



SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER

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***SOPHIA GIRLS' COLLEGE, AJMER
(AUTONOMOUS)
DEPARTMENT OF PHYSICS
COURSE PLAN***



COURSE PLAN (PHYSICS)

U.G Programs

2021-22



SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)

B. Sc. I (SEMESTER I)


ELECTROMAGNETICS (PHY-102)

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 (%)
AUGUST- SEPTEMBER	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	Video Lecture method, problem solving method, quiz	Tabulate vector properties and theorems related to it.	<u>Knowledge Based</u> -What is scalar field? -what do you mean by flux of a vector field?	Knowledge--60 Understanding-30 Higher Order-10
 Head Department of Physics Sophia Girls' College (Autonomous), Ajmer	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	Video Lecture method, PPT, problem solving method, class test			



					<u>Understanding Based</u>	
SEPTEMBER - 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.	Various boundary conditions.	Video Lecture Method, PPT, seminars, quiz, numerical solving method	Derive Claussius Mossoti equation.	-Illustrate the electromagnetic induction. -what are poisons and laplace equation?	
	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). <i>Head</i> Department of Physics Sophia Girls' College (Autonomous), Ajmer	Electromagnetic Induction	Demonstration through examples, diagrams, PPT			
					<u>Higher Order Thinking Skills Based</u> - Derive Biot savart	



OCTOBER - NOVEMBER	UNIT III Concept of magnetic field B and magnetic flux, Biot-Savart's law, B due to a straight current carrying 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	Magnetic flux and intensity of magnetic field	Online Group Discussion, Video Lecture method, problem solving	Classify Electrostatic properties of conductors and various boundary conditions.	law. - Express the Maxwell's equation in their differential form.	
DECEMBER - JANUARY	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	Electrostatic properties of conductors.	Video Lecture Method, PPT, quiz, numerical solving method			

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SOPHIA GIRL'S COLLEGE, AJMER (AUTONOMOUS)
B.Sc. II (SEMESTER III)
ELECTRONICS (PHY-301)

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 (%)
AUGUST - SEPTEMBER	UNIT I Energy bands in solids, Intrinsic and extrinsic semiconductors, carrier mobility and electrical resistivity of semiconductors, photoconduction in semiconductors, solar cell, p-n junction diode and their characteristics.	Semiconductors	PPT, online Quiz, Video Lecture method, Problem solving method.	Describe Zener diode and its function as a voltage regulator.	<u>Knowledge Based</u> - What are semiconductors? Give example. -what do u mean by avalanche breakdown?	Knowledge—60 Understanding-30 Higher Order-10
	Zener and Avalanche Breakdown, Zener diode, Zener diode as voltage regulator, Light emitting diode(LED), Photodiode, Solar cell, p-n junction as a rectifier, half wave and full wave rectifiers (with derivation), Filters (series inductor, Shunt capacitance, L-section or choke, pie and RC filter circuits.	Application of diode as a rectifier.	Video Lecture method, problem solving method, Quiz, e-content, demonstration through examples, diagrams		<u>Understanding Based</u> -Describe LED. - Describe the	



SEPTEMBER - OCTOBER	UNIT II Junction transistor, Working of NPN and PNP transistors, Three configuration of transistor(C-B , C-E, C-C modes), Common base, common emitter, and common collector characteristics of transistor.	Transistor in different configurations.	PPT, Quiz, Lecture method, Problem solving method.	Compare Transistors, parameters and biasing of transistors.	working of Transistor.	
NOVEMBER	Parameters of a transistor and their relation, D.C. load line, Transistor biasing; various method of transistor biasing and stabilization. Junction Field Effect Transistor(JFET), volt ampere relations.	Operating point of JFET.	Demonstration through examples, diagrams ,video		<u>Higher Order Thinking Skills Based</u>	
DECEMBER- JANUARY	UNIT III Amplifier, Classification of Amplifiers, common base and common emitter amplifiers, coupling of amplifiers.	Amplifiers.	Video Lecture Method, PPT, quiz, Demonstration through examples.	-Explain R-C coupled amplifier.	- Explain CB and CE amplifier. -Discuss feedback in Amplifiers.	
	Various methods of coupling, Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers, Resistance-Capacitance(RC) coupled amplifier. PCR Machine.	Negative Feedback.	Video Lecture Method, PPT, quiz, numerical solving method			

