

## KU2DSCPHY124 :Heat and Thermodynamics

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
2	DSC	100	KU2DSCPHY124	4	75

Learning Approach (Hours/ Week)		Marks Distribution			Duration of ESE (Hours)
Lecture+ Tutorial	Practical	CE	ESE	Total	
3	2	35	65	100	2

### Course Description:

*This course explores temperature, heat, and thermal equilibrium, introducing the foundational concepts of thermodynamics through the zeroth and first laws. Students delve into thermal expansion, calorimetry, and heat transfer mechanisms. They then progress to understanding thermodynamic systems, work, internal energy, and processes, culminating in the second law and entropy, with a focus on applications like heat engines and refrigerators. Throughout, emphasis is placed on the fundamental principles governing energy flow and efficiency in various systems.*

**Course Prerequisite:** Higher secondary level Physics

### Course Outcomes:

CO No.	Expected Outcome	Learning Domains
1	Understand the fundamental principles of heat transfer	U
2	Apply the laws of thermodynamics to solve problems related to heat transfer	A

3	Demonstrate an understanding of heat engines refrigerators and their applications in everyday life	A
4	Evaluate the efficiency of different heat transfer processes and systems	E
5	Develop critical thinking and problem-solving skills in the context of heat and thermal physics	An

*\*Remember (R), Understand (U), Apply (A), Analyse (An), Evaluate (E), Create (C)*

#### Mapping of Course Outcomes to PSOs

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	3	2	1	3	3	2	1
CO 2	2	2	1	3	3	2	0
CO 3	3	3	0	3	3	2	1
CO 4	2	2	1	2	3	2	1
CO 5	3	2	0	2	2	3	1

*\*Correlation level 0-None, 1-Slight, 2-Medium, 3-High*

#### COURSE CONTENTS

Contents for Classroom Transaction:

M O D U L E	U N I T	DESCRIPTION	HOURS
1		Temperature and heat	10
	1	Temperature and thermal equilibrium	2
	2	Zeroth law of thermodynamics	2

	3	Thermometers and temperature scales, Gas Thermometers and Kelvin scale, Kelvin scale and absolute temperature,	2
	4	Thermal Expansion, Quantity of heat, Calorimetry and Phase changes, Mechanisms of heat transfer	4
		Sections 17.1-17.3, 17.4, 17.5-17.7- Book 1	
2	Thermodynamics and first law of Thermodynamics		14
	1	Thermodynamic systems, Work done during volume changes, Paths between thermodynamic states	4
	2	Internal energy and First law of thermodynamics,	3
	3	Kinds of thermodynamic processes,	3
	4	Internal energies of ideal gas, Heat capacities of ideal gases, adiabatic process in ideal gases	4
	5	Sections 19.1, 19.2, 19.3, 19.4, 19.6-19.8 Book1	
3	Second law of Thermodynamics		12
	1	Directions of Thermodynamic processes	2
	2	Heat engines, hot and cold reservoirs, Energy flow diagram and efficiency, Refrigerators	4
	3	The second law of thermodynamics, Carnot cycle	3
	4	Carnot refrigerator, Carnot cycle and second law	3
		Sections 20.1, 20.2, 20.4, 20.5, 20.6 Book 1	
4	Entropy		9
	1	Entropy and disorder	2
	2	Entropy in reversible processes, irreversible processes, cyclic processes	3
	3	Entropy and second law	2
	4	Microscopic Interpretation of entropy	2
	Sections 20.7, 20.8, Book 1		
5	Practical Module		30
	<i>Directions: At least 5 experiments from the following + 2 Activities (can be selected from the list or teacher can design.</i>		
	1.	Potentiometer- calibration of low range voltmeter	

2.	Spectrometer –Refractive index of a prism	
3.	Liquid lens - Refractive index of a liquid and material of the lens using another liquid of known refractive index.	
4.	Newton's law of cooling- Specific heat of a liquid	
5.	Air Wedge-Diameter of a thin wire	
6.	CF bridge-resistance and resistivity	
7.	Deflection Magnetometer –Tan A and Tan B	
8.	Logic gates OR, AND using diodes	
9.	Simulations based on Heat and Thermodynamics	

#### Essential Readings:

1. University Physics with Modern Physics- Hugh D Young and Roger A Freedman-14<sup>th</sup> Edn. ,2016.

#### Suggested Readings:

1. Heat and Thermodynamics- Brijlal, N. Subrahmanyam and P S Hemne, S Chand Publications, 2018.
2. Heat and Thermodynamics- Mark Zemansky and Richard Dittman, 8<sup>th</sup> Edn, McGraw Hill Education, 2017.

#### Assessment Rubrics:

Evaluation Type			Marks	Evaluation Type			Marks	Total
Lecture			75	Practical			25	100
a)	ESE		50	a)	ESE		15	
b)	CCA		25	b)	CCA		10	
	i	*Test Paper	10		i	Punctuality	3	
	ii	**Assignment/ Book- Article review	10		ii	Skill	4	
	iii	Seminar/ Viva-Voce	5		iii	Record	3	

\*Best out of two test papers

\*\* or any other activities like quiz, open book exam, group activity