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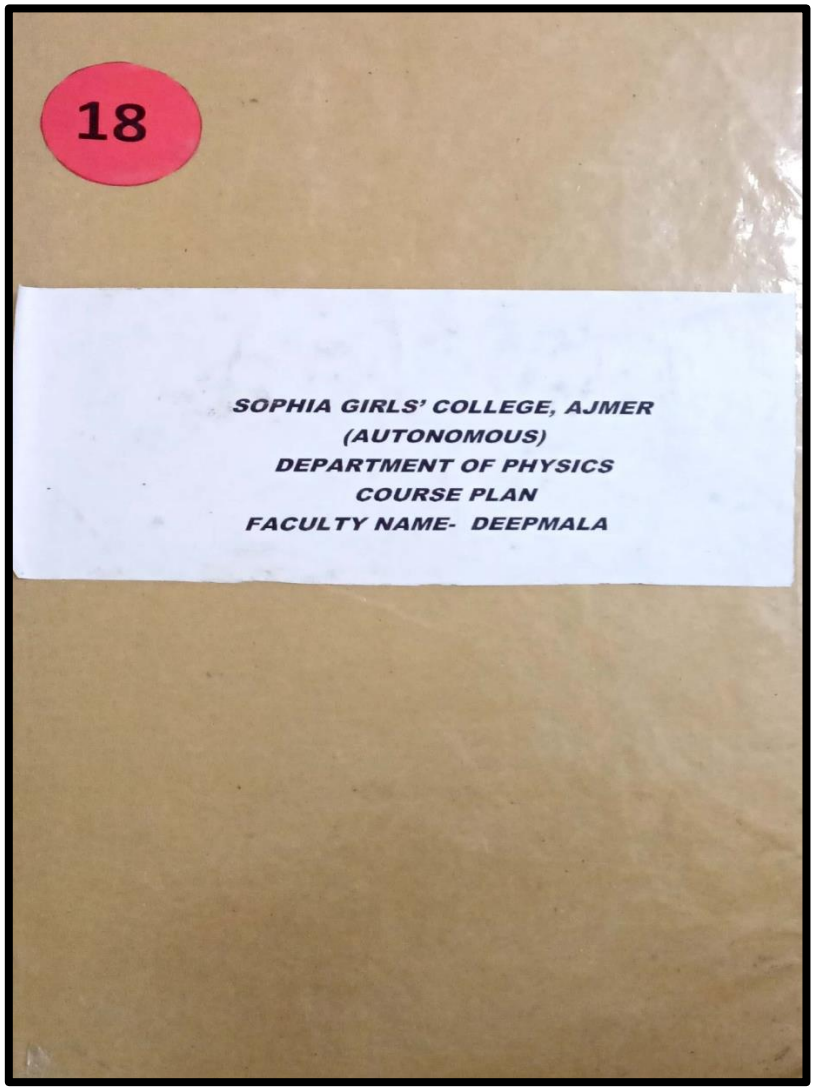

COURSE_PLAN_2018-19_MRS_DEEPMALA_SINGHAL

COURSE PLAN(PHYSICS)

U.G Programs

2018-19

Max. Marks: 75 (50 External: 25 Internal) Min. Marks: 30 (20 External; 10 Internal) Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY	**UNIT I** Scalars and Vectors: dot products, vector product, triple vector product, gradient of scalar field and its geometrical interpretation, divergence and curl of a vector field. Flux of vector field	Scalar and vector fields	Lecture method, problem solving method, quiz	Tabulate vector properties and theorems related to it.	*Knowledge Based* -What is scalar field? -State the Stokes theorem.	Knowledge--60 Understanding-30 Higher Order-10
JULY	Gauss's divergence theorem, Stokes theorem. Gauss's Law and its integral and differential form. Coulomb's law in vacuum expressed in vector form.	Theorems related to scalar and vector fields	Lecture method, problem solving method		*Understanding Based* -Illustrate the electromagnetic induction.	
AUGUST	**UNIT III** Concept of magnetic field B and magnetic flux, Biot-Savart's law, B due to a straight current carrying	Magnetic flux and intensity of magnetic field	Group Discussion, Lecture method		-show that $\text{div}\,\hat{R} = \frac{2}{R}$, where $\vec{R}=\hat{i}x+\hat{j}y+\hat{k}z$	

