Department of Science Education
Institute of Education & Research
University of the Punjab, Lahore

Course Outline

Programme	BS Science Education (1-8)	**Course Code**	SE-308A	**Credit Hours**	3
Course Title	**Physics-III: Thermal Physics**				

Course Introduction

This course is designed to explores the microscopic and macroscopic principles governing heat, temperature, and energy transfer through kinetic theory and the laws of thermodynamics.

Learning Outcomes

Upon completion of this course, students will be able to:

1. Explain the kinetic theory of gases and fundamental laws of thermodynamics.
2. Apply thermodynamic principles to analyze physical systems and processes.
3. Evaluate entropy, thermodynamic cycles, and efficiency of heat engines.
4. Understand basic concepts of statistical mechanics and thermoelectric effects.

	Course Content	**Assignments/Readings**
Week 1	**Unit-I: Kinetic Theory of Gases** 1.1 Kinetic theory of the ideal gas	Resnick & Halliday, Ch. 17
	1.2 Postulates and assumptions	Resnick & Halliday, Ch. 18
Week 2	1.3 Work done on an ideal gas	Resnick & Halliday, Ch. 18
	1.4 Internal energy of an ideal gas.	Resnick & Halliday, Ch. 18
Week 3	1.5 Intermolecular forces	Resnick & Halliday, Ch. 18
	1.6 Limitations of ideal gas model	Resnick & Halliday, Ch. 18
Week 4	**Unit-II: Statistical Mechanics** 2.1 Fundamentals of statistical mechanics	Resnick & Halliday, Ch. 18
	2.2 Macrostates and microstates.	Resnick & Halliday, Ch. 18
Week 5	2.3 Statistical distribution and mean values	Resnick & Halliday, Ch. 18
Week 6	2.4 Maxwell distribution of molecular speeds	Resnick & Halliday, Ch. 18
	2.5 Distribution of molecular energies 2.6 Brownian motion.	Resnick & Halliday, Ch. 18
Week 7	**Unit-III: Heat and Laws of Thermodynamics** 3.1 Heat and different theories of heat	Resnick & Halliday, Ch. 19

	3.2 Specific heat and gram molecular specific heat	Resnick & Halliday, Ch. 19
Week 8	3.3 Zeroth Law and First Law of Thermodynamics; Applications.	Resnick & Halliday, Ch. 19
Week 9	3.4 Second Law of Thermodynamics	Blundell, Ch. 3
	3.5 Reversible and irreversible processes.	Blundell, Ch. 3
Week 10	3.6 Indicator diagram	Blundell, Ch. 3
	3.7 Practical thermodynamic processes	Blundell, Ch. 3
Week 11	**Unit-IV: Entropy and Thermodynamic Relations** 4.1 Entropy 4.2 Law of increase of entropy	Resnick & Halliday, Ch. 20
	4.3 Entropy and second law of thermodynamics	Resnick & Halliday, Ch. 20
Week 12	4.4 Temperature–Entropy (T–S) diagram	Roy, Ch. 4
	4.5 Maxwell's thermodynamic relations.	Resnick & Halliday, Ch. 20
Week 13	4.6 TDS equations	Roy, Ch. 4
	4.7 Clapeyron's equation	Resnick & Halliday, Ch. 20
Week 14	**Unit-V: Thermodynamic Cycles and Applications** 5.1 Carnot cycle and Carnot engine	Young & Freedman, Ch. 19
	5.2 Thermodynamic temperature scale	Resnick & Halliday, Ch. 20
Week 15	5.3 Third Law of Thermodynamics	Blundell, Ch. 5
	5.4 Low temperature physics	Resnick & Halliday, Ch. 20
Week 16	5.5 Thermoelectricity (Seebeck effect, Peltier effect, Thermocouple)	Resnick & Halliday, Ch. 20
	Course review	

Textbooks and Reading Material

Textbooks.

1. *Physics (Volume 1 & 2) by R. Resnick, D. Halliday and K. S. Krane (5th Edition), Wiley (2002).*
2. *Concepts in Thermal Physics, by S. J. Blundell and K. M. Blundell, Oxford, (2009).*
3. *University Physics with Modern Physics by H. D. Young, R. A. Freedman (14th Edition), Addison-Wesley (2015).*
4. *Principle of Modern Thermodynamics by B. N. Roy, Institute of Physics, London (1995).*

Suggested Readings

1. *Concepts in Thermal Physics, by S. J. Blundell and K. M. Blundell, Oxford,*Journal Articles/ Reports

Teaching Learning Strategies
1. Interactive lectures with multimedia presentations 2. Problem-solving sessions and numerical practice 3. Classroom discussions and conceptual questioning 4. Tutorial assignments and quizzes 5. Use of simulations and graphical analysis 6. Student presentations and group activities 7. Continuous formative assessment and feedback
Assignments: Types and Number with Calendar
Total Assignments: 4 1. **Assignment–1:** Written (Numerical + Short Questions) – *Unit–I: Kinetic Theory of Gases* – **Week 4** 2. **Assignment–2:** Written (Problems + Conceptual Questions) – *Unit–II: Statistical Mechanics* – **Week 7** 3. **Assignment–3:** Written (Numerical + Descriptive Questions) – *Unit–III: Laws of Thermodynamics* – **Week 10** 4. **Assignment–4:** Written / Presentation – *Unit–IV & V: Entropy, Thermodynamic Relations & Applications* – **Week 14** Submission deadline: One week after issuance of each assignment.