# LECTURE PLAN
# DEPARTMENT OF PHYSICS

NAME: PROF.G.P.Gupta DESIGNATION: ASST. PROF.

COURSE: B.Sc SEMISTER III SESSION: 2018-2021

PAPER NAME: PHY-CC-5.T: MATHEMATICAL PHYSICS-II AND THERMAL PHYSICS

| SL. No | Topic/Sub Topic | Expected No. of Lecture |
|---|---|---|
| 01 | Fourier Series: Periodic functions. Orthogonality of sine and cosine functions, Dirichlet Conditions. Expansion of periodic functions in a series of sine and cosine functions and determination of Fourier coefficients. Complex representation of Fourier series. Fourier's Theorem, Analysis of saw tooth, triangular and square wave form. (23 Lectures) | 23 |
| 02 | Kinetic Theory of Gases Distribution of Velocities: Maxwell-Boltzmann Law of Distribution of Velocities in an Ideal Gas and its Experimental Verification. Mean, RMS and Most Probable Speeds. Degrees of Freedom. Law of Equipartition of Energy, Specific heats of mono-,dia- and tri-atomic Gases. (12 Lectures) | 12 |
| 03 | Molecular Collisions:Mean Free Path,Collision Probability. Clausius and Maxwell Derivations of mean free path. Transport Phenomenon in Ideal Gases: (1) Viscosity, (2) Thermal Conductivity and (3) Diffusion. Brownian Motion-Einstein's theory and experimental determination of Avogadro's number.(10 Lectures) | 10 |
| 04 | Real Gases: Behavior of Real Gases: Deviations from the Ideal Gas Equation. Andrew's Experiments on $CO_2$ Gas. Critical Constants. Continuity of State. Boyle Temperature. Van der Waal's Equation of State for Real Gases using Virial theorem. Values of Critical Constants. Law of Corresponding States. Comparison with Experimental Curves. p-V Diagrams. Theory of Joule-Thomson effect, Porous Plug Experiment. J-T effect for perfect and Van der Waal gases, Temperature of Inversion & Critical temperature. Joule- Thomson Cooling, Relation between Boyle temperature. (15 Lectures) | 15 |
| | Total Lecture= | 60 |

Reference Books:


1. Mathematical Methods for Physicists: Arfken, Weber, 2005, Harris, Elsevier.
2. Fourier Analysis by M.R. Spiegel, 2004, Tata McGraw-Hill.
3. Mathematics for Physicists, Susan M. Lea, 2004, Thomson Brooks/Cole.
4. Differential Equations, George F. Simmons, 2006, Tata McGraw-Hill.
5. Partial Differential Equations for Scientists & Engineers, S.J. Farlow, 1993, Dover Pub.
6. Mathematical methods for Scientists & Engineers, D.A. McQuarrie, 2003, Viva Books


(Signature)

# LECTURE PLAN
# DEPARTMENT OF PHYSICS

NAME: PROF.G.P.Gupta DESIGNATION: ASST. PROF.

COURSE: B.Sc SEMISTER III SESSION: 2018-2021

PAPER NAME: PHY-CC-6.T: PHYSICS OF THERMODYNAMICS

| SL. No | Topic/Sub Topic | Expected No. of Lecture |
|---|---|---|
| 01 | Zeroth and First Law of Thermodynamics: Zeroth Law of Thermodynamics, First Law of Thermodynamics and its differential form, Internal Energy, First Law & various processes, Applications of First Law: General Relation between CP and CV, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Co-efficient. (12 Lectures) | 12 |
| 02 | Second Law of Thermodynamics: Reversible and Irreversible process with examples. Conversion of Work into Heat and Heat into Work. Heat Engines. Carnot's Cycle, Carnot engine & efficiency. Refrigerator & coefficient of performance, 2ndLaw of Thermodynamics: Kelvin-Planck and Clausius Statements and their Equivalence. Carnot's Theorem. Applications of Second Law of Thermodynamics: Thermodynamic Scale of Temperature and its Equivalence to Perfect Gas Scale. (14 Lectures) | 14 |
| 03 | Entropy: Concept of Entropy, Clausius Theorem. Clausius Inequality, Second Law of Thermodynamics in terms of Entropy. Entropy of a perfect gas. Principle of Increase of Entropy.Entropy Changes in Reversible and Irreversible processes with examples.Entropy of the Universe.Temperature–Entropy diagrams for Carnot's Cycle. Third Law of Thermodynamics. Unattainability of Absolute Zero.(12 Lectures) | 12 |
| 04 | Thermodynamic Potentials: Thermodynamic Potentials: Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free Energy. Their Definitions, Properties and Applications. First and second order Page 12 of 24 Phase Transitions with examples, Clausius Clapeyron Equation (12 Lectures) | 12 |
| 05 | Maxwell's Thermodynamic Relations: Derivations and applications of Maxwell's Relations, Maxwell's Relations:(1) Clausius Clapeyron equation, (2) Values of Cp-Cv, (3) Tds Equations, (4) Joule-Kelvin coefficient for Ideal and Van der Waal Gases, (5) Energy equations, (6) Change of Temperature during Adiabatic Process. (10 Lectures) | 10 |
| | Total Lecture= | 60 |

