S.N.M COLLEGE, MALIANKARA

DEPARTMENT OF PHYSICS

LESSON PLAN

Programme : B.Sc. Physics					
Semester	**Course code**	**Course title**	**Theory T**	**Practical P**	**Credit C**
VI	**PH6CRT09**	**THERMAL AND STATISTICAL PHYSICS**	**54**	**0**	3
Teachers	**Dr. Urmila K S, Mr. Namith Navakrishnan**				
Academic Year	**2023-2024**				
Instructional Approach or method	**FOCUSED INSTRUCTION---** LECTURES **LEARNING ----**ICT ENABLED SESSIONS **COLLABORATIVE LEARNING--** PROJECT/GROUP WORK **INDEPENDENT LEARNING** –ASSIGNMENT & SEMINARS				

	COURSE OUTCOMES (COs)
CO1:	Identify and describe the statistical nature of concepts and laws in thermodynamics, in particular: entropy, temperature, chemical potential, free energies, partition functions.
CO2:	Understand basic concepts and working of heat engines.
CO3:	Use the statistical physics methods, such as Boltzmann distribution, Gibbs distribution, Fermi-Dirac and Bose-Einstein distributions to solve problems in some physical systems.
CO4:	Explain fundamental concepts of statistical mechanics and computation of thermodynamics of ideal monoatomic gas.
C05:	Derive Maxwell's thermodynamic relations.

MODULE AND HOUR	Learning Objectives	Lecture No.& Proposed Date	Topics to be covered	Instructional Approach or method	Date of Completion & Remarks
Module-I: Equation of state for gases Zeroth law of thermodynamics First laws of thermodynamics Heat engines and second law of thermodynamics 21 Hours	To learn about the basics of ideal gas, the laws of thermodynamics and heat engines	1 1/1/24	Equation of an ideal gas and behaviour of real gases	Lecture	1 1/1/24
		2 5/1/24	Andrew's experiment on carbondioxide	Lecture	2 5/1/24
		3 8/1/24	Critical state and two phase regions	Video lecture	3 8/1/24
		4 12/1/24	Intermolecular forces and Van der Waals equation of state	ICT enabled classroom session	4 12/1/24
		5 15/1/24	Van der Waals isotherms and critical constants	ICT enabled classroom session	5 15/1/24
		6 19/1/24	Limitation of vander Waals equation	ICT enabled classroom session	6 19/1/24
		7 22/1/24	Thermodynamic system, surroundings, variables and thermal equilibrium	Discussion	7 22/1/24
		8 29/1/24	Zeroth law of thermodynamics	Lecture	8 29/1/24

		9 2/2/24	Reversible and Irreversible processes	Discussion	9 2/2/24
		10 5/2/24	Internal energy, heat, work, cyclic processes	Assignment	10 5/2/24
		11 9/2/24	First law of thermodynamics	Discussion	11 9/2/24
		12 12/2/24	Indicator Diagram	Lecture	12 12/2/24
		13 13/2/24	Work done in a reversible isothermal expansion of ideal gas	ICT enabled classroom session	13 13/2/24
		14 14/2/24	Work done in a reversible adiabatic expansion of ideal gas	ICT enabled classroom session	14 14/2/24
		15 16/2/24	Second law of thermodynamics	ICT video through Moodle	15 16/2/24
		16 19/2/24	Heat engine and efficiency	ICT video through Moodle	16 19/2/24
		17 19/2/24	Carnot's ideal heat engine and work done by the engine per cycle	Lecture with demonstration	17 19/2/24
		18 20/2/24	Carnot refrigerator and heat pump	Assignment	18 20/2/24

		19 20/2/24	Carnot theorem	Seminar presentation	19 20/2/24
		20 21/2/24	Clausius-Clapeyron latent heat equation	Lecture	20 21/2/24
		21 21/2/24	Discussion and solving of previous year question paper	Group work	21 21/2/24
		22 22/2/24	Solving numerical problems	Group work	22 22/2/24
Module-II: Entropy Thermodynamic relations Conduction and radiation 17 Hours	To understand the definition and principle of entropy, thermodynamic relations	23 22/2/24	Definition of entropy	Lecture	23 22/2/24
		24	Principle of increase of entropy, entropy and unavailable energy	Lecture	24 23/2/24
		25	Change in entropy in heat conduction	ICT enabled classroom session	25 23/2/24

		26	Change in entropy in reversible and irreversible process	ICT video through Moodle	26 26/2/24
		27	Efficiency of Carnot cycle from TS diagram	ICT enabled classroom session	27 26/2/24
		28	Entropy of an ideal gas, entropy and disorder	Seminar presentation	28 27/2/24
		29	Maxwell's thermodynamic relations	Lecture	29 27/2/24
		30	TdS equations, energy equation, heat capacity equations	ICT enabled classroom session	30 28/2/24
		31	Thermodynamic functions	Assignment	31 28/2/24
		32	Third law of thermodynamics	Lecture	32 29/2/24
		33	Conduction and thermal conductivity	Discussion	33 29/2/24
		34	Lee's disc experiment	Video lecture	34 1/3/24
		35	Energy flux, intensity and radiant emittance	Seminar presentation	35 1/3/14
		36	Stefan's law	Lecture	36 4/3/24

		37	Stefan-Boltzmann law	Assignment	37 5/3/24
		38	Solving numerical problems	Group work	38 5/3/24
		39	Doubt clearing session		39 6/3/24
		40	**Internal Examination**		40 7//24
Module-III: Statistical mechanics Statistical distributions 16 Hours	To learn about microstates, macrostates and various types of statistical distributions	41	Microstates and Macrostates	Lecture with demonstration	41 11/3/24
		42	Principle of equal a priori probability	Lecture	42 11/3/24
		43	Phase space and Ensemble	Discussion	43 12/3/24
		44	Ensemble formulation of statistical mechanics	Discussion	44 12/3/24
		45	Microcanonical, Canonical and Grand canonical ensemble	ICT enabled classroom session	45 13/3/24
		46	Partition function and average energy of particle,	Lecture with demonstration	46 13/3/24

		47	Maxwell Boltzmann distribution law	ICT enabled classroom session	47 14/3/24
		48	Bose-Einstein statistics	ICT enabled classroom session	48 15/3/24
		49	Fermi-Dirac distribution law	ICT enabled classroom session	49 15/3/24
		50	Equipartition theorem	Seminar presentation	50 18/3/24
		51	Discussion of previous year question papers	Group work	51 19/2/24
		52	Solving numerical problems	Group work	52 19/2/24
		53	Doubt clearing session		53 20/3/24
		54	**Internal Examination**		54 21/3/24

Signature of Teacher(s) in charge

Name and signature of HoD

S.N.M. COLLEGE MALIANKARA-683 516 KERALA STATE