	conductor.Ampere circuital law (integral and differential form), Force on a current carrying wire and torque on a current loop in a magnetic field, Maxwell's equations (integral and differential form) and displacement current			Explain Magnetic field and analysis of AC circuits	*Higher Order Thinking Skills Based* - Estimate equations for the growth and decay of current in LR circuit. - Express the Maxwell's equation in their differential and integral forms and discuss them..	
SEPTEMBER	Electromagnetic induction, Faraday law (its integral and differential form) Lenz's law, mutual & self inductance, Charging, discharging of condenser through resistance, rise and decay of current in LR circuit, decay constant, transient in LCR circuit	Electromagnetic Induction	Demonstration through examples			
OCTOBER	**UNIT II** Electric field in matter: atomic and molecular dipoles, permanent dipole moment. Capacity of parallel plate capacitor with partially or completely filled dielectric, electric displacement, Lorentz local field and Clausius Mossotti equation.	Electrostatic properties of conducts	Lecture Method, PPT, quiz, numerical solving method	Classify Electrostatic properties of conducts and various boundary conditions.		
	Electrostatic field – conductors in electric field, Boundary conditions for potential and field at dielectric surface, Poisson's and Laplace's equations in Cartesian cylindrical and spherical polar coordinates (without derivation).	Various boundary conditions.	Lecture Method, PPT, quiz, numerical solving method			

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AJMER

Head
Department of Physics
Sophia Girls' College
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B.Sc II (SEMESTER III) Thermodynamics and Statistical Physics (302)

Max. Marks : 75 (50Ext; 25 Int) Min. Marks: 30(20 Ext;10 Int) Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
JULY	Thermodynamics: Zeroth law of thermodynamics. First law of thermodynamics and its limitations.Second law of thermodynamics and its significance, Heat engine, Carnot's Heat engine and its efficiency.	Fundamental knowledge of thermodynamics and Carnot's Heat engine	Group discussion White board teaching for derivation,PPT, Examples,	laws of Thermodynamics and thermodynamical functions.	*Knowledge Based* -What is II law of thermodynamics - Define Carnot'sHeat engine. *Understanding Based* -Compare laws of Thermodynamics. -Describe Gibbs Functions. *Higher Order Thinking Skills Based* -Explain Joule – THomosons effect -Derive Maxwells equations	Knowledge--40 Understanding-40 Higher Order-20
	Joule Thomson effect Thomson effect, Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect		Quiz, PPT,Practicles			
	Entropy.Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G)					
AUGUST	Derivation of Maxwell thermodynamical relations from	Detail concept of probability and its	Diagrams, Class	Compose		

	thermodynamical functions. Unit – II Microscopic and Macroscopic systems, events-mutually exclusive. dependent and independent.	relation with entrophy	test,Examples. Numericals	Probablity Problems and relation between probability and entropy		
	Probability, A- priori Probability Tossing any number of Coins, distributions of N (for N= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states,					
SEPTEMBER-	Probability (Boltzmann's relation). Phase space, Division of Phase space into cells. Unit – III Need for Quantum Statistics: three kinds of statistics,			•Contrast and compare different types of statistics and their applications.		
	basic approach in three statistics basic approach in three statistics	Comparison of : three kinds of statistics, Planck's radiations law.				
OCTOBER - November	.Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E. gas. Fermi – Dirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature.		Open book test Theortical concept by PPt,White board teaching for derivation, Examples,group disscussion ,Class test			

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B.Sc III (SEMESTER V) Quantum Mechanics (502)

Max. Marks : 75 (50Ext: 25 Int) Min. Marks: 30(20 Ext;10 Int) Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
JULY	**UNIT-1** Origin of Quantum theory: Failure of classical Physics to explain the phenomenon such as black body spectrum, Planck's radiation law. Compton effect	Outcome of . De-Broglie Hypothesis ,Quantum theory and Uncertainty principle and its consequences	White board teaching for derivation,PPT, Examples,group disscussion	•Understand Fundamental of Quantum theory, Heisenberg Uncertainty principle and its applications.	*Knowledge Based* -What is a Wave? -Define a wave function. *Understanding Based* -Write application Debrogli Hypothesis. - Give difference between time dependent and time independent Schrodinger equations. *Higher Order Thinking Skills Based* - For Potential step calculatef reflection and transmission coefficient. - Deduce Planck's radiation law	Knowledge--30 Understanding-50 Higher Order-20
	. De-Broglie Hypothesis,Uncertainty principle and its consequences gamma ray microscope, diffraction at a single slit.		Quiz, PPT,Practicles			
	. Application of uncertainty principle- (i) Non existence of electron in nucleus (harmonic oscillator. Energy-time uncertainty.					
AUGUST	ii) Ground state energy of H-atom (iii) Ground state energy of harmonic oscillator. Energy-time uncertainty.		Diagrams, Class test,Examples, Numericals	-Describe Wave Function and types of Schrodinger equation.		

