COURSE- PLAN

2019-20

SUBJECT : PHYSICS

Submitted by:
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Sophia Girls' College, Ajmer

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

Sc. I (SEMESTER I) ELECTROMAGNETISM (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 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 conductor.Ampere circuital law	Magnetic flux and intensity of magnetic field	Group Discussion, Lecture method		-show that $\text{div}\ \vec{R} = \frac{2}{R}$ where $\vec{R}=\hat{i}x+\hat{j}y+\hat{k}z$.	

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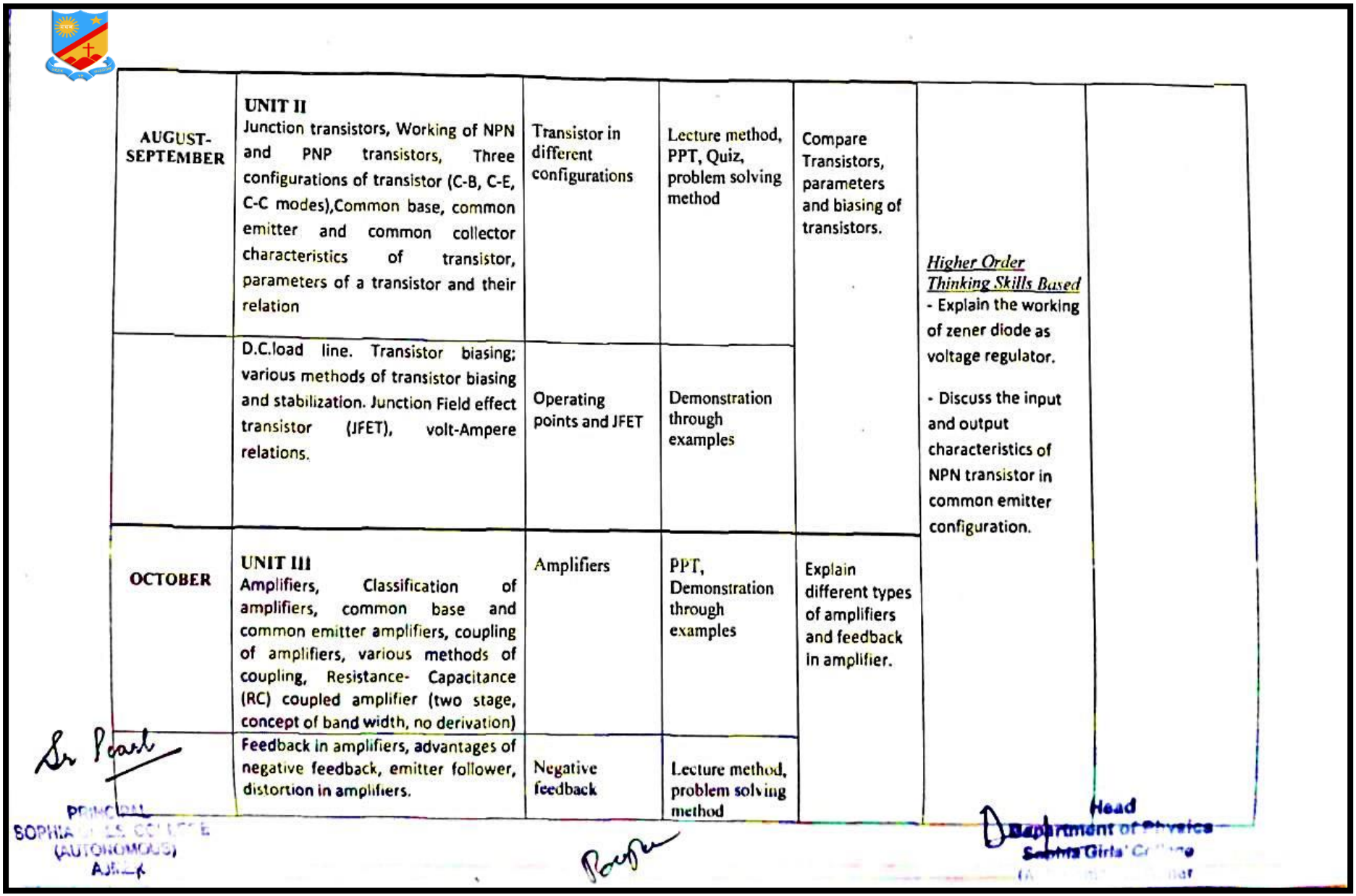
SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)

