SEMESTER I

Core Paper II

HEAT, THERMODYNAMICS AND STATISTICAL METHODS

Instructional Hrs . : 45 **Sub. Code: 15PHUC102**

Max. Marks: CIA - 25; ESE – 75 **Credits: 3**

Objective: The paper helps the students to learn about the behavior of Thermo dynamical systems.

UNIT I **9 Hrs.**

Equation of State of a Real Gas: Van Der Waal's Equation of State - *Critical Constants*.

Quantum Theory of Specific Heat: Dulong and Petit's Law and the Deduction - Failure of Dulong and Petit's Law - Einstein Theory and its Limitations - Debye's Theory - *Specific Heat of Di-Atomic Gases.*

UNIT II **9 Hrs.**

Entropy: Principles of Increase of Entropy - Temperature-Entropy Diagram - Entropy of A Perfect Gas Thermodynamic Potentials: Internal Energy (U), Helmholtz Function(F), Gibb's Function(G), and Enthalphy(H) - Maxwell's Thermodynamic Relations - *(T-ds) Equations - Clausius Latent Heat Equation From Maxwell's Thermodynamic Relations.*

UNIT III **9 Hrs.**

Production of Low Temperature and Liquefaction of Gases: Method of Production of Low Temperatures: Joule Thomson Effect - Porous Plug Experiment - Theory and Results - Joule Thomson Effect for Perfect and *Real Gases* –Liquefaction of air (Linde's process) , Hydrogen and Helium – Helium-I and Helium-II - *Lamda Point* **–** Superfluidity- Adiabatic Demagnetization.

UNIT IV **9 Hrs.**

Thermal Radiation: Quantum Theory of Radiation - Planck's Hypothesis - Average Energy of Planck's Oscillator - Planck's Radiation Law and Its Experimental Verification - Wien's Law and Rayleigh- Jeans's Law in Relation to Planck's Law - *Stefan's Constant and Wien's Constant from Planck's Law.*

UNIT V **9 Hrs.**

Statitical Thermodynamics: Statistical Equilibrium - Probability Theorems in Statistical Thermodynamics - Maxwell-Boltzman Distribution Law - Maxwell-Boltzman Distribution Law In Terms of Temperature - Quantum Statistics - Phase Space – Fermi-Dirac Distribution Law - Bose – Einstein's Distribution Law (Qualitative Study Only) – *Comparison of Three Statistics.*

Note: *Italics* denotes Self Study Topics

TEXT BOOKS

1. Brijilal and Subramanyam., "*Heat and Thermodynamics*" S.Chand & Co., New Delhi First Edition, Reprint 2006.

2. **Murugeshan, & Kiruthiga Sivaprasath.,** "*Thermal Physics"*. S.Chand & Co. New Delhi,First Edition, 2004.

3. **Singal, Agarwal and Sathya Prakash.,** "*Heat and Thermodynamics and Statistical Physics"* Pragati Prakashan Publications, 9th Edition, Reprinted 1995.

REFERENCE BOOKS

1. **Mathur D.S.,** "*Heat and Thermodynamics",* S. Chand & Co., New Delhi, First Edition, 5th Reprint 2008.

2. **Sharma J.K and Sarkar K.K.,** "*Thermodynamics and Statistical Physics"* Himalaya Publishing House, Bombay, Third Revised Edition, 1991.

3. **Saxena A.K and Tiwari C.M**.,"*Heat and Thermodynamics"* Narosa Publishing House, New Delhi, First Edition, 2014.

SEMESTER II

Core Paper III

ELECTRICITY, MAGNETISM & ELECTROMAGNETISM

Instructional Hrs. : 45 **Sub. Code: 15PHUC203**

Max. Marks: CIA - 25; ESE – 75 **Credits: 3**

Objective: The domain of electricity and magnetism extends over the whole of nature. The concepts taught through the course can be applied to several fields of relevance e.g. Optics, Material science, Biophysics, Atomic physics, Nuclear physics etc. Theoretical and practical skills developed can be extended to industrial applications. The student gains the knowledge of electrical behavior of charge and magnetic properties of materials.

