B.Sc. PHYSICS SYLLABUS UNDER CBCS For Mathematics Combinations [2020-21 Batch onwards] II Year B.Sc.-Physics: IV Semester Course-IV: ELECTRICITY, MAGNETISM AND ELECTRONICS Work load:60 hrs per semester 4 hrs/week

UNIT-I 1. Electrostatics: (6hrs) Gauss's law-Statement and its proof, Electric field intensity due to (i) uniformly charged solid sphere and (ii) an infinite conducting sheet of charge, Deduction of Coulomb's law from Gauss law, Electrical potential–Equipotential surfaces, Potential due to a (i) dipole (ii)uniformly charged sphere 2.Dielectrics: (6 hrs) Dielectrics-Polar and Non-polar dielectrics- Effect of electric field on dielectrics,Dielectric strength, Capacitance of a parallel plate condenser with dielectric slab between the plates, Electric displacement D, electric polarization P,Relation between D, E and P, Dielectric constant and electric susceptibility.

UNIT-II 3.Magnetostatics: (6 hrs) Biot-Savart's law and its applications: (i) circular loop and (ii) solenoid, Divergence and curl of magnetic field, Ampere's Circuital Law and its application to Solenoid,Hall effect, determination of Hall coefficient and applications. 4.Electromagnetic Induction: (6 hrs) Faraday's laws of electromagnetic induction, Lenz's law,Self induction and Mutual induction, Self inductance of a long solenoid, Mutual inductance of two coils, Energy stored in magnetic field, Eddy currents and Electromagnetic damping

UNIT-III 5.Alternating currents: (6 hrs) Alternating current - Relation between current and voltage in LR and CR circuits,Phasor and Vector diagrams, LCR series and parallel resonant circuit, Q –factor, Power in ac circuits, Power factor. 6.Electromagnetic waves-Maxwell's equations: (6 hrs) Idea of displacement current,Maxwell's equations-Derivation, Maxwell's wave equation (with derivation), Transverse nature of electromagnetic waves, Poynting theorem (Statement and proof)

UNIT-IV 7. Basic Electronic devices: (12 hrs) PN junction diode, Zenerdiode andLight Emitting Diode (LED) and their I-V characteristics, Zener diode as a regulator- Transistors and its operation, CB, CE and CC configurations, Input and output characteristicsofa transistor in CE mode, Relation between alpha, beta and gamma; Hybrid parameters, Determination of hybrid parameters from transistor characteristics; Transistor as an amplifier.

UNIT-V: 8. Digital Electronics: (12 hrs) Number systems, Conversion of binary to decimal system and vice versa, Binary addition & Binary subtraction (1's and 2's complement methods), Laws of Boolean algebra, DeMorgan's laws-Statements and Proofs, Basic logic gates, NAND and NOR as universal gates, Exclusive-OR gate, Half adder and Full adder circuits.

Practical CourseIV:Electricity, Magnetism and Electronics Work load: 30 hrs 2 hrs/week

Minimum of 6 experiments to be done and recorded

1. Figure of merit of a moving coil galvanometer.

2. LCR circuit series/parallel resonance, Q factor.

3. Determination of ac-frequency –Sonometer.

4. Verification of Kirchoff's laws and Maximum Power Transfer theorem.

5. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.

6. PN Junction Diode Characteristics

7. Zener Diode –V-I Characteristics

8. Zener Diode as a voltage regulator

9. Transistor CE Characteristics- Determination of hybrid parameters

10. Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.

11. Verification of De Morgan's Theorems.

12. Construction of Half adder and Full adders-Verification of truth tables

B.Sc. PHYSICS SYLLABUS UNDER CBCS For Mathematics Combinations [2020-21 Batch onwards] II Year B.Sc.-Physics: IV Semester Course V: MODERN PHYSICS Work load:60hrs per semester 4 hrs/week

UNIT-I : 1. Atomic and Molecular Physics:(12 hrs) Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes, Spectral terms and spectral notations, Selection rules, Intensity rules, Fine structure of Sodium D-lines, Zeeman effect,Experimental arrangement to study Zeeman effect;Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Quantum theory of Raman effect,Applications of Raman effect.

UNIT-II: 2. Matter waves&Uncertainty Principle: (12 hrs) Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter waves, Davisson and Germer's experiment, Phase and group velocities, Heisenberg's uncertainty principle for position and momentum& energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit)and photons(Gamma ray microscope),Bohr's principle of complementarity.

UNIT-III: 3. Quantum (Wave) Mechanics:(12 hrs) Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to (i) one dimensional potential box of infinite height(InfinitePotential Well) and (ii) one dimensional harmonic oscillator

UNIT-IV: 4. Nuclear Physics:(12 hrs) Nuclear Structure:General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces- Yukawa's meson theory; Nuclear Models: Liquid drop model, The Shell model, Magic numbers; Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Solid State detector; Elementary Particles: Elementary Particles and their classification

UNIT-V: 5. Nano materials:(7hrs) Nanomaterials – Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D); Quantum dots, Nano wires, Fullerene, CNT, Graphene(Mention of structures and properties),Distinct properties of nano

materials (Mention-mechanical,optical, electrical, and magnetic properties); Mention of applications of nano materials: (Fuel cells,Phosphors for HD TV, Next Generation Computer chips, elimination of pollutants, sensors) 6. Superconductivity: (5 hrs) Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic field, Meissner effect , Isotope effect,Type I and Type II superconductors, BCS theory (elementary ideas only),Applications of superconductors

Practical Course V:Modern Physics Work load: 30 hrs 2 hrs/week

Minimum of 6 experiments to be done and recorded

1. e/m of an electron by Thomson method.

2. Determination of Planck's Constant (photocell).

3. Verification of inverse square law of light using photovoltaic cell.

4. Determination of the Planck's constant using LEDs of at least 4 different colours.

5. Determination of work function of material of filament of directly heated vacuum diode.

6. Study of absorption of α-rays.

7. Study of absorption of β-rays.

8. Determination of Range of β-particles.

9. Determination of M & H.

10. Analysis of powder X-ray diffraction pattern to determine properties of crystals.

11. Energy gap of a semiconductor using junction diode.

12. Energy gap of a semiconductor using thermistor

13. GM counter characteristics