In Engineering tools, knowledge the optical instruments and quantum mechanical treatment
C112.PO2	2.3	In modern technology, Impart Knowledge of optics phenomena and crystal structures required to design instruments with higher intensity.
C112.PO3	1.5	In nano technology days, we can impart the knowledge about quantum mechanical treatment and electron moments in various levels
C112.PO4	--	
C112.PO5	0.5	To impart the knowledge of materials with characteristic utility in appliances and different types of conducting appliances in modern life
C112.PO6	0.3	The engineering application knowledge is gained by crystal structures and semiconductors
C112.PO7	--	
C112.PO8	--	
C112.PO9	--	
C112.PO10	--	
C112.PO11	--	

C112.PO12	2	Life long applications of optical, crystal and quantum mechanical applications and different types of semiconducting materials
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Justification for CO-PSO Mapping

Mapping	Level	Justification
C112.PO1	--	
C112.PO2	--	
C112.PO3	--	
C112.PO4	--	
C112.PO5	--	
C112.PO6	--	
C112.PO7	--	
C112.PO8	--	
C112.PO9	--	
C112.PO10	--	
C112.PO11	--	
C112.PO12	--	

Topics beyond Syllabus

S.No.	Description	Proposed Actions
1	Applications of Interference and Diffraction of light	Assignments
2	Explanation about dielectrics and magnetics	Assignments

TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/PROJECTS/NPTEL ETC

Topic beyond Syllabus: Mapping with PO and PSO:

Topic beyond syllabus	Program Outcomes (PO)												Program Specific Outcomes (PSO's)	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
1.	3	3	2	3	3	-	-	-	-	-	-	2	-	-

Justification for Topic beyond the Syllabus (TBS) -PO Mapping.

Mapping	Level	Justification
TBS-PO1	3	Students could apply the acquired real time knowledge interference and diffraction.
TBS-PO2	3	Able to analyze applications of interference and diffraction.
TBS-PO3	2	Able to knowledge various types of magnetic materials
TBS -PO4	3	Use research-based knowledge for dielectrics and magnetics.
TBS -PO5	3	Use aid of dielectrics and magnetic materials as a software tools for various applications

Justification for Topic Beyond the Syllabus (TBS) -PSO Mapping.

Mapping	Level	Justification
TBS-PSO1	--	PPT
TBS-PSO2	--	PPT

WEB SOURCE REFERENCES:

1	https://www.loc.gov/rr/scitech/selected-internet/physics.html
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Syllabus / Lesson Plan:

Sl.No	Unit	Topic	No. of Periods	Text Book / Reference Book	Teaching Aid Used / Methodology	Hours
INTERFERENCE						
1	1.1	Introduction	1	TB.1	CHALK/TALK	7
2		Principle of superposition	1	TB.1	CHALK/TALK	
3		Interference of light-Young's double slit Experiment	1	TB.1	CHALK/TALK	
4		Interference in thin films& applications	1	TB.1	CHALK/TALK	
5		Colors in thin films	1	TB.1	PPT	
6		Newton's Rings-Determination of wavelength and refractive index	1	TB.2	CHALK/TALK	

7		Problems	1	-----	CHALK/TALK	
DIFFRACTION						
8	1.2	Introduction- Fresnel and Fraunhoffer diffraction-Differences	1	TB.1	CHALK/TALK	8
9		Fraunhoffer diffraction due to single slit	1	TB.1	CHALK/TALK	
10		Fraunhoffer diffraction due to double slits	1	TB.1, TB.2	CHALK/TALK	
11		Fraunhoffer diffraction due to N slits	1	TB.1	CHALK/TALK	
12		Diffraction Grating-Grating Spectrum	1	TB.1	CHALK/TALK	
13		Dispersive power of Grating (Qualitative).	1	TB.1	CHALK/TALK	
14		Resolving power of Grating (Qualitative).	1	TB.1	CHALK/TALK	
15		Problems	1	----	CHALK/TALK	
POLARIZATION						
16	1.3	Introduction-Types of polarization	1	TB.1	CHALK/TALK	5
17		Polarization by reflection	1	TB.1	CHALK/TALK	
18		Double refraction- Nicol's Prism	1	TB.1, TB.2	PPT	
19		Half wave and Quarter wave plates	1	TB.1	CHALK/TALK	
20		Problems	1	----	CHALK/TALK	
CRYSTALLOGRAPHY						
21	2.1	Space lattice, Basis, Unit Cell and lattice parameters	1	TB.1	CHALK/TALK	7
22		Bravais Lattices – crystal systems (3D)	1	TB.1	CHALK/TALK	
23		coordination number - packing fraction of SC	1	TB.1	CHALK/TALK	
24		coordination number - packing fraction of BCC	1	TB.1, TB.2	CHALK/TALK	
25		coordination number - packing fraction of FCC	1	TB.1, TB.2	CHALK/TALK	
26		separation between successive (hkl) planes.	1	TB.1, TB.2	PPT	
27		Miller indices-Problems	1	TB.1	CHALK/TALK	
X-Ray DIFFRACTION						
28	2.2	Bragg's law	1	TB.1	CHALK/TALK	5
29		X-ray Diffractometer	1	TB.1	CHALK/TALK	
30		crystal structure determination by Laue's method	1	TB.1	CHALK/TALK	
31		crystal structure determination by powder method	1	TB.1	PPT	
32		Problems	1	-----	CHALK/TALK	
DIELECTRIC MATERIALS						
33	3.1	Introduction-Dielectric polarization	1	TB.1	CHALK/TALK	
34		Dielectric polarizability,	1	TB.1	CHALK/TALK	