	UNIT-II Fundamental postulates of quantum mechanics, eigen function and	Schrodinger equation – time dependent and time independent form and its physical significance.			equation.	
	eigen value, degeneracy degeneracy orthogonality of eigen functions, commutation relations					
	Schrodinger equation – time dependent and time independent form					
SEPTEMBER-	Physical significance of the wave function and its interpretation, probability current density			Solve various problems related to the boundary condition based on Schrodinger equation		
	operators in quantum mechanics.Expectation values of dynamical variables, the position, momentum and energy.					
OCTOBER - November	**UNIT-3** Simple Solutions of Schrodinger equation : Time independent Schrodinger equation and stationary state solution, Boundary and continuity conditions on the wave function, particle in one dimensional box , eigen function and eigen values , discrete energy levels extension of results for three dimensional case and degeneracy of levels. Potential step and	Application of schrodinger wave equation to solve different problems.	Theortical concept by PPt,White board teaching for derivation, Examples,group disscussion ,Class test			
	rectangular potential barrier, calculation of reflection and transmission coefficient, Simple harmonic oscillator (one dimensional) eigen function, energy eigen values, zero point energy.					

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B. Sc. I (SEMESTER II)

Kinetic Theory of Gases and Theory of Relativity (PHY-201)

Max. Marks: 75 (50 External; 25 Internal) Min. Marks: 30 (20 External; 10 Internal) Credit: 03

COURSE PLAN

SEM II Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II DECEMBER	**UNIT I** Applications of special theory of relativity: Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance, Length Contraction, Time Dilation, Velocity addition theorem, Variation of mass with velocity.	Theory of Relativity and its applications	Blackboard teaching,Lecture method, problem solving method, quiz	Describe Einstein's theory of Relativity and Lorentz transformation equations	*Knowledge Based* -What is the time Dilation? -what is the RMS speed?	Knowledge—60 Understanding-30 Higher Order-10
JANUARY	Mass energy equivalence, Transformation of relativistic momentum and energy, relation between relativistic momentum and energy, Mass, velocity, momentum and energy of zero rest mass		Lecture method, problem solving method		*Understanding Based* -Calculate the speed component where probability reduces half of its maximum	
	UNIT II Inertial frames, Galilean	Different types of Frames of				

	transformation, Non-Inertial frames. fictious forces, Displacement. velocity and acceleration in rotating co-ordinate system, Coriolis force and its application, Effect of Coriolis force on a particle moving Horizontally on Earth	References	Group Discussion, Lecture method	Explain frame of references. Coriolis force and their effects	value. -Derive the variation of mean free path of molecules of gas with pressure and temperature. *Higher Order Thinking Skills Based* - Estimate the formula for displacement, velocity and acceleration in rotating coordinate system. - Calculate the effect of Coriolis force on Pendulam.	
FEBRUARY	Effect of Coriolis force on Bodies falling Vertically downward on Earth, Effect of Coriolis force on Bodies thrown Vertically upward on Earth Effect of Coriolis force on Pendulum or Foucault Pendulum.	Coriolis force	Demonstration through examples			
	UNIT III Assumptions of Kinetic Theory of gases, Law of equipartition of energy and its applications for specific heats of gases	To calculate different types of velocity	Lecture Method, PPT, quiz, numerical solving method	. Illustrate Properties of gases and different types of velocities.		
MARCH	Maxwell distribution of speeds and velocities (derivation required), Experimental verification of Maxwell's Law of speed distribution: most probable speed, average and r.m.s. speed, mean free path.		Lecture Method, PPT, quiz, numerical solving method			

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B.Sc II (SEMESTER IV) Optics (402)

