DEPARTMENT OF PHYSICS

R.V. COLLEGE OF ENGINEERING

(An autonomous institution affiliated to VTU, Belagavi)
Mysore, Bangalore-560059

***Course Title*: Condensed Matter Physics (EE Stream)**	***Course Code*: 22PHY12A**
***Total Contact Hours*: 42**	***Credits: 04***
***SEE Marks*: 100**	***CIE Marks*:150**
Semester: ODD	***Academic Year:2022-2023***
***Lesson Plan Author*: Dr. Avadhani D N**	***Date*: 06.12.2022**

Week	Day/ Hour	Unit (Hour)	Main topic	Sub topic	COs
I	1	I(1)	**Quantum Mechanics**	Introduction to Quantum mechanics, dual nature of radiation. de Broglie hypothesis and matter waves	1
	2	I(2)		Properties of matter waves, expression for de Broglie wave length of electron.	1
	3	I(3)		Phase velocity and Group velocity, relation between phase and group velocity in dispersive medium.	1
	4	I(T)		PROBLEM SOLVING	1,2,3
II	5	I(4)		Heisenberg's Uncertainty principle, application for broadening of spectral line.	1,2
	6	I(5)	**Wave Mechanics**	Wave function explanation, Physical significance of wave function. Setting up of time independent one-dimensional Schrodinger's wave equation.	1,2
	7	I(6)		Expectation values, properties of wave function, Eigen values and Eigen function.	1,2
	8	I(T)		PROBLEM SOLVING	1,3

III	9	I(7)		Particle in one-dimensional potential well of infinite depth: Discussion of solution, normalisation, Energy Eigen values.	1,2
	10	I(8)	**Wave mechanics**	Graphical representation of wave functions, probability densities of particle in an infinite potential well. Explanation of energy eigen value for a free particle.	1
	11	II(9)	**Electrical Conductivity in Metals**	Classical free electron theory, assumptions and failures, quantum free electron theory, assumptions and failures.	1
	12	II(T)		PROBLEM SOLVING	1,2
IV	13	II(10)		Band theory of solids, concept of Fermi energy, Fermi level, Fermi factor, variation of Fermi factors with energy.	1,2,3
	14	II(11)		Density of states, Carrier concentration in metal at 0K. Problems on QFT.	1,2
	15	II(12)	**Electrical Conductivity in Semiconductor**	Expression for electron concentration in conduction band of intrinsic semiconductor.Explanation of concept of effective mass.	1,2
	16	II(T)		PROBLEM SOLVING	1,2,3
V	17	II(13)		Explanation of Fermi level in intrinsic semiconductor.Derivation	1,2
	18	II (14)		Law of mass action. Expression for conductivity in semiconductors.	1,2
	19	II(15)		Extrinsic semiconductor, Variation of charge carrier concentration and Fermi level with temperature, Effect of doping on Fermi level of an extrinsic semiconductor.	1,2
	20	II(T)		Problem solving.	1,2,3
VI	21	II(16)		Hall effect, expression for Hall coefficient. Problems.	1,2
	22	III(17)	**Lasers and Optical Fibers:**	Basic interaction of radiation with matter, characteristics of Lasers.	1,2

	23	III(18)		Expression for energy density interms of Einstein's coefficient. Condition for amplification.	1,2
	24	III(T)		PROBLEM SOLVING	1,3
VII	25	III(19)		Requisites for laser action. Construction and working of Semiconductor laser.	1,2
	26	III(20)		Applications of laser: Defence application-laser range finder and Laser printing.	1,2
	27	III(21)		Introduction to Optical fiber, basic principle, Propagation mechanism.	1,2
	28	III(T)		PROBLEM SOLVING	1,3
VIII	29	III(22)		Expression for Numerical aperture, definition. of fractional index change and relation between fractional index change and NA.	1,2
	30	III(23)		V- number, modes of propagation and types of optical fibers.	1,2
	31	III(24)		Attenuation in optical fiber, types of attenuation and cause of attenuation.	1,2
	32	III(T)		PROBLEM SOLVING	1,2,3
IX	33	III(25)		Point to point communication, Applications: Fiber optic sensors.	1,2
	34	IV(26)	**Semiconductor devices:**	Introduction to semiconductor devices, direct and indirect bandgap semiconductors. Band gap engineering.	1,2,
	35	IV(27)		P-N junction diode-forward and reverse bias, diode equation	1,2
	36	IV(T)		PROBLEM SOLVING	
X	37	IV(28)		V – I characteristics of a diode. Applications of diode as bridge rectifier.	1,2
	38	IV(29)		Breakdown mechanism in diodes: Avalanche & Zener breakdown, Zener diode as voltage regulator.	1,2
	39	IV(30)		Transistors: Introduction to transistor, types of transistors, identification of NPN and PNP transistors and their symbols.	1,2

	40	IV(T)		PROBLEM SOLVING	1,2,3
XI	41	IV(31)		Transistors characteristics: V-I characteristics in Common Emitter, Common Base and Common Collector configuration,	1,2
	42	IV(32)		CE configuration as an amplifier and its applications in electronic circuits.	1,2
	43	IV(33)		Students' activity: design of rectifier / amplifiers and execution.	1,2
	44	IV(T)		PROBLEM SOLVING	1,2,3
XII	45	V(34)	**Dielectrics and Transducers:**	Dielectrics: Polar and non-polar dielectrics, polarization of dielectrics, relation between polarization, dielectric susceptibility and electric field.	1
	46	V(35)		Polarization mechanism: Electronic, ionic, orientation and space charge polarisation.	1,2
	47	V(36)		Definition of internal field, internal field in one dimensional solid (only equation), derivation of Clausius Mossotti equaiton.	1,2
	48	V(T)		PROBLEM SOLVING	1,2,3
XIII	49	V(37)		Frequency dependency of dielectric constant, Electrical insulation – Dielectric breakdown.	1
	50	V(38)		**Transducers**: Stress-Strain curve, moduli of elasticity.	1,2
	51	V(39)		**Transducers**: strain gauge, ultrasonic piezoelectric transducer, temperature transducer – Thermocouples.	1,2
	52	V(T)		PROBLEM SOLVING	
XIV	53	V(40)		PROBLEM SOLVING	
	54	V(41)		REVISION OF SYLLABUS	
	55	V(42)		REVISION OF SYLLABUS	
	56	V(T)		REVISION OF SYLLABUS	

Sudha Kamath, HoD Physics.