Reference Books:


1. Heat and Thermodynamics, M.W. Zemansky, Richard Dittman, 1981, McGraw-Hill.
2. A Treatise on Heat, Meghnad Saha, and B.N.Srivastava, 1958, Indian Press
3. Thermal Physics, S. Garg, R. Bansal and Ghosh, 2nd Edition, 1993, Tata McGraw-Hill


(Signature)

# LECTURE PLAN
# DEPARTMENT OF PHYSICS

NAME: PROF.G.P.Gupta DESIGNATION: ASST. PROF.

COURSE: B.Sc SEMISTER III SESSION: 2018-2021

PAPER NAME: PHY-CC-7.T: ANALOG SYSTEMS AND APPLICATIONS

| SL. No | Topic/Sub Topic | Expected No. of Lecture |
|---|---|---|
| 01 | Semiconductor Diodes: Derivation of Richardson's formula, P and N type semiconductors. Energy Level Diagram.Conductivity and Mobility, Concept of Drift velocity. Static and Dynamic Resistance. Current equation Mechanism in Forward and Reverse Biased Diode. Derivation for Barrier Potential, Barrier Width and Current for Step Junction. (10 Lectures) | 10 |
| 02 | Two-terminal Devices and their Applications: (1) Rectifier Diode: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers, Calculation of Ripple Factor and Rectification Efficiency, C-filter (2) Zener Diode and Voltage Regulation. (10 Lectures) | 10 |
| 03 | Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains and and Relations between and . Load Line analysis of Transistors. DC Load line and Q-point. Physical Mechanism of Current Flow.Active, Cutoff and Saturation Regions. (10 Lectures) | 10 |
| 04 | Amplifiers: Transistor Biasing and Stabilization Circuits. Fixed Bias and Voltage Divider Bias. Transistor as 2-port Network. h-parameter Equivalent Circuit. Analysis of a single-stage CE amplifier using Hybrid Model. Input and Output Impedance. Current, Voltage and Power Gains. Classification of Class A, B & C Amplifiers. (10 Lectures) | 10 |
| 05 | Coupled Amplifier: Two stage RC-coupled amplifier and its frequency response. (4 Lectures) | 04 |
| 06 | Coupled Amplifier: Two stage RC-coupled amplifier and its frequency response. (4 Lectures) Feedback in Amplifiers: Effects of Positive and Negative Feedback on Input Impedance, Output Impedance, Gain, Stability, Distortion and Noise.(6 Lectures) | 06 |
| 07 | Sinusoidal Oscillators: Barkhausen's Criterion for self-sustained oscillations. RC Phase shift oscillator, determination of Frequency.Hartley & Colpitts oscillators, Wien Bridge Oscillator.(10 Lectures) | 10 |
| | Total Lecture= | 60 |

**Reference Books:**


1. Integrated Electronics, J. Millman and C.C. Halkias, 1991, Tata Mc-Graw Hill.
2. Electronics: Fundamentals and Applications, J.D. Ryder, 2004, Prentice Hall.
3. Solid State Electronic Devices, B.G.Streetman & S.K.Banerjee, 6th Edn.,2009, PHI Learning


(Signature)

| SL. No | Topic/Sub Topic | Expected No. of Lecture |
|---|---|---|
| 01 | To determine the Coefficient of Thermal Conductivity of Cu by Searle's Apparatus. | |
| 02 | To determine the Coefficient of Thermal Conductivity of a bad conductor by Lee and Charlton's disc method. | |
| 03 | To determine the Temperature Coefficient of Resistance by Platinum Resistance Thermometer (PRT). | |
| 04 | To study the variation of Thermo-Emf of a Thermocouple with Difference of Temperature of its Two Junctions. | |
| 05 | To study V-I characteristics of PN junction diode, and Light emitting diode. | |
| 06 | To study the V-I characteristics of a Zener diode and its use as voltage regulator. | |
| 07 | Study of V-I & power curves of solar cells, and find maximum power point & efficiency. | |
| 08 | To study the characteristics of a Bipolar Junction Transistor in CE and CB configurations . | |
| 09 | To study the frequency response of voltage gain of a RC-coupled transistor amplifier. | |

**Reference Books :**

1. Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House

2. A Text Book of Practical Physics, I.Prakash & Ramakrishna, 11th Ed., 2011, Kitab Mahal

3. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted

(Signature)