C. U. SHAH UNIVERSITY, WADHWAN CITY.

Faculty of: **Science & Life Sciences**
Course: **Bachelor of Science (Physics)**
Semester**: II**
Subject Code**: PHM203-1C**
Subject Name: **Thermal Physics**

Sr. No	Category	Subject Code	Subject Name	Teaching hours/ Week			Credit hours	Credit Points	Evaluation Scheme/ Semester								
									Theory				Tutorial / Practical				Total
									Continuous and Comprehensive Evaluation		End Semester Exams		Internal Assessment		End Semester Exams		
				Th	Tu	Pr			Marks	Marks	Marks	Duration	Marks	Duration	Marks	Duration	
1	MAJOR-1	PHM203-1C	Thermal Physics	3	-	2	5	4	10 10 05	Assignment MCQ Attendance	50	2	25	1	-	-	100

AIM :

- Aware students of the history of Physics and its scope.
- Acquaint the basic concept of Physics as a subject.
- Basic concepts related to Thermodynamics.
- Learn laboratory skills for handling instruments.

COURSE CONTENTS

Course Outline for Theory

UNIT	COURSE CONTENT	TEACHING HOURS`
I	**Laws of Thermodynamics** Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between C_p and C_V, Work Done during Isothermal and Adiabatic Processes, Compressibility and Expansion Coefficient, Reversible and irreversible processes, Second law and Entropy, Carnot's cycle and theorem, Entropy changes in reversible and irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero.	**15**
II	**Thermodynamic Potentials** Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications, Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (CP-CV), CP/CV, TdS equations.	**15**
III	**Kinetic Theory of Gases**	**15**

	Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena:Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy(no derivation) and its applications to specific heat of gases; mono-atomic and diatomicgases.	

Course Outline for Practical

Sr. No.	Course Contents
1	Thermal expansion of solids - Measuring using the expansion apparatus
2	Determining the thermal conductivity of building materials using the single-plate method
3	Operating the hot-air engine P as a thermal engine, heat pump and a refrigerator
4	Determination of specific vaporization heat of water
5	Joule-Thomson effect
6	Determining the adiabatic exponent c_p/c_V
7	Converting electrical energy into heat energy - Measuring with a voltmeter and an ammeter
8	Determination of volumetric expansion coefficient of liquids
9	Investigation of the density maximum of water
10	Determination of specific heat of solids
	Total Hours - 30

TEACHING METHODOLOGY:

- Conventional method (classroom blackboard teaching)
- ICT Techniques
- Teaching through the classroom, laboratory work
- Variety of learning styles and tools (PowerPoint presentations, audio-visual resources, e-resources, seminars, workshops, models)
- Teaching through laboratory work

Learning Outcomes:-After successful completion of this course, students have:

- Knowledge of laws of thermodynamics and their applications.
- Knowledge of thermodynamic potentials.
- Knowledge of kinetic theory of gases.

Arrangement of lectures duration and practical session as per defined credit numbers:

Units	Lecture Duration (In Hrs.)		Calculation of Credits (In Numbers)		Total Lecture Duration	Credit Calculation
	Theory	Practical	Theory	Practical	Theory+ Practical	Theory+ Practical
Unit – 1	15	30	3	1	45 + 30	4
Unit – 2	15					
Unit – 3	15					
TOTAL	45	30	3	1	75	4

Evaluation

Theory Marks	Practical Marks	Total Marks
75	25	100

REFERENCE BOOKS:

1. 'Thermodynamics', **Enrico Fermi**, Courier *Dover Publications*.
2. 'A Treatise on Heat Including Kinetic Theory of Gases, Thermodynamics and Recent Advances in Statistical Thermodynamics', **MeghnadSaha and B. N. Srivastava**, *Indian Press*, (1969).
3. 'Heat and Thermodynamics: An Intermediate Textbook' **Mark Waldo Zemansky, Richard Dittman**, *McGrawHill.*
4. 'Thermal Physics', **S. Garg, R. Bansal and C. Ghosh**, *Tata McGraw Hill.*
5. 'Thermodynamics, Kinetic Theory, and Statistical Thermodynamics',**Francis W. Sears and Gerhard L. Salinger,***Narosa Publication.*
6. 'Heat and Thermodynamics', **M. W. Zemasky and R. Dittman**, *McGraw Hill*.
7. 'University Physics', **Ronald Lane Reese**, *Thomson Brooks/Cole, (2003)*.
8. 'Thermal Physics', **A. Kumar and S. P. Taneja**, *R. Chand Publications*.