DEPARTMENT OF PHYSICS

PROGRAMME OUTCOMES: U.G. PHYSICS GENERIC ELECTIVE/ PROGRAMME COURCE

Program Outcomes

PO-1. Get a brief idea about the various fields of physics.

PO-2. Solve the problem and also think methodically, independently and draw a logical conclusion.
PO-3. Employ critical thinking and the scientific knowledge to design, carry out, record and analyze the results of Physics experiments.

PO-4. Create an awareness of the impact of Physics on the society, and development outside the scientific community.

PO-5. To inculcate the scientific temperament in the students and outside the scientific community.

PO-6. Exhibit disciplined work habits as an individual. Programme Specific Outcomes

PSO-1. Gain the knowledge of Physics through theory and practical.

PSO-2. Understand good laboratory practices and safety.

PSO-3. Gain capability of oral and written scientific communication, and will prove that they can think critically and work independently.

PSO-4. Make aware and handle the sophisticated instruments/equipments.

COURSE OUTCOME

Core/GE	**Outcomes** After completion of these courses students will:
T1 – Physics I (4 Credits) Intensity and Loudness	**CO-1.** Know Algebra and vector, vector Calculus and some related theorems. **CO-2**. Clearly understand Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. **CO-3.** Concept about Work and energy. Conservation of energy, Motion of rockets, Torque, Conservation of angular momentum. **CO-4.** Concept about Newton's Law of Gravitation. Motion of a particle in a central force field, Kepler's Laws, Satellite in circular orbit and their application. **CO-5.** Learn about Elastic moduli, work done in stretching twisting couple on a cylinder, Torsional pendulum, Searles method. **CO-6.** Learn about the Postulates of special theory of relativity. Lorentz transformations. Simultaneity and order of events. lorentz contraction. Time dilation, relativistic transformation of velocity, relativistic addition of velocities. **CO-7.** Know about Differential equation of SHM

	and its solutions, Oscillations having equal frequencies, Beats, Lissajous Figures, units of Damped oscillations. Forced vibrations and resonance, musical notes, musical scale. Acoustics of buildings, Sabine's formula **CO-8.** Study on Gauss theorem and its applications, electric dipole, Calculation of electric field from potential. Capacitor, Dielectric medium, Polarisation, Displacement vector, Parallel plate capacitor with Dielectric.
P1 – Physics I Lab (2 Credits) Students can learn how to	**CO-1.** Experimentally determine length (or diameter) using verniercaliper, screw gauge and travelling microscope. **CO-2**. Experimentally determine the Moment of Inertia of a Flywheel. **CO-3.** Experimentally determine the Modulus of Rigidity of a Wire by Maxwell's needle. **CO-4.** Experimentally determine the Elastic Constants of a Wire by Searle's method. **CO-5.** Experimentally determine g by Kater's Pendulum. **CO-6.** Experimentally determine motion of a Spring and calculate (a) Spring Constant, (b) g. **CO-7.** Experimentally investigate the motion of coupled oscillators. **CO-8.** Experimentally study Lissajous Figures. **CO-9.** Experimentally determine the Moment of Inertia of cylindrical body about an axis passing through its centre of gravity. **CO-10.** Experimentally determine the Modulus of Rigidity of a Wire by dynamical method. **CO-11.** Experimentally determine Frequency f vs 1/l curve for a sonometer- wire and hence unknown frequency of a tuning fork.
SEM 2	
T2 – Physics II (4 Credits)	**CO-1.** Understand Biot-Savart's law and its applications, Ampere's circuital law, Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferro- magnetic materials, Faraday's laws of EM induction, Lenz's law, self and mutual inductance. Energy stored in magnetic field. **CO-2.** Know the basic concept of EM wave, Maxwells equation, displacement current, EM energy density. EM wave propagation. **CO-3. Gather c**oncept about Mean free path, Law of equipartion of energy and its applications, Blackbody radiation, Plank's distribution law, Stefan Boltzmann Law and Wien's displacement

	law. **CO-4.** Study on Thermodynamic system, Zeroth Law of TDS and temperature. First law, Applications of First Law, Reversible and irreversible processes, Second law and Entropy, Carnot's cycle & theorem, Unattainability of absolute zero, Cp and Cv and their relation. **CO-6.** Concept about Phase space, Macrostate and Microstate, Entropy and Thermodynamic probability, Maxwell-Boltzmann law Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein distribution law, comparison of three statistics.
P2 – Physics II Lab (2 Credits) After completing the lab students can learn how to	**CO-1.** Experimentally determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.. **CO-2.** Experimentally determine Stefan's Constant. **CO-3.** Experimentally use a Multimeter for measuring, Resistances, AC and DC Voltages, DC Current, Checking electrical fuses. **CO-4.** Experimentally determine the Characteristics of a Series RC Circuit. **CO-5.** Experimentally determine a Low Resistance by Carey Foster's Bridge. **CO-6.** Experimentally verify the Thevenin and Norton theorems . **CO-7.** Experimentally verify the maximum power transfer theorem. **CO-8.** Experimentally study a series LCR circuit. **CO-9.** Experimentally determine the coefficient of linear expansion of the material of a rod using Optical Lever Method.
SEM 3	
T3 – Physics III (4 Credits)	**CO-1.** Learn about Electromagnetic nature of light, wave front, Huygens Principle. **CO-2.** Take concepts on Young's Double Slit experiment, Lloyd's Mirror, Fresnel's Biprism, Stokes' treatment, Fringes of equal inclination , Fringes of equal thickness, Newton's Rings, diffraction- Single slit, Double Slit, Diffraction grating, Half-period zones. Zone plate. **CO-3.** Know about Transverse nature of light waves. Plane polarized light – production and analysis, Circular and elliptical polarization. **CO-4.** Take concepts on amorphous and crystalline Materials, Unit Cell. Miller Indices, Reciprocal Lattice,Bragg's Law. Defraction of X ray by Crysteel **CO-5.** Understand about Heisenberg uncertainty principle,Time dependent Schrodinger equation, Properties of

