GOVT. GEN. DEGREE COLLEGE, CHAPRA

UNDER GRADUATE DEPARTMENT OF PHYSICS

B.Sc. Physics (General) CBCS Syllabus

Programme Specific Outcomes

- After completion of the UG physics course, the students will be able to learn not only the basic knowledge of the subject but also get knowledge in the working of different scientific as well as engineering instruments, which will help the students in their profession in the future . The very basic nature of Physics is to illuminate a student in the development of analytical mind, who never believes in anything without logic.

- PSO 1: The outcome lies in the daily life of human being. Here a person learns basic principles of the properties of matter and relationship between different principles. To know this the students are exposed to mathematical and analytical physics. The basic properties of matter are unveiled to them in the name of mechanics, general properties of matter, sound, optics etc.

- PSO 2: This activates the students to perform experiments in mechanics, general properties of matter, optics, electronics etc and compare the values with theoretical results.

- PSO 3: This course is designed in such a way that students can learn different Laboratory Experiments on each theoretical concept which may help to built a clear concept on the subject. Students can also learn about varies application based topic such as Workshop skill, Weather, Forecasting, Radiation Hazards etc.

- PSO 4: Students are also motivated to equip themselves for facing competitive examinations.

GOVT. GEN. DEGREE COLLEGE, CHAPRA

Course Outcome or Learning Outcome
Three year B.Sc. degree course
Under CBCS semester system
GENERAL COURSE IN PHYSICS

Course Code: PHY-G-CC-T-01 & PHY-G-CC-P-01
Semester : Sem I
Topic Name : Mechanics and LAB

Course Outcome: After successful completion of this course students should be able to learn about:

- Vector operations,
- Fundamentals of Dynamics: Reference frames. Inertial frames; Galilean transformations; Galilean invariance.
- Conservation of momentum; Work and energy: Work and kinetic theorem. Conservative and non conservative forces. Potential Energy. Energy diagram. Stable and unstable equilibrium. Motion of Rockets
- Collisions: Elastic and inelastic collisions between article particles. Centre of Mass and Laboratory frame
- Rotational Dynamics: Angular momentum of a particle and system of particles. Torque. Principle conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia .
- Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or wire
- Simple harmonic motion. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, Sharpness of resonance , Power dissipation and Quality factor .
- Coriolis force and its applications. Components of velocity and accelerations in cylindrical and spherical coordinate systems.
- Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations.

➢ **After going through the practical course, the students should be able**

- To Measure of length (or diameter) using vernier caliper, screw gauge and travelling microscope.
- To study the random error in observations.
- To determine the Modulus of Rigidity of a wire.
- To determine the Moment of Inertia of a rigid body.
- Modulus of the material of a bar by flexure method .

- To determine the value of g using Bar Pendulum.
- To determine the value of g using Kater's Pendulum
- To determine the height of a building using a Sextant.

Course Code: PHY-G-CC-T-02 & PHY-G-CC-P-02
Semester : Sem II
Topic Name : Electricity and Magnetism & LAB

Course Outcome: After completion of this course student should be able to learn:

- Electrostatic field, Electric flux, Gauss's theorem, and its applications in electrostatics, Electric potential due to an electric dipole, Capacitance of an isolated spherical conductor, Parallel plate condenser etc.
- Magnetic force between current elements and definition of Magnetic Field B.
- Biot-Savart's Law and its applications, Ampere circuital law, Magnetic properties of materials etc.
- Faraday's law of electromagnetic induction, Lenz's law, Self and mutual inductance, L of single coil, M of two coils, Energy stored in magnetic field.
- Maxwell's equations, Poynting's vector, Electromagnetic wave (em) propagation through vacuum, Transverse nature of em waves, Polarization etc.

➢ **In laboratory, the students able to**

- Measure the resistance, capacitance, current and voltage by using a multimeter. They also understand the series /Parallel connections of ammeter/ voltmeter and their applications to measure the currents/voltages.
- Study the characteristics of a series RC Circuit.
- Determine an unknown Low Resistance using Potentiometer.
- Determine an unknown Low Resistance using Carey Foster's Bridge.
- Verify the Thevenin and Norton theorems.
- Verify the Superposition, and Maximum power transfer theorems.

