ADIKAVI SRI MAHARSHI VALMIKI UNIVERSITY, RAICHUR

SYLLABUS

B.Sc. Three Year Degree Program for the Subject

Physics

With Effect from 2024-25

DISCIPLINE SPECIFIC CORE COURSE (DSC) FOR SEM I-IV, SKILL ENHANCEMENT COURSE (SEC) FOR SEM IV/V/VI and ELECTIVE COURSES FOR SEM V AND VI

AS PER N E P (Revised): 2024

SEMESTER-III

THERMAL PHYSICS AND STATISTICAL MECHANICS

TOTAL HOURS: 64

Unit –1	16 hours

Thermodynamics: Zeroth Law, First Law and Internal energy, Isothermal and adiabatic changes – indicator diagram. Derivation of PV^{γ}=constant. Applications of first law for work done during (i) Cyclic process   (ii) adiabatic process (iii) isothermal process (iv) isobaric process (v) isochoric process. Carnot's engine – Working – its efficiency (Derivation). General Relation Between C_p&C_v ($C_p-C_v=R$). Carnot's theorem, Clausius – Clapeyron equation (derivation) – application to melting point and boiling point of a substance. Problems.

Entropy: Second law of Thermodynamics, Entropy Concept – Physical analogies. Change of entropy during reversible and irreversible process with examples. Change of entropy in Carnot's cycle (T-S diagram). Third law of Thermodynamics (Statement). Problems.

Unit –2	16 hours

Kinetic Theory of Gases: Review of gas Law- Principle of Equipartation energy based on kinetic theory of gases, Derivation of U=3/2 RT, Expression for Mean Free Path, Probability of a molecule having mean free pat ,Transport of Phenomenon-diffusion, Viscosity and Thermal conductivity of Gases, Derivation Of Maxwell's Law Of Distribution Of Velocities. Problems.

Radiation: black body, Energy distribution in black body spectrum. Wein's law, Rayleigh-Jean's Law and Stefan's law of radiation. Derivation of Planck's law of radiation (from concept of oscillators) – Deduction of Wein's displacement law, Rayleigh-Jean's Law & Stefan's law from Planck's law. Solar constant – estimation of surface temperature of sun. Problems.

Unit –3	16 hours

Statistical Mechanics-I:

Introduction: Phase Space, Descriptions of microscopic and macroscopic, Ensembles and Thermodynamic Probability, Statistical Equilibrium. Fermi - Dirac Distribution Function; Fermi sphere and Fermi energy, Fermi gas; Electronic specific heat capacity in metals. Problems.

Unit –4	16 hours

Statistical Mechanics-II:

Maxwell-Boltzmann Distribution Law, Bose-Einstein Distribution Law, and Fermi - Dirac Distribution Law. Comparison of Three Distribution laws. Molecular energies in an ideal gas. Fundamental postulates of statistical mechanics. Quantum statistics. Application of Fermi Dirac distribution to white dwarfs and neutron stars. Problems.

References Books:

Sl. No.	Title of theBook	Authors Name	Publisher	Year of Publication
1	Thermal physics	S.Garg,R.Bansal and C.Ghosh,Tata MeGraw-Hill	MeGraw-Hill	1993
2	Thermodynamics,	Enrico Fermi	Courier Dover publications	1956
3	Heat and thermodynamics	M.W. Zemasky and R.Dittman.	MeGraw-Hill	1981
4	Thermodynamics, kinetic theory & Statistical thermodynamics	,F.W.sears& G.L.salinger.	Narosa. publication	1988,
5	Thermal physics	A. Kumar & S. P. Taneja	S. Chand Publications.	2014
6	College Physics	N. Sundararajan, George Thomas, Sayyed Azeez	United Publication	1998
7	Heat &thermodynamics	Brijlal and Subramanyam.	S. Chand publications	2012
8	Modern physics	R.Murigation	S. Chand publications	

Practical Content

List of Experiments to be performed in the Laboratory (Minimum of 8 Experiments)

1	To determine Mechanical Equivalent of Heat, j by Callender and Berne's constant flow method
2	Measurements of Planck's constant using Black Body Radiations
3	To determine Stefan's constant
4	Verification of Stefan's T'th Law.
5	To determine the coefficient of Thermal conductivity copper by Searle's Apparatus.
6	To determine the coefficient of thermal conductivity Cu by Angstrom's method.
7	To determine the coefficient of Thermal conductivity of a bad conductor by Lee and Charlton disc method.
8	To determine the temperature co efficient of resistance by platinum resistance thermometer.
9	To study the variation of thermo EMF across two junctions of a thermocouple with temperature.
10	Variation of Clausius – Clapeyron equation and Determination of Specific Enthalpy.
11	To caloibrate the given thermocouple and to determine the unknown temperature.
12	To record and analyze the cooling temperature of an hot object as a function of time using a thermocouple and suitable data acquisition system.
13	To determine the specific heat of solids and liquids using the method of mixtures.

Reference Books:

Sl. No.	Title of the Book	Authors Name	Publisher	Year of Publication
1	B. Sc. Practical Physics	Harnamsingh, Dr. P. S. Hemne	S. Chand & Co.	2014
2	Physics through experiments	B. Saraf	Vikas Publication	2015
3	B.Sc. Practical Physics	C.LArora	S.Chand&co.	2020