BSP402T					Thermodynamics					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
4	0	0	4	4	25	50	25	--	--	100

COURSE OBJECTIVES

- To understand the connection between heat and work.
- To apply the kinetic theory of gases to solve problems related to behavior of gases.
- To critically analyze the implications of laws of thermodynamics.
- To assess the use of liquid nitrogen and liquid helium to achieve low temperature.
- To measure the amount of heat transfer during thermodynamic processes.

UNIT 1 Laws of thermodynamics **14 Hrs.**

Laws of Thermodynamics, concept of heat and work, State Functions, Internal Energy, Isothermal and Adiabatic Processes with applications, Compressibility and Expansion Coefficient, Atmosphere and Adiabatic Lapse Rate, Reversible and Irreversible Changes, Carnot Cycle, Carnot Engine and its Efficiency, Kelvin-Planck and Clausius Statements and their Equivalence, Applications of Second Law of Thermodynamics.

UNIT 2 Entropy& Maxwell's Thermodynamic Relations **15 Hrs.**

Concept of entropy, Clausius Theorem, Second Law of Thermodynamics in terms of Entropy. Entropy of a Perfect Gas. Entropy of the Universe. Entropy Changes in Reversible and Irreversible Processes. Principle of Increase of Entropy. Impossibility of Attainability of Absolute Zero: Third Law of Thermodynamics. Temperature-Entropy Diagrams. First and second order Phase Transitions, Derivations of Maxwell's Relations, Clausius Clapeyron equation.

UNIT 3 Kinetic Theory of Gases **15 Hrs.**

Maxwell-Boltzmann Law of Distribution of Velocities, Mean, RMS and Most Probable Speeds, Degrees of Freedom, Law of Equipartition of Energy, Mean Free Path, Collision Probability, Behavior of Real Gases: from the Ideal Gas Equation, Van der Waal's Equation of State for Real Gases, Thermodynamic equations for a Van der Waals gas, Liquefaction of gases, Properties of liquid helium, Introduction to superfluidity and superconductivity.

UNIT 4 Blackbody radiation **14 Hrs.**

Planck's law of radiation, Temperature dependence, Stefan-Boltzmann law, pressure of radiation, spectral distribution of Black body radiation, Wien's displacement law, Rayleigh-Jean's law, The ultraviolet catastrophy, Kirchaff's Law: absorption and emission.

Max. <58> Hrs.

COURSE OUTCOMES

On completion of the course, student will be able to

CO1 - Understand connection between heat and work.

CO2 - Apply the kinetic theory of gases to solve problems related to behavior of gases.

CO3 - Critically analyze the implications of laws of thermodynamics.

CO4 - Assess the use of liquid nitrogen and liquid helium to achieve low temperature.

CO5 - Evaluate the materials for superconducting applications.

CO6 - Measure the amount of heat transfer during thermodynamic processes.

TEXT/REFERENCE BOOKS

1. An Introduction to thermal physics, D. V. Schroeder, Pearson, 2007.
2. Thermodynamics, Enrico Fermi, Courier Dover Publications, 1956.
3. A Treatise on Heat: Including Kinetic Theory of Gases, Thermodynamics and Recent Advances in Statistical Thermodynamics, Meghnad Saha & B. N. Srivastava,Indian Press, 1958.
4. Heat and Thermodynamics: An Intermediate Textbook, Mark Waldo Zemansky & Richard Dittman,McGraw-Hill, 1981.
5. Thermal Physics, Garg, Bansal and Ghosh, Tata McGra-Hill, 1993.
6. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics, Francis W. Sears & Gerhard L. Salinger, Narosa, 1986.
7. Heat and Thermodynamics, Brij Lal & N. Subrahmanyam, S. Chand, 1968.
8. Thermodynamics: An engineering approach, Yunus A Cengel; Michael A Boles, McGraw Hill, 8th ed.

END SEMESTER EXAMINATION QUESTION PAPER PATTERN

Max. Marks: 100 **Exam Duration: 3 Hrs**

Part A/Question: 3 Questions from each unit, each carrying 3 marks	36 Marks
Part B/Question: 2 Questions from each unit, each carrying 8 marks	64 Marks