UNIT I **9 Hrs.**

Electro Statistics: Gauss Theorem - Application of Gauss Theorem - Coulomb's Law: Proof Mechanical Force Experienced by Unit Area of a Charged Surface Energy Stored per Unit Volume in an Electric Field.

Principle of Capacitors: Parallel Plate Capacitor - Force of Attraction between Plates of a Charged Parallel Plate Capacitor Polarization in Dielectric Materials. *Types of Capacitors: Guard Ring Capacitor - Electrolytic Capacitor - Variable Capacitor.*

UNIT II **9 Hrs.**

Magnetic Properties Of Materials: Electron Theory of Magnetism - Langevin Dia, Para and Ferromagnetism - *Magnetic Susceptibility and Magnetic Permeability* - Hystersis - Area of the Hystersis Loop – Ferro Magnets – Determination of Susceptibility - Guoy's Method.

UNIT III **9 Hrs.**

Helmholtz Equations of Varying Current: Growth and Decay of Current in an Inductive–Resistive Circuit - Charging and Discharging of a Capacitance through a Resistance - Charging And Discharging of a Capacitance through an Inductance and a Resistance - Discharge of a Capacitance through an Inductance – Oscillatory Circuits - *Force on a Current Carrying Conductor - Theory of Ballistic Galvanometer.*

UNIT IV **9 Hrs.**

AC Circuit Analysis and Network Theorems: LCR Series Resonance Circuit - LC Parallel and *L, R and C Parallel Resonance Circuits* - Power Consumed By the Above Circuits - Q-Factor and Bandwidth of Response of a tuned Circuit - Sharpness of Resonance – Network Theorems: Thevenin and Norton theorems.

UNIT V **9 Hrs.**

Dynamics of Charged Particles: Charged Particles in a Uniform and Constant Electric Field - Charged Particle an Alternating Electric Field - *Charged Particle in a Uniform and Constant Magnetic Field* - Magnetic Focusing - Charged Particle in Combined Electric and Magnetic Field When the Fields are parallel and are in Mutually Perpendicular Directions.

Note: *Italics* denotes Self Study Topics

TEXT BOOKS

1. **Brijlal&Subramaniam N.**,*"Electricity and Magnetism"*, Ratan Prakasham Mandir, Agra, 17th Edition 1989.
2. **Murugeshan R.,** "*Electricity and Magnetism*" S.Chand &Company Ltd.,New Delhi 9th revised edition, 2011.
3. **Nagaratnam.N., Lakshmi Narayanan. N., "** *Electricity and Magnetism*" The National Publishing Company, Chennai, 3nd Revised Edition. 1994.

REFERENCE BOOKS

1. **Tewari k.k**., "*Electricity and Magnetism"* S.Chand & Company, New Delhi, 1st Edition, Reprint 2013.
2. **Seghal, D.C., Chopra, K.L., Seghal, N.K., "***Electricity and Magnetism",* S.Chand & Company, New Delhi, 5th Edition. 2009.
3. **Emerson M.Pugh., Emerson W.Pugh**., *"Principles of Electricity and Magnetism*" Wesley London, First Edition.

SEMESTER IV

Non-Major Elective II

SCIENTIFIC FACTS

Instructional Hrs. :30 Sub. Code:

14PHUN402 Max. Marks: ESE-100

Credits: 2

To create interest in science and provide explanation for the phenomena, that we witness in day – to - day life. To facilitate the spread of scientific spirit. To develop an insatiable curiosity in science.

Topics:

Physics

TEXT BOOKS

1. "*The Hindu Speaks on Scientific Facts*" Volume I., Kasturi & Sons Ltd., Chennai, 6th Prin

2004.

2. "*The Hindu Speaks on Scientific Facts*" Volume II, Kasturi & Sons Ltd., Chennai, 2008 Print,

2008.