

Lab & OE Paper problem.
5th and 6th Sem



Aadikavi Shri Maharshi Valmiki University
Raichur - 584 133
SYLLABUS and COURSE STRUCTURE

of

PHYSICS

as per the Choice Based Credit System (CBCS) designed in
accordance with of State Education Policy (SEP-2024)

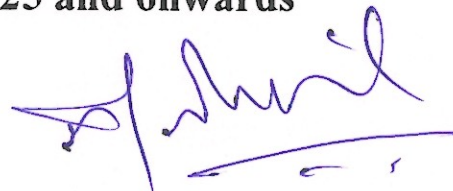
Syllabus of V and VI Semester

Bachelor of Science (B. Sc. Physics)

w.e.f.

Academic Year 2024-25 and onwards


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Solid State Physics

No.of Credits-04, 64 Hours

Unit –1	16 hours
Crystal Structure: Concept of lattice, periodic crystal, unit cell, Bravais lattice, Crystal planes and Miller indices, Interplanar spacing in terms of Millers indices. X-ray diffraction, Bragg's law, Braggs spectrometer (construction and working), powder method, Structure of NaCl and KCl, Crystal binding: Ionic, covalent, metallic, molecular and hydrogen bonding, X-ray spectra; Moseley's law, Scattering of X-rays- Compton effect, Bragg's law and problems.	8hrs
Band Theory of Solids: Classification of solids: Conductors, semiconductors and Insulators Intrinsic and extrinsic semiconductors. Derivation of expression for Electron density, hole density and Electrical conductivity in intrinsic semiconductors, expression for Fermi level in intrinsic and extrinsic semiconductors. PN junction diode and problems.	8hrs
Unit –2	16 hours
Free Electron Theory of Metals: Study of electrical and thermal properties of metals, expression for electrical and thermal conductivities, Weidman Franz Law, Ohm's law, Drude and Lorentz theory, derivation of electron density of states, Concept of Fermi energy, expression for Fermi energy and kinetic energy of electron(at absolute zero temperature), Density of states for free electrons with derivation, qualitative discussion of lattice vibration and concept of phonon and problems.	
Unit –3	16 hours
Specific Heat of Solid: Dulong and Petit's law, Einstein's theory and Debye's theory of specific heats(derivation),Hall Effect: Experimental determination of Hall co-efficient and its application, Fermi- Dirac distribution. Problems.	6 hrs

Magnetic Properties of Materials: Review of basic Formulae: Magnetic intensity, Magnetic induction, Permeability, Magnetic susceptibility, dia, para and ferro magnetism and its properties, qualitative explanations of classical (Langvein's theory) and quantum theory of paramagnetism (law Currie- Weiss law), discussion of B-H curve, hysteresis & energy loss. Problems. **10 hrs**

Unit –4

16 hours

Superconductivity: Introduction, elementary ideas of superconductivity and experimental facts-Zero Resistivity and critical temperature, Meissner effect, BCS theory of superconductor, Critical magnetic field, persistent current, London's equations. Type I and Type II super conductors, applications of superconductors, and problems.

References Books:

SI No	Title	Name of Author	Publication	Year
1	Introduction to Solid State Physics	Charles Kittel	Global Publication	2018
2	Solid State Physics	Giuseppe Grosso and Giuseppe	Academic Press	2000
3	Modern Physics	R.Murigeshan	S,Chand Publication	2010
4	Elementary Solid State Physics	M. Ali Omar	Pearson Education	1975
5	Condensed Matter Physics	Ajay Kumar Saxena.	Laxmi Publications Pvt. Ltd	2000
6	Introduction to Superconductivity	Michael Tinkham	McGraw-Hill	2004
7	Solid State Physics	A J Dekker	, MacMillan India Ltd	2000
8	Essential of crystallography	, M A Wahab	Narosa Publications	2009

SEMESTER-V

WAVES AND OPTICS

No. of Credits – 04, 64 Hours

Unit –1	16 hours
Waves and Superposition of Harmonic Waves. Waves: plane and Spherical waves, Longitudinal and Transverse waves, Characteristics of wave motion, plane progressive waves, and its equation, wave equation for differential forms, particle and wave velocities, and relation between them, Energy transport of transverse wave, Expression for intensity of progressive wave. Problems. 6hrs	
Superposition of Harmonic Waves: principle of superposition and linearity, superposition of two Collinear Harmonic Oscillator: Oscillation having Equal Frequency, Explanation of Lissajous Figures (amplitude unequal, same phase, phase of $\pi/4$), Composition of the harmonic motion with unequal frequency and different amplitude, transverse waves on a string. travelling and standing waves on a string. normal modes of a string. group velocity, phase velocity, plane waves, spherical waves, wave intensity, and problems. 10hrs	
Unit –2	16 hours
Sound: Simple harmonic motion-forced vibrations and resonance - intensity and loudness of sound motion-decibels - intensity levels - musical notes. acoustics of buildings reverberation and time of reverberation - absorption coefficient - Sabine's formula - measurement of reverberation time -acoustic aspects of buildings. Newton's formula for velocity of sound and Laplace correction. beats & its application. Problems. 16hrs	

