



Department of Physics and Astronomical Science

Central University of Himachal Pradesh

(Established under Central Universities Act 2009)

DHARAMSHALA, DISTRICT KANGRA – 176215

HIMACHAL PRADESH

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Course Name: Heat and Thermodynamics

Type: IDC

Course Code: PAS 5112

Credit 02

Level: 5 (B.Sc. 1st Semester)

Credits Equivalent:

(One credit is equivalent to 10 hours of lectures / organized classroom activity / contact hours; 5 hours of laboratory work / practical / field work / Tutorial / teacher-led activity and 15 hours of other workload such as independent individual/ group work; obligatory/ optional work placement; literature survey/ library work; data collection/ field work; writing of papers/ projects/dissertation/thesis; seminars, etc.)

Course Objective: This course aimed at giving an Inter Disciplinary Course which will give a brief idea about heat and thermodynamics.

Course Outcome: This gives details about concept of heat, laws of thermodynamics, different thermodynamic potentials and kinetic theory of gases.

Attendance Requirements:

Students are expected to attend all lectures in order to be able to fully benefit from the course. A minimum of 75% attendance is a must failing which a student may not be permitted to appear in examination.

Evaluation Criteria:

1. Mid Term Examination:20%
2. End Term Examination:60%
3. Continuous Internal Assessment: 20%. i.e. 20 marks out of 100

Course contents

Unit 1: Laws of Thermodynamics (10 Hours)

Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_p and C_v , Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes, Second law and Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.

Unit 2: Thermodynamical Potentials (5 Hours)

Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect, Clausius Clapeyron Equation, Expression for $(C_p - C_v)$, C_p/C_v , TdS equations. (10 Lectures)

Unit 3: Kinetic Theory of Gases (5 Hours)

Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases.

References:

1. Heat and Thermodynamics by Mark Zemansky and Richard Dittman, Mc GrawHill.
2. Physics for Degree Students-I by M. Das, P. K. Jena, M. Bhuyan and D. K. Rout, Srikrishana Prakashan.