Max. Marks : 75 (50Ext; 25 Int) Min. Marks: 30(20 Ext;10 Int) Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
December-January	Unit-1 Interference of a light: The principle of superposition, two slit interference, coherence requirements of the sources.Newton's ring and its application to find wavelength of light and refractive index of medium	Knowledge of Interference,Newton rings and Michelson interferometer	White board teaching for derivation,PPT, Examples,group disscussion	Summarize Interference and its application in Michelson interferometer	*Knowledge Based* -Define Coherent sources -What is the principle of Interference? *Understanding Based* -Write application of Newton Rings -Compare uniaxial and biaxial crystals. *Higher Order Thinking Skills Based* - Explain Working ofMichelson	Knowledge--30 Understanding-50 Higher Order-20
	. Haidinger fringes : Fringes of equal inclination.Michelson interferometer it's application for precision determination of wavelength, Wavelength difference and the width of spectral lines. Unit-2		Quiz, PPT,			

February	Polarization of light : Meaning of polarization, polarization by reflection: Brewster law, polarization by refraction through "Pile of plates". Laws ofMalus, Phenomenon of double refraction, uniaxial and biaxial crystals.	Meaning polarisation and its applications	Class test,assignements,project work, class teaching on board,ppt	• Explain Polarization phenomenon and Polaroids.	interferometer -Explain Diffraction due to Double slits	
	Huygenstheory of double refraction, the ordinary and extra ordinary refractive indices.Production and Analysis of Polarized Light : production of plane polarizedlight, the Polaroid,.					
March-April	Nicol prism, analyser and polarizer, double image prisms,quarter and half wave plates Unit-3 Fresnel diffraction : Half periods zones,Fraunhofferdiffraction : Single slit, double slit, n slit, Intensity distribution, Plane diffraction grating, Dispersive power of a grating, Resolving power, Reyleigh criterion, resolving power : telescope, grating, prism.		Basic concepts of diffraction by pracical.Theortical concept by PPt,White board teaching for derivation, Examples,group disscussion	•Compare Fresnel and Fraunhoffer Diffraction and their application in grating.		

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B.Sc III (SEMESTER VI) Atomic and Molecular Spectroscopy (602)

Max. Marks : 75 (50Ext; 25 Int) Min. Marks: 30(20 Ext;10 Int) Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
December-January	Lasers and Holography : Spontaneous and stimulated emission, density of states, Einstein's A and B coefficients, Ratio of stimulated to spontaneous transitions in a system in thermal equilibrium	Fundamental knowledge of LASER and Types of LASER and Holography	Working of laser through energy level diagram White board teaching for derivation,PPT, Examples,group disscussion	• Describe properties of LASER, types of LASER and Holography applications.	*Knowledge Based* -Define LASER -What is a Holography? *Understanding Based* -Write application of Lasers -Derive Cofficient of Spontaneous and stimulated emission? *Higher Order*	Knowledge--30 Understanding-50 Higher Order-20
	, Energy density of radiation as a result of stimulated emission and absorption, Condition for		Quiz, PPT,Practicles			

	amplification, Population inversion, Methods of optical pumping				*Thinking Skills Based* - Explain Working of He-Ne LASER. -Illustrate Rotational energy levels of diatomic molecule	
	Energy level schemes of He-Ne and Ruby lasers, working of a laser source					
February	Special features of a laser source and their origin. Basic concepts of holography, construction of a hologram and reconstruction of the image. Unit – II Elementary Spectroscopy : Quantum features of one electron	Quantum features of one electronand spin-orbit coupling.	Class test,assignements,project work, class teaching on board,ppt	•Explain continous and descrete enery levels of one electron atomp		
	spectral lines of hydrogen atom, Frank-Hertz experiment and discrete energy states, Stern and Gerlach experiment, Spin and Magnetic moment, Spin Orbit coupling and qualitative explanation of fine structure.					
March-April	Atoms in a magnetic field, Zeeman effect (normal and anomalous), Zeeman splitting. Unit – III Qualitative features of molecular spectroscopy, Rigid rotator, discussion of energy eigen values and eigen functions, Rotational energy levels of diatomic	Detail of Zeeman's splitting and rigid body rotator.	Theortical concept by PPt,White board teaching for derivation, Examples,group disscussion	•Summarise Molecular Spectra and Raman effect		

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AJMER

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Department of Physics
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