Unit –3	16 hours
Wave optics:Theories of light, electromagnetic nature of light. definition and properties of wave front. Huygens principle. construction of wave front. 4hrs Interference of light: Coherent sources, interference due to Division Of Wave front: Young's Double Slit Experiment, Expression for Fringe Width, Lloyd's single Mirror And Fresnel's Bi- prism. interference due to Division of Amplitude: Interference in Thin Films, interference due to Transmitted light, Wedge-Shaped Films. (Air Wedge), Newton's Rings, Theory of Newton's rings by Reflected and Transmitted light, Michelson interferometer, Measurement of a wavelength and Numericals. 12hrs	
Unit –4	16 hours
Diffraction: Idea of Form of Fringes, determination of wavelength, wavelength difference, refractive index and visibility of fringes. Fraunhofer diffraction, single slit, double slit, multiple slits or diffraction grating Fresnel diffraction: half-period zones. zone plate. Fresnel diffraction pattern of a straight edge slit and a wire using half-period zone analysis. Problems. 6hrs Polarization of light: Types of polarization, transverse nature of light waves. plane polarized light, methods of polarization: polarization by reflection, refraction, scattering, absorption, double refraction in a calcite crystal, Brewster's law and its application, Huygens theory of positive and negative crystal, optical activity: Fresnel theory of quarter wave plate and half wave plate. Laurent half shaded polarimeter. Malus law, Super position of Waves linearly polarized at right angles, production of Elliptical and Circular polarized light, Application of polarized light. Cardinal points, Spherical and Chromatic aberrations in lenses. Huygens and Ramsdons eye pieces and problems. 10hrs	

Reference Books:

Sl No	Title	Authour	Publication	Year
1	optics text book	Brijilal and Subramanyam	S.Chand publications	2006
2	College Physics for B.Sc.	N.Sundararajan,George thomas,Sayyedazeez	United Publication	2002
3	Optics	Ajoyghatak	S.Chand publications	2008
4	A text Book of Sound	Brijilal and Subramanyam	S.Chand publications	1985
5	Engineering Physics	R K Gour And S L Gupta	Dhanpat Rai & Co. (P) Ltd.	2012

Practical Content

List of Experiments to be performed in the Laboratory (Minimum of 10 Experiments)

Solid State Physics and Waves and Optics

No. of Credits: 02

1	Measurement of heat capacity of metals.
2	To Measurement of Susceptibility of paramagnetic solution.
3	To determine the inter planar Spacing d and structure Factor s using X-ray powder Diffraction film.
4	To the temperature co-efficient of resistance of semiconductor.
5	To Draw the B-H Curve of iron and determine the energy loss from Hysteresis.
6	To measure the resistivity of a semiconductor (Ge) Crystal with temperature by Four Probe Method(Room Temperature) and determine its Band Gap.
7	To Determine the energy gap of a semiconductor.
8	Temperature coefficient of resistance and energy gap of thermistor.
9	Solar cell characteristics – Open circuit voltage – short circuit current – efficiency.
10	Study of Hall effect in a metal.
11	Determination of Fermi energy of a metal.
12	Velocity of sound through a wire using Sonometer.
13	Frequency of AC using Sonometer.
14	Study of Lissajous Figures.
15	To determine the thickness of a thin paper by measuring the width of the

	interference fringes produced by a wedge-shaped film.
16	To determine the Frequency of an Electrically Maintained Tuning Fork by Melde's Experiment and to verify λ^2 - T Law.
17	To determine the Refractive Index of the Material of a given Prism using Mercury Light.
18	To determine Dispersive Power of the Material of a given Prism using Mercury Light.
19	To determine the value of Cauchy Constants of a material of a prism.
20	To determine the Resolving Power of a Prism.
21	To determine wavelength of sodium light using Newton's Rings.
22	To determine wavelength of (1) Sodium & (2) spectrum of Mercury light using plane diffraction Grating.
23	To determine the Resolving Power of a Plane Diffraction Grating.

Reference Books:

Sl. No	Title	Name of Author	Publication	Year
1	Experiment In Physics	B. Saraf	Vikas Publicatios	1975
2	Advanced Practical Physics	S.P. Singh	Pragati Prakashan	1969
3	Physics Practicals	C. L. Arrora	S.Chand	2010
4	Experiments In Modern Physics.	Melissoons		1966
5	Physics Lab. Manual	Misra and Misra	South Asian Publishers	2000
6	Practical Physics	Gupta and Kumar	Pragati Prakashan	1976

Open Elective Paper
Energy Sources
No. of Credits 02; 32 Hours

Unit –1	16 hours
Renewable and Non-Renewable Energy Sources Energy concept-sources in general, its significance & necessity, Classification of energy sources: Primary and Secondary energy, Commercial and Non-commercial energy, ,Conventional and Non-Conventional energy, Based on Origin- Examples and limitations. Importance of Non-commercial energy resources, Need of renewable energy, Wind Energy, Tidal Energy, Ocean Thermal Energy Conversion, biomass, biochemical Conversion, biogas generation, geothermal energy, Hydroelectricity.	
Unit –2	16 hours
Conventional and Solar Energy Sources Fossil fuels & Nuclear energy- production & extraction, Usage rate and limitations, Impact on environment and their issues & challenges, Need of eco-friendly & green energy & their related technology, Solar Energy-Key features, its importance, Merits & demerits of solar energy, Applications of solar energy. Solar water heater, flat plate collector, solar distillation, solar cooker, solar green houses, solar cell-brief discussion of each. Need and characteristics of photovoltaic (PV) systems,PV models and equivalent circuits, and sun tracking systems.	

References Books:

Sl. No.	Book Title	Author Name	Publication	year
01	Fuelcell Techonology	Hoogers G	CRC Press	2003
02	Fuelcell and their application	Karl Kordesch &Gunter R.Simader	VCH Publisher	2001. 1ed
03	Energy Harvesting Technologies	Shashank Priya and Daniel J. Inman	Springer nature link	2009
04	Renewable Energy and Harvesting	Binapani Satpathy	Kalyani Publishers	2018

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