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, p-n junction diode and their characteristics, Zener and Avalanche breakdown, Zener diode, Zener diode as a voltage regulator. Light emitting diodes (LED), Photoconduction in semiconductors, Photodiode, Solar Cell.	Semiconductors	PPT, Lecture method, Quiz, problem solving method	Summarise Junction Diode, types of diodes and their applications	*Knowledge Based* - What is principle of solar cell? -Define h-parameter. *Understanding Based* - Describe construction and working of JFET. - Draw the circuit diagram of PNP transistor in common collector configuration.	Knowledge--60 Understanding-30 Higher Order-10
JULY-AUGUST	p-n junction as a rectifier, half wave and full wave rectifiers (with derivation), filters (series inductor, shunt capacitance, L-section or choke, π and R.C. filter circuits	Application of diode as a rectifier	Lecture method, Quiz, problem solving method			



AUGUST-SEPTEMBER	**UNIT II** Junction transistors, Working of NPN and PNP transistors, Three configurations of transistor (C-B, C-E, C-C modes),Common base, common emitter and common collector characteristics of transistor, parameters of a transistor and their relation	Transistor in different configurations	Lecture method, PPT, Quiz, problem solving method	Compare Transistors, parameters and biasing of transistors.	*Higher Order Thinking Skills Based* - Explain the working of zener diode as voltage regulator. - Discuss the input and output characteristics of NPN transistor in common emitter configuration.	
	D.C.load line. Transistor biasing; various methods of transistor biasing and stabilization. Junction Field effect transistor (JFET), volt-Ampere relations.	Operating points and JFET	Demonstration through examples			
OCTOBER	**UNIT III** Amplifiers, Classification of amplifiers, common base and common emitter amplifiers, coupling of amplifiers, various methods of coupling, Resistance- Capacitance (RC) coupled amplifier (two stage, concept of band width, no derivation)	Amplifiers	PPT, Demonstration through examples	Explain different types of amplifiers and feedback in amplifier.		
	Feedback in amplifiers, advantages of negative feedback, emitter follower, distortion in amplifiers.	Negative feedback	Lecture method, problem 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 I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JULY-AUGUST-	**UNIT I** Crystal Binding and Crystal Structure : Crystal Bonding, Ionic Bond, Binding Energy of Ionic Crystal,Determination of the Repulsive Exponent, Covalent Bonding, Metallic bonding,Molecular or VanderWaal's Bonding, Hydrogen Bonding. Space Lattice and Crystal Structure,Bravis Lattice, Miller Indicesand Crystal Structure, Spacing of Planes in Crystal Lattice, Atomicpacking, Simple Cubical LatticeStructure, Face Centred Cubic Lattice Structure, Body Centred Cubic Lattice Structure	Crystal structure	PPT, Lecture method, Problem solving method	Explain various types of bonding and crystal structures	*Knowledge Based* - What is flux quantization? - Write the value of 1 Bohr magneton. *Understanding Based* - Compare the crystals produced by ionic bond and covalent bond	Knowledge--40 Understanding-35 Higher Order-25

	X-ray diffraction, Bragg's Law and experimental X-ray diffraction [Laue's equation], reciprocal lattice and its physical significance, reciprocal lattice vectors, reciprocal lattice to a simple cubic lattice, b.c.c. and f.c.c	X-ray diffraction	. Lecture method. numerical solving method		- Relate the critical magnetic field at 1 K and that at 0 K. *Higher Order Thinking Skills Based* - Prove that the packing factor of a face centred cubic crystal is 74%. - Explain the Langevin's theory of diamagnetism.
AUGUST-SEPTEBER	**UNIT IIi** Superconductivity : Introduction, Experimental Features of Superconductivity, The Isotope Effect and Electron-Phonon Interaction, The Effect of the Superconducting Transition on Properties of superconductors, Special Features of Superconducting Materials, Theoretical Survey (Basic Ideas), Flux Quantisation, BCS Theory of Superconductivity: Cooper Pairs, High Temperature Superconductors (Basic Ideas)	Superconductivity	Quiz, Demonstration through examples	Illustrate Superconductivity, its properties and classification of magnetic material.	
	Magnetic Properties : Classification of Magnetic Materials, Origin of Atomic Magnetism, Magnetic Susceptibility, phenomenon of Diamagnetism, Para magnetism susceptibility of Ionic Crystal, Ferromagnetism	Magnetism	Lecture method, Demonstration through examples		

OCTOBER	**UNIT II** Thermal Properties of the 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 Contribution of the internal Energy hence to the Specific Heat of Metals, Thermal Conductivity of the lattice	Specific Heat of Solids	Lecture method. PPT. Problem solving method	Describe specific heat, its various models and theory of formation of bonds in solids.	
	Band Theory of Solids : Formation of Bands, Periodic Potential of a Solid, Wave Function in a Periodic Lattice and Bloch Theorem, Number of States in a Band, Kronig Penny Model, Velocity of the Bloch electrons and Dynamical Effective Mass, Momentum, Crystal Momentum and Physical Origin of the Effective Mass, Negative Effective Mass and concept of Holes, The distinction between metals, insulators, and intrinsic semiconductors.	Band theory of solids	Lecture method		