		Susceptibility and Dielectric constant				
35		Types of polarizations- Electronic and Ionic (Quantitative), Orientation polarizations (qualitative)	1	TB.1, TB.2	PPT	8
36		Lorentz internal field	1	TB.1, TB.2	CHALK/TALK	
37		Claussius-Mossotti equation	1	TB.1, TB.2	CHALK/TALK	
38		Complex dielectric constant- Frequency dependence of polarization	1	TB.1, TB.2	CHALK/TALK	
39		Dielectric loss	1	TB.1, TB.2	CHALK/TALK	
40		Problems	1	TB.1, TB.2	CHALK/TALK	
MAGNETIC MATERIALS						
41	3.2	Magnetic dipole moment- Magnetization- Magnetic susceptibility and permeability	1	TB.1	CHALK/TALK	7
42		Atomic origin of magnetism	1	TB.1	CHALK/TALK	
43		Classification of magnetic materials (Dia, Para and Ferro) and Ferri magnetic materials	1	TB.1	CHALK/TALK	
44		Domain concept of Ferromagnetism & Domain walls (Qualitative)	1	TB.1	CHALK/TALK	
45		Hysteresis	1	TB.1	PPT	
46		soft and hard magnetic materials	1	TB.1	CHALK/TALK	
47		Problems	1	TB.1	CHALK/TALK	
QUANTUM MECHANICS						
48	4.1	Introduction	1	TB.1	CHALK/TALK	6
49		Dual nature of matter, Heisenberg's Uncertainty Principle	1	TB.1	PPT	
50		Schrodinger's time independent wave equation	1	TB.1	CHALK/TALK	
51		Schrodinger's time dependent wave equation	1	TB.1	CHALK/TALK	
52		Significance and properties of wave function	1	TB.1	CHALK/TALK	
53		Particle in a box (one dimensional potential well)	1	TB.1	CHALK/TALK	
FREE ELECTRON THEORY						
54	4.2	Introduction	1	TB.1	CHALK/TALK	7
55		Classical free electron theory	1	TB.1	PPT	
56		Classical free electron theory- merits and demerits	1	TB.1	CHALK/TALK	
57		Quantum free electron theory	1	TB.1	CHALK/TALK	
58		Equation for electrical conductivity based on quantum free electron theory	1	TB.1	CHALK/TALK	
59		Fermi-Dirac distribution	1	TB.1	CHALK/TALK	

60		Density of states - Fermi energy	1	TB.1	CHALK/TALK	
SEMICONDUCTORS						
61	5	Semiconductors: Formation of energy bands	1	TB.1	CHALK/TALK	9
62		classification of crystalline solids	1	TB.1	CHALK/TALK	
63		Intrinsic semiconductors- Density of charge carriers	1	TB.1, TB.2	PPT	
64		Electrical conductivity and Fermi level of intrinsic semiconductors	1	TB.1, TB.2	CHALK/TALK	
65		Extrinsic semiconductors - density of charge carriers	1	TB.1	CHALK/TALK	
66		Dependence of Fermi energy on carrier concentration and temperature	1	TB.1	CHALK/TALK	
67		Drift and diffusion current	1	TB.1	CHALK/TALK	
68		Einstein's equation	1	TB.1	CHALK/TALK	
69		Hall effect and its applications	1	TB.1	CHALK/TALK	

Topic Beyond Syllabus:

S.No.	Topic Beyond Syllabus Planning	PERIODS	Methodology	Text book/references/web references and additional text book reference
1	Applications of Interference and Diffraction of light	2	Assignment	T1, T3
2	Explanation about dielectrics and magnetics	2	Assignment	

Note: Bloom's Taxonomy Levels

BTL1-Remember	BTL2 – Understand	BTL3 –Apply
BTL4-Analyze	BTL5 –Evaluate	BTL6–Create

Text books (T) / Reference books (R)/Additional text books (A):

T/R/A	Book Title/Author/Publication
T1	M. N. Avadhanulu, P.G.Kshirsagar & TVS Arun Murthy” A Text book of Engineering Physics”- S.Chand Publications, 11 th Edition 2019.
T2	Engineering Physics” by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015).
R1	Engineering Physics by M.R.Srinivasan, New Age international publishers (2009).
R2	Shatendra Sharma, Jyotsna Sharma, “ Engineering Physics”, Pearson Education, 2018
R3	Engineering Physics - Sanjay D. Jain, D. Sahasrabudhe and Girish, University Press
R4	B.K. Pandey and S. Chaturvedi, Engineering Physics, Cengage Learning

ASSESSMENT METHODOLOGIES-DIRECT

<input checked="" type="checkbox"/> ASSIGNMENTS	<input checked="" type="checkbox"/> STUD. SEMINARS	<input checked="" type="checkbox"/> TESTS/MODEL EXAMS	<input checked="" type="checkbox"/> UNIV. EXAMINATION
<input type="checkbox"/> STUD. LAB PRACTICES	<input type="checkbox"/> STUD. VIVA	<input type="checkbox"/> MINI/MAJOR PROJECTS	<input type="checkbox"/> CERTIFICATIONS
<input type="checkbox"/> ADD-ON COURSES	<input type="checkbox"/> OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

<input checked="" type="checkbox"/> ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	<input checked="" type="checkbox"/> STUDENT FEEDBACK ON FACULTY (TWICE)
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ASSESSMENT OF MINI/MAJOR PROJECTS BY
EXT. EXPERTS

OTHERS



Prepared by



Approved by