

Lesson Plan

Name of College : Government College for Women, Shahzadpur (Ambala)

Academic Session : September-December (2022)

Class : B.Sc. I Semester

Paper : Classical Mechanics and Theory of Relativity (PH-101) (1-3)Days

Teacher's Name : Dr. Raj Kumari, Assistant Professor (Physics)

Month	Dates	Topic to be covered	Academic/ Activity to be organized	Assignments/ Tests
September	05-07	Unit I: Mechanics of single and system of particles, conservation law of linear momentum.		
	12-14	Angular momentum and mechanical energy for a particle and system of particles.		
	19-21	Centre of Mass and equation of motion and related Numerical.		
	27-28	Constrained Motion and related Numerical.		Assignment I
October	03-05	Unit II: Degree of freedom and Generalized Coordinates, Transformation equations. Generalized Displacement, Velocity, Acceleration, Momentum, Force and Potential.	Intra-College Science Quiz	
	10-12	Hamilton's Variation Principle, Lagrange's equation of motion from Hamilton's Principle.		Test I
	17-19	Linear Harmonic Oscillator, Simple Pendulum. Atwood's Machine and related numerical		
	24-26	<i>Diwali Vacations</i>		
November	01-02	Unit III: Frame of Reference, Limitations of Newton's Law of motion, and inertial frame of reference.	Seminars by Students	Assignment II
	07-09	Galilean Transformation, Galilean Invariance, Transformation equation for a frame of Reference-inclined to an inertial frame, Rotating Frame of Reference.		
	14-16	Non-inertial frames-the accelerated frame of reference.		
	21-23	Effect of Centrifugal and Coriolis force due to Earth's rotation.		
	28-30	Michelson-Morley's Experiment and concept of Einstein's relativity.		Test II
December	05-07	Unit IV: Special theory of Relativity, Lorentz invariance, Length Contraction, Time Dilation, Twin Paradox.	Intra-College Science Exhibition	

	12-14	Velocity addition Theorem, Variation of mass with velocity, Mass energy equivalence.		
	19-21	Transformation of relativistic momentum and energy, Relation between relativistic momentum and energy, mass, velocity, momentum.		Revision Tests



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Lesson Plan

Name of College : Government College for Women, Shahzadpur (Ambala)

Academic Session : September-December (2022)

Class : B.Sc. V Semester

Paper : Nuclear Physics (PH-502) & Quantum and Laser Physics (PH-501) (1-6)Days

Teacher's Name : Dr. Raj Kumari, Assistant Professor (Physics)

Month	Dates	Topic to be covered	Academic/ Activity to be organized	Assignments/ Tests
September	01-03	Unit I: Nuclear Structure and Properties of Nuclei Nuclear composition (p-e and p-n hypotheses)		
	05-10	Nuclear Properties; Nuclear size, spin, parity, statistics, Nuclear magnetic dipole moment, quadruple moment (shape concept)		
	12-17	Determination of charge by Mosley Law, Determination of size of nuclei by Rutherford Back Scattering. systematic of nuclear binding energy, nuclear stability		Assignment I
	19-24	Unit II: Nuclear Radiation decay Processes Alpha disintegration and its theory, Energetics of Alpha decay, Origin of continuous beta spectrum (neutrino hypothesis)		
	27-30	Types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays, Radiation interaction, Interaction of heavy charged particles (Alpha particles), Energy loss of heavy charged particle (idea of Bethe formula, no derivation)		Test I
October	01-08	Range and straggling of alpha particles. Geiger-Nuttal law, Energy loss of Beta-particles (ionization), Range of electrons, Passage of Gamma radiations through matter (Photoelectric Effect), Compton effect, Pair production effect & electron-positron annihilation	Science Quiz	
	10-15	Unit IV: Nuclear reactions. Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions.		Assignment II

		Conservation laws, Q-value Of a reaction, Nuclear Reactors. Nuclear Reactors, General aspects of Reactor Design, Nuclear fission (Principle, construction, working and use), Nuclear fusion reactors, (Principle, construction, working and use).		
	17-22	Unit III: Nuclear Accelerators Linear accelerator, Tandem accelerator & Cyclotron, Betatron accelerator, Nuclear Radiation Detectors: Gas filled counters Ionization chamber, Proportional counter, G.M. Counter, Scintillation counter and semiconductor detector		Test II
	27-31	Unit I: Origin quantum physics (Experimental basis) Overview, scale of quantum physics, boundary between classical and quantum phenomena, Photon, Photoelectric effect, Compton effect (theory and result), Frank Hertz experiment, de-Broglie hypothesis. Davisson and Germer experiment,		
November	01-05	Phase velocity, group velocity and their relation. Heisenberg's uncertainty principle. Time energy and angular momentum, position uncertainty. Uncertainty principle from de Broglie wave. (Wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit. Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle).	Seminars by Students	Assignment III
	07-12	Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density		
	14-19	Unit II: Application of Schrodinger wave equation: (i) Free particle in one-dimensional box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy). (ii) One dimensional step potential $E > V_0$ (Reflection and Transmission coefficient) (iii) One dimensional step potential $E < V_0$ (penetration depth calculation		
	21-26	(iv) One dimensional potential barrier, $E > V_0$ (Reflection and Transmission coefficient) (v) One-dimensional potential barrier, $E < V_0$ (penetration or tunneling coefficient). (vi) Solution of Schrodinger equation for harmonic		

		oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states).		
	28-30	Unit III: Laser Physics –I Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence, spatial and temporal coherence,		Test III
December	01-03	Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level, kinetics of optical absorption	Science Exhibition	
	05-10	population inversion: A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening).		
	12-17	Unit IV: Laser Physics – II He-Ne laser and RUBY laser (Principle, Construction and working), Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working),		
	19-24	Applications of lasers in the field of medicine and industry.		Revision Tests



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