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SOPHIA GIRL'S COLLEGE, AJMER (*AUTONOMOUS*)
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	Lecture method, problem solving method, quiz	Describe Einstein's theory of Relativity and Lorentz transformation equations	*Knowledge Based* -What is the Galilean transformation? -what is the most probable 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	Mass energy Relationship	Lecture method, problem solving method		*Understanding Based* -Calculate the speed component where	

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JANUARY	**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	Frame of references	Group Discussion, Lecture method	Explain frame of references, Coriolis force and their effects	probability reduces half of its maximum value. -Discuss the variation of mean free path of molecules of gas with pressure and temperature.
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		*Higher Order Thinking Skills Based* - Estimate the formula for displacement, velocity and acceleration in rotating coordinate system.
FEBRUARY	**UNIT III** Assumptions of Kinetic Theory of gases, Law of equipartition of energy and its applications for specific heats of gases	Kinetic Theory of gases	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.	Speed distribution	Lecture Method, PPT, quiz, numerical solving method		- Calculate the velocity of clock which delays by one minute in every one hour.

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

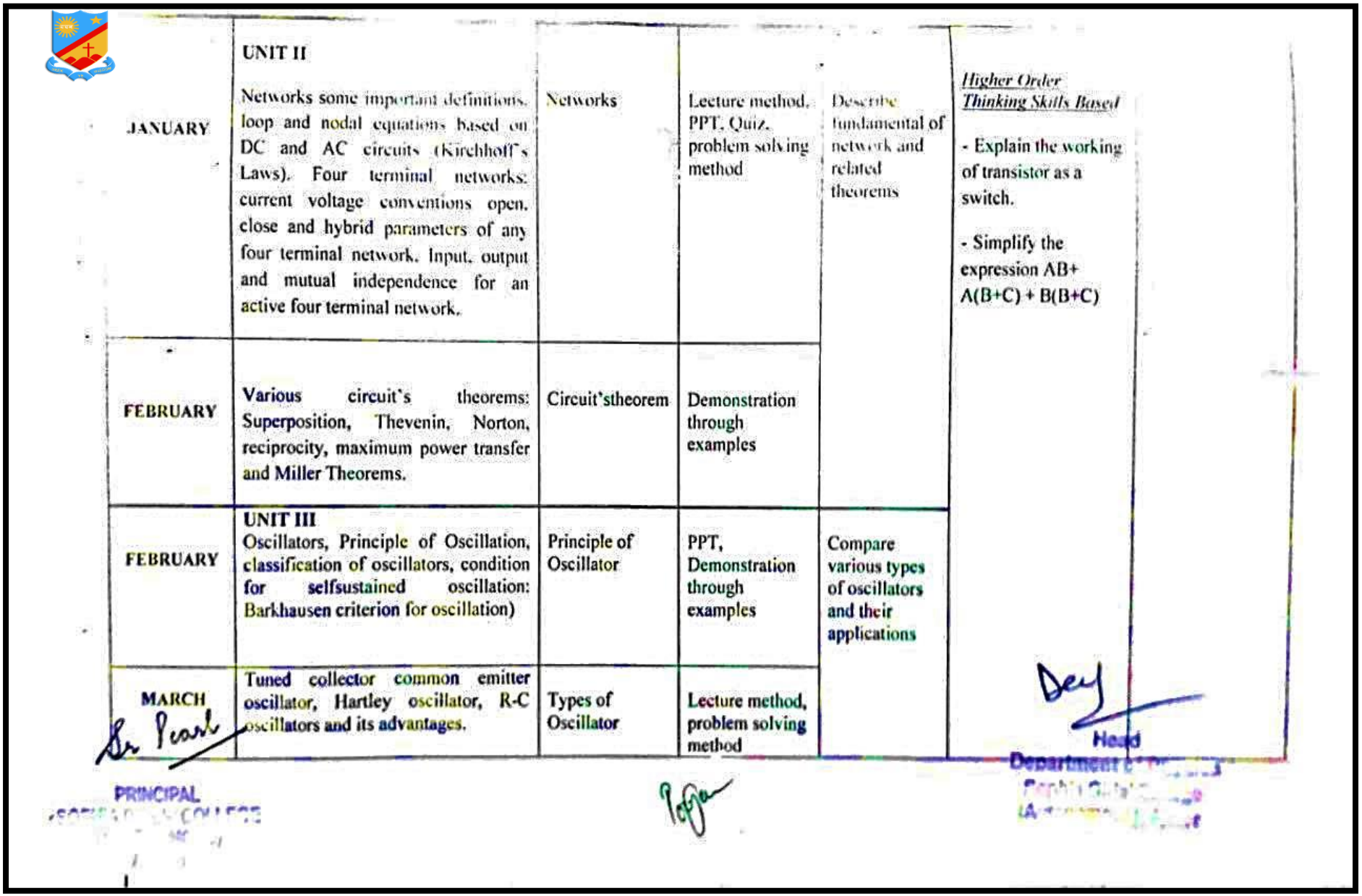
B. Sc. II (SEMESTER IV)

