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: PYC- 105	**Program/Course: T.Y. B.Sc.**	**Division:**
Academic year: 2024 - 2025	**Semester: V**	**Total Lectures: 60**

Course Objectives:

1. Understand the factors governing the motion of system of particles with examples.
2. Define central force. Discuss the motion under central force.
3. Learn about inertial and non inertial frames of reference. Study the laws of motion on rotating earth and various forces arising.
4. Understand the concept of rotational motion of rigid bodies.
5. Describe the working of Otto and Diesel cycle and calculate efficiency.
6. Discuss the various methods of production of low temperatures.

Course Learning Outcome: The students will be able to

1. Explain the factors governing the motion of system of particles.
2. Discuss various aspects of central force with examples.
3. Describe the laws of motion on rotating earth and discuss forces arising.
4. Understand the concept of rotational motion of rigid bodies.
5. Calculate the efficiency of Otto and Diesel engine.
6. Elaborate on various methods of production of low temperature.

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	04	**Motion of a system of particles** Center of mass coordinates, applications of conservation laws for linear momentum, angular momentum and energy - rockets, conveyor belts and planets,	The students will be able to: 1,Understand the concept of centre of mass coordinate 2. apply laws of conservation for angular and linear momentum		1. Mechanics by K.R.Symon 2. Introdction to classical mechanics by Takawale and puranic 3. Heat Thermodynamics and statistical physics by Brijlal and Subramanyam 4. Physics for t.y.B.Sc by sheth publishers
July	8-07-24	13-07-24	04	critique of conservation of laws. The collision problems, the two body problem, reduction to equivalent one body problem. Practical : Y by Koenig's method	The students will be able to: 1.Describe critique of conservation laws. 2. Develop two body problem and reduce to equivalent one body.		
July	15-07-24	20-07-24	04	**Motion under a central force** :General features of motion, qualitative discussions of orbits under inverse square law.force field.	The students will be able to: 1.State general features of motion. 2. define central force.		

				Nature of orbits, elliptical orbits, Practical : Optical Lever	3. Discuss inverse square force fied problems.		
July	22-07-24	27-07-24	04	Kepler's problem, hyperbolic orbits, classical scattering, definition of scattering cross section, Practical : Pt 100	The students will be able to: 1.State Kepler's laws . 2. Study classical scattering .		
July/August	29-07-24	3-08-24	04	impact parameter and scattering angle, Rutherford's scattering cross section.**Moving coordinate systems** Inertial and non-inertial coordinate frames, Practical: Practical : Quinkes' method to determine surface tension of mercury	The students will be able to: 1.Define impact parameter, Rutherford's scattering cross section. 2.Describe inertial and non-inertial frame of reference.		
August	5-08-24	10-08-24	04	rotating coordinate systems, laws of motion on the rotating earth, Coriolis force, Foucault's pendulum, and Larmor's theorem. Practical: repeatation Set I	The students will be able to: 1.Describe rotating co-ordinate system. 2.Discuss the laws of motion on rotating earth. 3. Learn about Foucault's pendulum.		

					4. State Larmor's theorm.		
August	12-08-24	17-08-24	04	**Rigid bodies** Rotation about an axis, moment of inertia tensor, Euler's equations of motion of a rigid body, Practical: repetition Set I	The students will be able to: 1.Discuss rotation about an axis. 2. Derive Euler's equations of motion of a rigid body.		
August	19-08-24	24-08-24	04	torque free motion, qualitative discussion of motion of a symmetric top.**Thermal Physics: Power cycles.** Internal Combustion Engines – The Otto cycle and its efficiency, Practical: Katers pendulum	The students will be able to : 1.Understand the concept of torque free motion. 2.Qualitatively discuss the motion of symmetric top. 3.Explain the working of Otto engine. 4.Calculate the efficiency.		
August	26-08-24	31-08-24	04	Diesel cycle and its efficiency.Production of low temperature. [13] Cooling by evaporation. Vapour compression machines. 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	2-09-24	5-09-24	03	Refrigerators based on Vapour absorption. Cooling by sudden adiabatic expansion of compressed gases. Efficiency and performance of refrigerating machines. Enthalpy and heat flow. Joule Kelvin effect. Expression for Joule Kelvin coefficient and inversion temperature. Practical : Thermal conductivity of bad conductors by Lees method	The students will be able to : 1.Describe the principle of refrigerators based on Vapour absorption. 2. Understand principle of cooling by sudden adiabatic expansion of gases. 3. Explain joiule kelvin effect.		
September	13-09-24	21-09-24	06	Application to Van der Waals' gas. Principles of regenerative and cascade cooling. Liquifaction of hydrogen and helium. Production of temperatures below 4o K. Properties of He I and He II. Practical : Viscosity by stokes method	The students will be able to : 1.Apply joule kelvin effect to Van der Waal's gas. 2. Explain principles of regerative cascade cooling, liquefaction of hydrogen and helium.		

September	23-09-24	28-09-23	04 04	Cooling by Adiabatic Demagnetisation of paramagnetic substances.Probability Random Events, Probability, Probability and Frequency, Some basic rules of Probability theory, Continuous random variables, Practical : repetition set II	The students will be able to : 1.Explain cooling by adiabatic demagnetization of paramagnetic substances. 2. Define probability, random events 3. Differentiate between probability and frequency. 4.state some basic rules of probability.		
September/October	30-09-24	5-10-24	04	Mean value of discrete and continuous variables, Variance: Dispersion, Probability Distribution, Binomial distribution: Mean value and fluctuation, Stirling's Approximation, Poisson Distribution: Mean value and Standard deviation, Practical : repetition set II	The students will be able to: 1.Define mean valueof discrete and continous variable,variance ,dispersion. 2.Formulate Bionomial distribution. Calculate mean value and S.D. 3.Define fluctuations.		

					3.Derive Stirling's formula. 4.Formulate Poisson distribution. Calculate mean value and S.D.		
October	7-10-24	12-10-24	04	Gaussian Distribution: Standard deviation. Statistical Distributions: Concept of Phase space, Probability of distribution and most probable distribution. Maxwell Boltzmann Statistics. Practical : Journal work	The students will be able to: 1.Derive expression for Gaussian distribution, calculate Standard deviation. 2. Explain the concept of phase space,probability of distribution and most probable distribution. 3. Discuss Maxwell Boltzmann statistics.		
October	14-10-24	22-10-24	04	Molecular speeds: mean, most probable and rms speeds. Experimental verification of Maxwell Boltzmann distribution law (Zartman ko experiment). Bose Einstein and Fermi Dirac statistics	The students will be able to: 1.Explain molecular speeds, mean,most probable and rms speeds. 2.Describe the experimental verification of MB distribution law.		

				(qualitative study). Practical : Journal work	3. Expalin Fermi Dirac and Bose Eistein statistics.		