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SOPHIA GIRL'S COLLEGE, AJMER (AUTONOMOUS)

B. Sc. III (SEMESTER-V)

SOLID STATE PHYSICS (PHY-501)

Max. Marks: 75 (50 External; 25 Internal)

Min. Marks: 30 (20 External; 10 Internal)

Credit: 03

COURSE PLAN

SEM V Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
AUGUST - SEPTEMBER	UNIT I Crystal binding and crystal structure: Crystal bonding, ionic bonding, binding energy of ionic crystal, determination of repulsive exponent, covalent bonding, metallic bonding, molecular and vanderwall's bonding, hydrogen bonding.	Types of bonding	Video Lecture method, online problem solving method, quiz, webinars, PPT	Summarise different bonding between atoms .	<u>Knowledge Based</u> -What is covalent bonding? -What is binding energy of ionic crystal?	Knowledge--60 Understanding-30 Higher Order-10
SEPTEMBER- OCTOBER	Space lattice and crystal structure, Bravis lattice ,Miller indices and crystal structure, spacing of planes in crystal lattice, atomic packing, simple cubical lattice structure, face centered cubic lattice structure, body centered cubic lattice structure, X-ray diffraction(Lattice structure	Video Lecture method, online problem solving method, e-content, seminars			



	Laue's equation), reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c., f.c.c.					
OCTOBER-NOVEMBER	UNIT II Thermal properties of solids : concepts of thermal energy and phonons, internal energy and specific heat, the various theories of lattice specific heat of solids: the Einstein model, vibrational modes of continuous medium, Debye model, electronic configuration of the internal energy hence to the specific heat of metals.	Basic concept of Einstein and Debye model.	Online Group Discussion, Video Lecture method, Quiz.	Explain thermal properties of solids.	<u>Understanding Based</u> -Discuss Kronnig penny model. -what is Effective Mass of electron?	
	Band theory of solids: formation of bands, periodic potential of solid, wave function in periodic lattice and Bloch theorem, number of states in a band, Kronnig penny model, velocity of Bloch electrons and dynamical effective mass, momentum, crystal momentum and physical origin of effective mass, negative effective mass, concept of	Kronnig Penny model.	Demonstration through examples, diagrams, chart, PPT, Quiz.			



	holes, distinction between metals, insulators, and intrinsic semiconductors.					
NOVEMBER - DECEMBER	UNIT III Superconductivity: Introduction, experimental features of superconductivity, the isotope effect, electron phonon interaction, the effect of superconducting transition of properties of superconductors, special features of superconducting materials,.	Superconductivity.	Video Lecture Method on google meet, PPT, quiz, numerical solving method.	What are cooper pairs? Explain BCS theory of superconductivity	<u>Higher Order Thinking Skills Based</u> - Estimate the phenomena of diamagnetism. - Explain the phenomenon of flux quantization.	
DECEMBER - JANUARY	Theoretical survey(basic idea), Flux quantization, BCS theory of superconductivity: cooper pairs ,high temperature superconductors(basic ideas), magnetic properties: classification of magnetic materials, origin of atomic magnetism, magnetic susceptibility, phenomenon of diamagnetism, para magnetic materials, magnetic properties of ionic crystal, ferromagnetism.	Magnetic properties of materials.	Meet Lecture Method, PPT, quiz, numerical solving method			

