PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Course Code				**23PHMAP232**			
Title of the Course				**HEAT AND THERMODYNAMICS**			
Offered to:				**B.Sc. Hons Physics**			
L	**0**	**T**	**0**	**P**	**2**	**C**	**1**
Year of Introduction:		**2024-25**		**Semester:**		**3**	
Course Category:		**MAJOR**		**Course Relates to:**		**L, R, N & G**	
Year of Revision:		**NA**		**Percentage:**		**NA**	
Type of the Course:				**EMPLOYABILITY & SKILL DEVELOPMENT**			
Crosscutting Issues of the Course:				**NA**			
Pre-requisites, if any				**BASIC KNOWLEDGE OF HEAT**			

Course Description

Students would gain practical knowledge about heat and radiation, thermodynamics, thermo emf, RTD etc. and perform various experiments.

Course Objectives:

1. The primary objective of this course is to provide the fundamental knowledge to understand the behaviour of thermal systems.
2. This course provides a detailed necessary transfer through solids, fluids, and experimental analysis, including the application and heat vacuum.
3. Convection, conduction, and radiation heat transfer in one and two dimensional steady and unsteady systems are examined.

* **Course Outcomes**

At the end of the course, the student will be able to…

	COURSE OUTCOME	BTL	PO	PSO
CO 1	Understand thermal conductivity, specific heat, and thermoelectric effects in materials like thermistors, rubber, and liquids	**K 1**	**1**	**1**
CO 2	Use experimental methods like Joule's calorimeter, Lee's method, and Stefan's constant measurement to explore thermal properties and energy transfer.	**K 3**	**1**	**1**
CO 3	Analyze the relationship between temperature and properties such as resistance and radiation in thermistors, bulbs, and black bodies.	**K 4**	**2**	**1**
CO 4	Assess the efficiency of energy conversion devices and apply corrections to specific heat experiments for improved accuracy.	**K 5**	**1**	**1**

CO 5	Design experiments to measure thermal properties and predict material performance in thermal applications	K 6	2	2

* **For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create**

CO-PO MATRIX									
CO NO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PSO1**	**PSO2**
CO1	**2**							**2**	
CO2	**2**							**3**	
CO3		**3**						**3**	
CO4	**2**							**2**	
CO5		**3**							**3**

* **Use the codes 3, 2, 1 for High, Moderate and Low correlation Between CO-PO-PSO respectively**

List of experiments

1. **Study of variation of resistance with temperature - Thermistor**: This experiment investigates how the resistance of a thermistor changes with temperature. Thermistors, which are temperature-sensitive resistors, exhibit a significant change in resistance as the temperature varies, allowing for the study of the relationship between resistance and temperature.
2. **Thermal conductivity of bad conductor - Lee's method**: Lee's method is used to measure the thermal conductivity of a poor conductor. By observing the rate of heat transfer through a material with known dimensions, the thermal conductivity of the bad conductor can be determined, helping to understand how poorly certain materials conduct heat.
3. **Thermal conductivity of rubber**: This experiment focuses on determining the thermal conductivity of rubber. Since rubber is a good insulator, the experiment provides insights into how heat flows through insulating materials and can help in assessing rubber's effectiveness in thermal insulation.
4. **Measurement of Stefan's constant - Emissive method**: This experiment is aimed at determining Stefan's constant, which relates to the radiant energy emitted by a black body in terms of its temperature. By using the emissive method, the relationship between temperature and emitted radiation can be studied, leading to the calculation of Stefan's constant.
5. **Heating efficiency of an electrical kettle with varying voltages**: In this experiment, the efficiency of an electrical kettle is evaluated by heating water at different voltages. The aim is to assess how varying voltage affects the kettle's performance and energy efficiency when converting electrical energy into heat.
6. **Specific heat of a liquid – Joule's calorimeter – Barton's radiation correction**: This experiment involves using Joule's calorimeter to determine the specific heat capacity of a liquid, with an additional correction for heat lost due to radiation, as per Barton's method. It helps in understanding the amount of heat required to raise the temperature of a liquid by a certain amount.
7. **Specific heat of a liquid by applying Newton's law of cooling correction**: This experiment measures the specific heat of a liquid by applying Newton's law of cooling to account for heat lost to the environment. The correction helps in obtaining

more accurate measurements of the heat capacity by adjusting for the cooling effect during the process.

8. **Thermo emf - Thermocouple - Potentiometer**: This experiment focuses on the generation of thermo-electric emf (electromotive force) using a thermocouple. By connecting the thermocouple to a potentiometer, the thermo emf produced due to temperature differences between two junctions can be measured and studied.
9. **Thermal behavior of an electric bulb (filament/torch light bulb)**: The aim of this experiment is to study the thermal behavior of an electric bulb's filament as it heats up. The relationship between electrical energy input, heat production, and light emission is explored to understand the efficiency and thermal properties of the bulb.
10. **Measurement of Stefan's constant**: This experiment involves determining Stefan's constant through the study of black body radiation. By measuring the radiation emitted by a black body at different temperatures, Stefan's constant can be calculated, which is key to understanding thermal radiation principles.

Note :

1. 9 (NINE) experiments are to be done and recorded in the lab. These experiments will be evaluated in CIA.
2. For certification minimum of 7 (Seven) experiments must be done and recorded by student who had put in 75 % of attendance in the lab.
3. 15 marks = 15 marks for CIA
4. 35 marks for practical exam.

The marks distribution for the Semester End practical examination is as follows:

Formula/ Principle / Statement with explanation of symbols	05
Diagram/Circuit Diagram / Tabular Columns	05
Setting up of the experiment and taking readings/Observations	10
Calculations (explicitly shown) + Graph + Result with Units	05
Procedure and precautions	05
Viva-voce	05
Total Marks:	35