Semester Lecture Plan

Name of the college: Government College of Arts, Science & Commerce, Sanquelim-Goa

Name of Faculty: Mahendra R. Pednekar	**Subject:** Physics Core	
Paper code: PHY 201	**Program/Course: S.Y. B.Sc.**	**Division:**
Academic year: 2024 - 2025	**Semester: III**	**Total Lectures: 45**

Course Objectives:
This course aims to foster comprehension of the characteristics and behaviour of gases, fundamental principles of thermodynamics, and practical applications in power generation and low temperature technologies

Course Learning Outcome: The students will be able to

1. **Recall the fundamental properties of gases and laws of Thermodynamics.**
2. **Understand the principles of heat and thermodynamics.**
3. **Apply the law to analyse the process.**
4. **Analyse the factors influencing Behaviour of gas.**
5. **Examine principles and applications of low-temperature technology.**

Month	Lectures From: To:	No. of lectures allotted	Topic, Subtopic to be covered	Learning outcome	ICT Tools	Reference books

June/July	28-06-24	6-07-24	03	Kinetic theory of gases Three states of matter, concept of ideal gas, postulates of Kinetic Theory of gases, expression of pressure of a gas, relation between rms velocity and temperature, Average kinetic energy of a gas molecule, heat and temperature, Practical: Pt 100	The students will be able to: 1. Recall the assumptions on which kinetic theory of gases is based. 2. apply laws of pjysics to determine the pressure applied on the walls of the container. Convert in different forms.		1. Heat Thermodynamics and statistical physics by Brijlal and Subramanyam 2. Physics for f.y.B.Sc by sheth publishers
July	8-07-24	13-07-24	03	kinetic interpretation of temperature, Degrees of freedom, Law of equipartition of energy and its application to specific heats of gases. Brownian motion and its features, Einstein's equation (qualitative), Determination of Avogadro's number. Mean free path and derivation to calculate MFP, Practical : Lees method	The students will be able to: 1.Define degrees of freedom, Brownian motion, mean free path etc 2. Apply to specific heats of gases. 3. Determine avogadros no. mean free path.		
July	15-07-24	20-07-24	03	Transport phenomena,	The students will be able to:		

				transport of momentum (viscosity). Behaviour of real gases Deviation from perfect gas behaviour, Discussion of results of Andrew's experiments on CO2 Practical : Pt 100 and Lees method Repeat	1.Understand the concept of transport phenomenon. Apply to momentum. 2. Differentiate between real and ideal gas. 3. Interprete Andrew's curves on CO_2		
July	22-07-24	27-07-24	03	and Amagat's experiment, critical constants, Van der Wall's equation of state, expression of Wan der Wall's constants, Reduced equation of state, Law of corresponding statePractical : Stefan constant	The students will be able to: 1.Understand the concept of critical values of pressure, volume and temperature. 2. State the law of corresponding states.		
July/August	29-07-24	3-08-24	03	relation between Boyle temperature and critical temperature, critical coefficient. Zeroth and First Law of Thermodynamics Basic concepts of thermodynamics: Thermodynamic system, Thermodynamic variables,	The students will be able to: 1.Define thermodynamical variables, system ,Boyle temperature, 2. State the Zeroth law of thermodynamics		

				Practical : Thermister characteristics			
August	5-08-24	10-08-24	03	Thermodynamic equilibrium, and Thermodynamic processes, Zeroth law of thermodynamics and concept of temperature, Internal energy and First law of thermodynamics, Relation between pressure, volume and temperature in adiabatic process, Work done in isothermal and adiabatic processes, Path dependence of heat and work. Practical : Stefan Constant and thermistor Repeat	The students will be able to: 1.Understand temperature. 2.State and analyse the first law of thermodynamics. 3. Explain isothermal process and calculate work done. 4. Examine what is Heat and work calculate work done in adiabatic process.		
August	12-08-24	17-08-24	03	Second and Third Law of Thermodynamics Process-reversible and irreversible, condition of reversibility, Second law of thermodynamics, Carnot's cycle, efficiency of Carnot's cycle,	The students will be able to: 1.Discuss Carnot cycle. 2. State and explain second and third law of thermodynamics.		

				Practical : Constant volume air thermometer			
August	19-08-24	24-08-24	03	reversibility of Carnot's cycle, Carnot's theorem, coefficient of performance of a refrigerator, reversibility of Carnot's cycle, Carnot's theorem, coefficient of performance of a refrigerator, Practical : constant pressure air thermometr			
August	26-08-24	31-08-24	03	Thermodynamic scale of temperature, its identity with perfect gas scale. Entropy as a Thermodynamic variable, Entropy change in reversible and irreversible processes, Practical : Repeat constant volume air and pressure air thermometer	The students will be able to 1.Define entropy 2.Understand Thermodynamic scale concept		
September	2-09-24	5-09-24	02	Temperature–Entropy diagram of Carnot's Cycle, Entropy of a	The students will be able to :		

				perfect gas, Physical significance of Entropy: Entropy and Unavailable Energy, Entropy and molecular [8] [7] [5] [12] disorder, Entropy and Second Law of Thermodynamics. Impossibility of attaining Absolute Zero, Third law of Thermodynamics Practical : Silicon diode as temperature sensor	1.Understand temperature entropy of carnot's cycle entropy of perfect gas 2. Concept of absolute zero and third law of thermodynamics.		
September	13-09-24	21-09-24	04	Power cycles Internal Combustion Engines – The Otto cycle and its efficiency, Diesel cycle and its efficiency. Power cycles Internal Combustion Engines – The Otto cycle and its efficiency, Diesel cycle and its efficiency. Practical Specific heat of graphite.	The students will be able to : 1.Explain the working of Diesel cycle, indicator diagram. 2.Compute the efficiency. 3.Understand the mechanism of vapour compression machines.		
September	23-09-24	28-09-23		Production of low temperature. Cooling by evaporation. Vapour compression machines. Refrigerators based	The students will be able to : 1.Explain cooling by adiabatic demagnetization		

			03	on Vapour absorption. Cooling by sudden adiabatic expansion of compressed gases. Practical : Silicon diode as temperature sensor Specific heat of graphite	of paramagnetic substances. 2. Explain workin of Vapour absorption. 3. Understand cooling by sudden adiabatic expansion of compressed gases.		
September/October	30-09-24	5-10-24	03	Efficiency and performance of refrigerating machines. Enthalpy and heat flow. Joule Kelvin effect. Expression for Joule Kelvin coefficient and inversion temperature. Revision : Revision	The students will be able to 1.Define efficiency of refrigerating machine 2. Discuss Joule Thomson effect and inversion temperature		
October	7-10-24	12-10-24	03	Application to Van der Waals' gas. Principles of regenerative and cascade cooling. Liquifaction of hydrogen and helium. Production of temperatures below 4o K. Practical : Journal work Practical : Revision	The students will be able to: 1.Apply Joule Thomson effect to Van der Waals gas 2. Explain the process of regenerative cooling and cascade cooling 3. Production of temperatures below 4K		

October	14-10-24	22-10-24	03	Production of temperatures below 4K. Properties of He I and He II. Revision Practical : Examination	The students will be able to: 1.Understand the process of production of low temperature 2. State the properties of Helium I and Helium II .		