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
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 (%)
JANUARY	UNIT I Assumption of kinetic theory of gases, law of equipartition of energy and it's applications of specific heats of gases, Maxwell distribution of speed and velocities,	Kinetic Theory of Gases. Maxwell distribution	Blackboard teaching, Lecture method, problem solving method, quiz	✓ Describes the Maxwell's distribution of speed and velocities.	<u>Knowledge Based</u> = what are Inertial frames ? -What is law of equipartition of energy? -what is the RMS speed?	Knowledge—60 Understanding-30 Higher Order-10
JANUARY	Experimental verification of Maxwell's law of speed distribution, most probable speed, average speed, r.m.s. speed, mean free path.	Verification of Maxwell's law	Lecture method, problem solving method	✓ Explains the Law of equipartition of energy. ✓		



FEBRUARY	UNIT III Application of special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance, Length contraction, Time dilation, Velocity addition theorem.	To understand special theory of relativity Velocity addition theorem	Lecture Method, PPT, quiz, numerical solving method, Flipped learning	✓ Calculate the variation of mass with velocity and also the mass energy equivalence.	<u>Understanding Based</u> Calculate equation for Galilean Transformation.
FEBRUARY	Variation of mass with velocity, Mass energy equivalence, relation between momentum and energy, Mass, velocity, momentum, and energy of zero rest mass.	Special theory of relativity energy of zero rest mass.	Lecture Method, PPT, quiz, numerical solving method	✓ Constructs relation between momentum and energy.	-Derive the effect of coriolis force on pendulum.
MARCH	UNIT II Inertial frames, Galilean 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	Describe the types of Frame of References. Fictious forces	Group Discussion, Lecture method, Animations, PPT	✓ Explains the coriolis force, ✓ Classifies frame of reference and galilean transformation	<u>Higher Order Thinking Skills Based</u> - Estimate the formula for displacement, velocity and acceleration in rotating coordinate system.
MARCH-APRIL	Effect of Coriolis force on pendulum and Foucault pendulum, 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 a body in various forms	Demonstration through examples, Lecture method,		Calculate the result for Length contraction and time dilation.

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
B.Sc. II (SEMESTER - IV)
Optics (PHY - 402)

Max. Marks : 75 (50Ext; 25 Internal)

Min. Marks: 30(20 Ext;10 Internal)

Credit: 03

COURSE PLAN

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
JANUARY	UNIT I Interference of a light: The principle of superposition, two slit interference, coherence requirements of the sources. Newton's ring and it's 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 discussion	✓ Summarizes the Interference and its application in Michelson interferometer	<u>Knowledge Based</u> -Define Coherent sources -What is the principle of Interference?	Knowledge--60 Understanding-30 Higher Order-10
JANUARY	Haidinger fringes: Fringes of equal inclination. Michelson interferometer it's application for precision determination of wavelength, Wavelength difference and the width of spectral lines.	Width of Spectral lines	Quiz, PPT, Observation method, PPT, Quiz		<u>Understanding Based</u> -Write application of Newton Rings	
FEBRUARY	UNIT – III Fresnel diffraction : Half periods zones, Fraunhofer diffraction : Single	Fresnel diffraction Fraunhofer	Basic concepts of diffraction by practical.	✓ Compares Fresnel and Fraunhofer Diffraction and	-Compare uniaxial and biaxial crystals.	



	slit, double slit, n slit, Intensity distribution, Plane diffraction grating, Dispersive power of a grating, Resolving power, Reyleigh criterion, resolving power : telescope, grating, prism.	diffraction Reyleigh criterion	PPT, White board teaching for derivation, Examples, group discussion	their application in grating.	<u>Higher Order Thinking Skills Based</u> - Explain Working of Michelson interferometer - Explain Diffraction due to Double slits	
MARCH	UNIT – II Polarization of light: Meaning of polarization, polarization by reflection: Brewster law, polarization by refraction through “Pile of plates”, Laws of Malus, Phenomenon of double refraction, uniaxial and biaxial crystals, Huygens theory of double refraction, the ordinary and extra ordinary refractive indices.	Meaning of polarisation and its applications	Class test, assignments, project work, class teaching on board, PPT,	✓ Explains Polarization phenomenon ✓ Uses of Polaroid. ✓ Implication of Law of Malus.		
APRIL	Production and Analysis of Polarized Light : production of plane polarized light, the Polaroid, Nicol prism, analyser and polarizer, double image prisms, quarter and half wave plates <i>Defmed</i> Head	Analysis of Polarized Light Nicol prisms	Lecture method, PPT, quiz, demonstration method <i>April</i>			

