COURSE PLAN (PHYSICS)

U.G Programs

2020-21

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 (%)
SEM I August	**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.	*Knowledge Based* -What is vector field? -what do you mean by gradient and divergence?	Knowledge--60 Understanding-30 Higher Order-10
AUGUST	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			
SEPTEMBER	**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	Various boundary conditions.	Video Lecture Method, PPT, seminars, quiz, numerical solving method	Derive	*Understanding Based*	

	displacement, Lorentz local field and Clausius Mossotti equation.			Claussius Mossoti equation.	-Illustrate the electromagnetic induction. -what do you mean by Dipole moment?	
SEPTEMBER	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).	Electromagnetic Induction	Demonstration through examples, diagrams, PPT			
OCTOBER	**UNIT III** Concept of magnetic field B and magnetic flux, Biot-Savart's law, B due to a straight current carryingconductor.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, problrm solving	. Classify Electrostatic properties of conducts and various boundary conditions.	*Higher Order Thinking Skills Based* - Derive Poisson's and Laplace equations.	
NOVEMBER-DECEMBER	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		- Express the Maxwell's equation in their differential form.	

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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 (%)
SEM I JULY	**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.	*Knowledge Based* - Explain types of semi conductors? Give example. -what are filters? Explain them with their types. *Understanding Based* -Describe three types of configuration of Transistor.	Knowledge—60 Understanding-30 Higher Order-10
JULY-AUGUST	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			

	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.	- Describe the working of Transistor.	
AUGUST-SEPTEMBER	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			
OCTOBER	**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.	*Higher Order Thinking Skills Based* - Explain different types of Amplifiers -Discuss feedback in Amplifiers.	
NOVEMBER	Various methods of coupling, Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers, Resistance-Capacitance(RC) coupled amplifier.	Negative Feedback.	Video Lecture Method, PPT, quiz, numerical solving method			

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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 (%)
JULY	**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 .	*Knowledge Based* -What is ionic bonding? -What is binding energy of ionic crystal?	Knowledge--60 Understanding-30 Higher Order-10
AUGUST	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.					
SEPTEMBER	**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 energyhence 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.		
OCTOBER	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, kronig penny model, velocity of bloch electrons and dynamical effective mass, momentum, crystal momentum and physical origin ofeffective mass, negative effective mass, concept of	Kronnig Penny model.	Demonstration through examples,diagrams, chart, PPT, Quiz.		*Understanding Based* -Discuss Bloch theorem. -what is Effective Mass of electron?	

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	holes, distinction between metals, insulators, and intrinsic semiconductors.					
OCTOBER - NOVEMBER	**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	*Higher Order Thinking Skills Based* - Estimate the BCS theory of superconductivity. - Explain the phenomenon of flux quantization. .	
NOVEMBER	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 susceptibility of ionic crystal, ferromagnetism.	Magnetic properties of materials.	Meet Lecture Method, PPT, quiz, numerical solving method			

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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 (%)
JANUARY	**UNIT I** Assumption of kinetic theory of gases, law of equipartition of energy, Maxwell distribution of speed and velocities, Experimental verification of Maxwell's law of speed distribution.	Kinetic Theory of Gases.	Video Lecture method, problem solving method, quiz, open book test	What are the assumptions of kinetic theory?	*Knowledge Based* -What law of equipartition of energy? -what is Maxwell's la?	Knowledge—60 Understanding-30 Higher Order-10
FEBRUARY	Most probable speed, average speed, r.m.s. speed, mean free path, Transport of energy and momentum, Brownian motion, Real gases, Vander Wall's equation.		Online meet, Video Lecture method, problem solving method, e-content			
FEBRUARY	**UNIT II** Inertial frames, Galilean transformation, Non-Inertial frames,	Describe the types of Frames of References.	Online group	P	*Understanding Based* what are the	

MARCH	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		Discussion, Video Lecture method, presentation		equation for Galilean Transformation. -Derive the effect of coriolis force on a particle moving horizontally on earth	
APRIL-May	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 , Michelson Morlay experiment.	Coriolis force	Demonstration through examples, PPT , diagrams, e-content			
July 22	**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 calculate length contraction and time dilation.	Video Lecture Method, PPT, quiz, numerical solving method, open book tesr	. Calculate variation of mass with velocity and also the mass enery equivalence.	*Higher Order Thinking Skills Based* - Explain Micchelson Morley experiment. Calculate Lorentz Transformation equation.	
	Variation of mass with velocity, Mass energy equivalence, relation between momentum and energy, Mass, velocity, momentum, and energy of zero rest mass.		Video 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 (%)
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	Video lecture e-content ,PPT, Examples, online group disscussion	Summarize Interference and its application in Michelson interferometer	*Knowledge Based* -what is the principle of superposition? -What is the principle of Interference?	Knowledge--30 Understanding-50 Higher Order-20
February	. Haidinger fringes : Fringes of equal inclination.Michelson interferometer it's application for precision determination of wavelength, Wavelength difference and the width of spectral lines.		Quiz, PPT, Video lectures, e- content, open book test			

March	**UNIT -2** 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	Online Class test,assignements,project work, Video lecture on google meet ,ppt	• Explain Brewster Law	*Understanding Based* -Write application of Newton Rings -what do you mean by Law of Malus?	
April-May	Huygenstheory of double refraction, the ordinary and extra ordinary refractive indices.Production and Analysis of Polarized Light : production of plane polarizedlight, the Polaroid,.					
I July -2021	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.		Video lecture, e-content , demonstration through diagrams, Examples, online group discussion	•Compare Fresnel and Fraunhoffer Diffraction and their application in grating.	*Higher Order Thinking Skills Based* - Explain Working ofMichelson interferometer -Explain Diffraction due to Double slits	

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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

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SEM VI Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
DECEMBER	**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 threshold, neutron emission in fission, the prompt neutrons and delayed neutrons, energy of fission neutrons, theory of nuclear fission and liquid drop model.	Fission and fusion.	Google meet Lecture method, problem solving method, quiz	Summarise the discovery of neutrons.	*Knowledge Based* -What are prompt and delayed neutrons? -What is nuclear fission?	Knowledge--60 Understanding-30 Higher Order-10
JANUARY	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, critical size of thermal	Nuclear reactors.	Google meet Lecture method, seminars, problem solving method, online quiz			

	reactors, Breeder reactors, reprocessing of spont fuel, radiation damages and fission products poisoning, uses of atomic energy.					
FEBURARY	**UNIT III** Nuclear fission: 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.	Online Group Discussion, Video Lecture method, Quiz, e-content	Concept of elementary particles.	*Understanding Based* -Discuss Lawson criteria. -what are elementary particles?	
FEBURARY-MARCH	Elementary particles: classification of elementary particles, fundamental interactions, unified approach(basic ideas), the conservation laws, Quarks(basic ideas), charmed and coloured quarks.	Elementary particles.	Online Demonstration through examples, PPT, Quiz.		*Higher Order Thinking Skills Based* - Describe the nature of cosmic rays.	
April-May	**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.	Meet Lecture Method, PPT, quiz, numerical solving method., e-content.	Explain the	- Explain Lattitude effect.	

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