	Wave Function, Wave Function , Normalization. Linearity and Superposition Principles. Eigenvalues and Eigenfunctions. Position, momentum & Energy operators, Expectation values of position and momentum. Wave Function of a Free Particle. Thermonuclear reaction and nuclear reactor. **CO-6.** Learn about Packing fraction, mass defect, binding energy, systematics of stable nuclei, Radioactivity, Fission and fusion. Mass deficit, relativity and generation of energy; Fission - nature of fragments and emission of neutrons.
P3 – Physics III (2 Credits) After completing the lab students can learn how to	**CO-1.** Experimentally measure angle of prism with spectrometer. **CO-2.** Experimentally determine Resolving Power of a Plane Diffraction Grating. **CO-3.** Experimentally determine wavelength of sodium light using Newton's Rings **CO-4.** Experimentally determine value of Boltzmann constant using V-I characteristic of PN diode. **CO-5.** Experimentally value of Planck's constant using LEDs of at least 4 different colours. **CO-6.** Experimentally Refractive index of water by travelling microscope . **CO-7.** Experimentally determine Refractive index of the material of a lens by lens mirror method . **CO-8.** Experimentally determine Refractive index of the liquid by lens- mirror method. **CO-9.** Experimentally determine Focal length of a convex lens by combination method and calculation of its power.
SEC-T2 Renewable Energy and Energy Harvesting (2 Credits)	**CO-1.** Learn about Fossil fuels and alternate Sources of energy. **CO-2.** Learn about Solar energy and related topics. **CO-3.** Know about Wind Energy and its utility on energy harvesting. **CO-4.** Understand the fact and uses of Ocean Energy. **CO-5.** Take clear understanding about the using of Geothermal energy. **CO-6.** Learn about hydro-energy. **CO-7.** Know about Piezoelectric Energy harvesting. **CO-8.** Discuss about Electromagnetic Energy Harvesting.
SEM 4	
T4 – Physics IV (4 Credits)	**CO-1.** Know about Band Gaps. Conductors, Semiconductors and insulators. P and N type Semiconductors. Conductivity of Semiconductors, mobility, Hall Effect (only statement), Hall coefficient. **CO-2.** Know about PN junction and its properties, current

	flow in PN junction, LEDs, Photodiode, Solar CellBipolar Junction transistors, CB, CE and CC Configurations. Active, Cutoff& Saturation regions, Current gains α and β, DC Load line,Voltage Divider Bias Circuit for CE Amplifier. H-parameter, Equivalent Circuit. Analysis of single- stage CE amplifier using hybrid Model and gain calculations, Class A, B & C Amplifiers. **CO-3.** Know about the Characteristics of an Ideal and Practical Op-Amp, Open-loop and closed- loop Gain. CMRR, concept of Virtual ground. Applications of Op-Amps. **CO-4.** Know about Binary Numbers, AND, OR and NOT gate ,NAND and NOR Gates as Universal Gates. XOR and XNOR Gates, De Morgan's Theorems. Boolean Laws. Simplification of Logic Circuit using Boolean Algebra, Karnaugh Map, Half Adders and Full Adders and Subtractors, 4-bit binary Adder-Subtractor. **CO-5.** Know about Half-wave Rectifiers, Full-wave Rectifiers, Zener Diode and Voltage Regulation, Zener diode, eipplefector etc.
P4 – Physics IV (2 Credits) students can learn how to	**CO-1.** Experimentally verify and design AND, OR, NOT and XOR gates using NAND gates **CO-2.** Experimentally minimize a given logic circuit. **CO-3.** Experimentally study zener diode characteristics and its application as voltage regulator. **CO-4.** Experimentally design an inverting amplifier of given gain using Op- amp 741 and study its frequency response. **CO-5.** Experimentally draw the I-V characteristics of a suitable resistance and that of a junction diode within specified limit on a graph, and hence to find d.c. and a.c. resistance of both the elements at the point of intersection. **CO-6.** Experimentally design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.
SEC-T3 Radiation Safety (2 Credits)	**CO-1**. Know about the Interaction of Radiation with matter and related topics. **CO-2.** Know about radiation detection, detectors and monitoring devices. **CO-3.** Understand about radiation safety management. **CO-4.** Know about application of nuclear techniques.
SEM 5	
DSE-2 Classical Dynamics (6 Credits)	**CO-1:** Understand the applications of Newton's Laws of motion in describing the

	motion of a charged particle in electric and magnetic fields. **CO-2:** Find the importance of Lagrangian and Hamiltonian mechanics, which are the two main branches of analytical mechanics with an emphasis on system energy, rather than on forces and solve various problems using Lagrangian and Hamiltonian formulations. **CO- 3:** Deal with the motion of a particle in a "central force field" . **CO-4.** Acquire knowledge about "small amplitude oscillations". **CO-5:** Study detailed description of "special theory of relativity". **CO-6:** Distinguish streamline and turbulent flows of fluids, derive the equations of motion for incompressible fluid flows, i.e., the Navier- Stokes equations.
SEC-T6 Electrical circuits and network skills (2 Credits)	**CO-1. Know about the** Basic Electricity Principles. **CO-2.** Know about Understanding Electrical Circuits. **CO-3.** Understand about Electrical Drawing and Symbols. **CO-4.** Know about Generators and Transformers. **CO-5.** Know about Electric Motors. **CO-6.** Know about Solid-State Devices. **CO-7.** Know about Electrical Protection. **CO-8.** Know about Electrical Wiring.