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SOPHIA GIRLS' COLLEGE (AUTONOMOUS), AJMER
B. Sc. III (SEMESTER - VI)
NUCLEAR PHYSICS (PHY- 601)

Max. Marks: 75 (50 External; 25 Internal)

Min. Marks: 30 (20 External; 10 Internal)

Credit: 03

COURSE PLAN

SEM VI Month	UNIT/TOPIC	Concepts/fa cts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
JANUARY	UNIT I Nuclear properties: Rutherford's theory of particle scattering, properties of nuclei, quadrupole moment and nuclear ellipticity, Quadrupole moment and nuclear spin, parity and orbital angular momentum, parity and its conservation.	Nuclear properties. Rutherford theory of particle scattering Parity and its conservation.	Lecture Method, PPT, quiz, numerical solving method, demonstration method.	✓ Explains the Rutherford theory of particle scattering. ✓ Distinguishes between quadrupole moment and orbital angular momentum	<u>Knowledge Based</u> -What is Nuclear fission? -What is the principle of nuclear reactors? -What is ellipticity.	Knowledge--30 Understanding-50 Higher Order-20
JANUARY	Cosmic rays: Discovery of cosmic rays, nature of cosmic rays, soft and hard , components, variation in cosmic rays – (1) Latitude effect. (2) East-West asymmetry and directional effect. (3) Altitude effect.	Cosmic rays. Effects of cosmic rays	Lecture Method, PPT, quiz, numerical solving method, PPT, Project method	✓ Explains Cosmic rays		



FEBURARY	UNIT III Nuclear fusion: the sources of stellar energy, the plasma: the fourth state of matter, fusion reaction, energy balance and Lawson criteria, magnetic confinement of plasma, classical plasma losses from the magnetic container, anomalous losses, turbulence and plasma instabilities.	Lawson criteria. magnetic confinement of plasma Plasma instabilities	Group Discussion, Lecture method, Quiz, Observation method	✓ Explains the elementary particles. ✓ Understands the fusion reaction ✓ Implies the Quarks models	<u>Understanding Based</u> -Discuss Plasma as the fourth state of matter. -what are elementary particles? -explain barrier penetration. -write nuclear reaction. -what is Breeder reactors?	
FEBURARY	Elementary particles: classification of elementary particles, fundamental interactions, unified approach (basic ideas), the conservation laws, Quarks (basic ideas), charmed and coloured quarks.	Elementary particles. Quarks	Demonstration through examples, PPT, Quiz, Lecture method			
MARCH	UNIT II Nuclear fission: The discovery of nuclear fission, the energy release in the fission, the fission products, mass distribution of fission products, fission cross section and	Fission and fusion. Energy of	Lecture method, problem solving method, quiz, PPT, Heuristic	✓ Summarise the discovery of Nuclear fission.		



	threshold, neutron emission in fission, the prompt neutrons and delayed neutrons, energy of fission neutrons, theory of nuclear fission and liquid drop model.	fission neutrons	method	✓ Applies theory of spontaneous fission.	<u>Higher Order Thinking Skills Based</u> - Estimate nuclear spin, parity and angular momentum.	
MARCH - APRIL	Barrier penetration- theory of spontaneous fission, nuclear energy sources, nuclear fission as a source of energy, the nuclear chain reaction, condition of controlled chain reaction, the principle of nuclear reactors, classification of reactors, typical reactors, power of nuclear reactors, the Breeder reactors,	Nuclear reactors. Condition of controlled chain reaction	Lecture method, problem solving method, Animation, PPT	✓ Classifies the type of reactors	- Explain Lattice effect. - Differentiate charmed and coloured quarks.	

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