ELECTRONICS-II (PHY-402)

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

COURSE PLAN

SEM IV Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM IV DECEMBER	**UNIT I** Transistor as a switch, logic fundamentals, AND, OR, NOT, NOR, NAND, XOR gates. Boolean algebra, De Morgan's theorem.	Basics of Digital Electronics	PPT, Lecture method, Quiz, problem solving method	Analysis different Logic Gates and their combinations.	*Knowledge Based* - What is the principle of oscillator? -Define NOR gate.	Knowledge—50 Understanding-35 Higher Order-15
JANUARY	Positive and negative logic, logic gates circuits realization using DTL and TTL logic, Simplification of Boolean expression.	Boolean expression	Lecture method, Quiz, problem solving method		*Understanding Based* - State and derive Thevenin's theorem. - Give the circuit diagram of Hartley oscillator and explain its working.	



JANUARY	**UNIT II** Networks some important definitions, loop and nodal equations based on DC and AC circuits (Kirchhoff's Laws). Four terminal networks: current voltage conventions open, close and hybrid parameters of any four terminal network. Input, output and mutual independence for an active four terminal network.	Networks	Lecture method, PPT, Quiz, problem solving method	Describe fundamental of network and related theorems	*Higher Order Thinking Skills Based* - Explain the working of transistor as a switch. - Simplify the expression AB+ A(B+C) + B(B+C)
FEBRUARY	Various circuit's theorems: Superposition, Thevenin, Norton, reciprocity, maximum power transfer and Miller Theorems.	Circuit'stheorem	Demonstration through examples		
FEBRUARY	**UNIT III** Oscillators, Principle of Oscillation, classification of oscillators, condition for selfsustained oscillation: Barkhausen criterion for oscillation)	Principle of Oscillator	PPT, Demonstration through examples	Compare various types of oscillators and their applications	
MARCH	Tuned collector common emitter oscillator, Hartley oscillator, R-C oscillators and its advantages.	Types of Oscillator	Lecture method, problem solving method		

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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 (%)
SEM VI DECEMBER	**UNIT I** Rutherford's Theory of a Particle Scattering. Properties of Nuclei : Quadrupole Moment and Nuclear Ellipticity. Quadrupole Moment and Nuclear Spin	Properties of Nuclei	PPT, Lecture method, Quiz, problem solving method	Understand nuclear Properties of a nucleus and cosmic rays	*Knowledge Based* - Define parity of the nucleus. -What is impact parameter?	Knowledge--40 Understanding-35 Higher Order-25
JANUARY	Parity and Orbital Angulr Momentum, Parity and Its Conservation. 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 or Directional Effect (3) Altitude Effect	C-osmic Rays	Lecture method, Quiz, problem solving method		*Understanding Based* - Explain latitude effect on the intensity of cosmic rays. -Differentiate between particles and antiparticles by *giving two examples*	

JANUARY	**UNIT II** The Discovery of Nuclear Fission. The Energy Release in Fission. The Fission products. Mass Distribution of Fission Products. Fission Cross Section and Threshold	Nuclear Reactions	Lecture method, PPT, Quiz, problem solving method	Describe nuclear fission, its application in Liquid Drop Model and nuclear reactors	*Higher Order Thinking Skills Based* - Determine the expression of scattering cross-section of α-particles in Rutherfold scattering. - Discuss any one method for detection of cosmic rays.
FEBRUARY	Neutron Emission In Fission, The Prompt Neutron and Delayed Neutrons, Energy of Fission Neutrons,Theory of Nuclear Fission and Liquid Drop Model, 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	Demonstration through examples		
FEBRUARY	**UNIT III** The Sources of Stellar Energy, The Plasma : The Fourth State of The Matter, Fusion Reaction, Energy Balance and Lawson Criterion	Stellar Energy	PPT, Demonstration through examples	Assess fourth state of matter, plasma and classification of elementary particles.	

MARCH	Magnetic Confinement of Plasma, Classical Plasma Losses from the Magnetic Container, Anomalous Losses, Turbulence and Plasma Instabilities. Elementary Particles : Classification of Elementary Particles, Fundamental Interactions, Unified Approch (Basic ideas). The Conservation Laws, Quarks (Basic ideas), Charmed and Colour Quarks.	Elementary Particles	Lecture method, problem solving method			

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