Course Code: **PHY-G-CC-T-03 & PHY-G-CC-P-03**

Semester : **Sem III**

Topic Name : **Thermal Physics and Statistical Mechanics & LAB**

Course Outcome: **After completion of this course student should be able to learn:**

- Different thermo dynamical processes, Zeroth law of thermodynamics and temperature, The application of first and second law of thermodynamics, Entropy of a system, Carnot's cycle.
- Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations and applications - Joule-Thompson Effect
- Derivation of Maxwell's law of distribution of velocities and its application to find out the average ,R.M.S. (Root mean squar velocity) and most probable velocity, Mean free path (Zeroth Order), Different transport Phenomena: Viscosity, Conduction and Diffusion
- Blackbody radiation, Spectral distribution, Concept of Energy density, Derivation of Planck's law , Wien's distribution law, Rayleigh-Jeans law, Stefan Boltzmann law and Wien's displacement law etc.
- Maxwell-Boltzmann law - distribution of velocity – Quantum statistics - Phase space - Fermi-Dirac distribution law , Bose-Einstein distribution law, Comparison of three statistics.

➢ **In laboratory, the students able to**

- Determine Mechanical Equivalent of Heat, J, by Callender and Barne's constant flow method.
- Measurement of Planck's constant using black body radiation.
- Determine Stefan's Constant.
- Determine the coefficient of thermal conductivity of Cu by Searle's Apparatus.
- Determine the coefficient of thermal conductivity of a bad conductor by Lee and Charlton's disc method.
- Determine the temperature co-efficient of resistance by Platinum resistance thermometer.
- Study the variation of thermo e.m.f across two junctions of a thermocouple with
  temperature.

Course Code: PHY-G-CC-T-04 & PHY-G-CC-P-04
Semester : Sem IV
Topic Name : Waves and Optics & LAB

Course Outcome: After completion of this course student should be able to learn:

- Superposition of two collinear and perpendicular harmonic oscillations, Lissajous figures with equal an unequal frequency and their uses, Transverse waves on a string, Traveling and standing waves on a string, Also learn force vibrations and resonance, Intensity and loudness of sound, Musical notes.
- The properties of surface tension and viscosity of liquid.
- Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation.
- Velocity of Transverse Vibrations of Stretched Strings. Newton's Formula for Velocity of Sound. Laplace's Correction .
- Standing (Stationary) Waves in a String: Fixed and Free Ends. Analytical Treatment. Phase and Group Velocities. Changes with respect to Position and Time. Energy of Vibrating String. Transfer of Energy. Normal Modes of Stretched Strings. Plucked and Struck Strings .
- Electromagnetic nature of light. Definition and properties of wave front. Huygens Principle. Temporal and Spatial Coherence.
- Interference (Fresnel's biprism, Phase change on reflection: Stokes' treatment, Interference in thin films, Newton's rings).
- The basic application of Michelson's interferometer(determine the wavelength, wavelength difference etc.)
- Diffraction of light (half-period zones, Zone plate, Single and double slits, Plane transmission grating)
- Polarization of light(Transverse nature of light waves, Plane polarized light-Production and analysis, Circular and elliptical polarization)

➢ **After going through the practical course, the students should able be to**

- Draw the frequency-resonance length curve of a sonometer wire and to determine an unknown frequency of a tuning fork.
- Determine the coefficient of Viscosity of water by any method.
- Determine the refractive index of the Material of a prism using Sodium light.
- Determine the wavelength of sodium light using Newton's Rings.
- Determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
- Determine dispersive power and resolving power of a plane diffraction grating.
- Draw the deviation - wavelength of the material of a prism and to find the wavelength of an unknown line from its deviation.

Course Code: PHY-G-DSE-T-01 & PHY-G-DSE-P-01
Semester : Sem V
Topic Name : Digital, Analog circuits and Instrumentation & LAB

Course Outcome: After successful completion of this course, students should be able to learn:

- Binary to decimal conversion and vice versa, Addition, Substraction, Multiplications and division of binary numbers, OR, AND, NOT, NAND, XOR, XNOR gates, Application of De morgan's theorems, half and full adders/subtractors.
- Semiconductor Diodes: P and N type semiconductors. Barrier Formation in PN Junction Diode. Qualitative Idea of Current Flow Mechanism in Forward and Reverse Biased Diode .
- Bipolar Junction transistors: n-p-n and p-n-p Transistors. Characteristics of CB, CE and CC Configurations. Current gains α and β.
- Characteristics of an Ideal and Practical Op-Amp (IC 741), Open-loop and closed- loop Gain .
- Barkhausen's Criterion for Self-sustained Oscillations. Determination of Frequency of RC Oscillator
- Introduction to CRO: Block Diagram of CRO
- Power Supply: Half-wave Rectifiers. Centre-tapped and Bridge Full-wave Rectifiers Calculation of Ripple Factor and Rectification Efficiency, Basic idea about capacitor filter,
- Timer IC: IC 555 Pin diagram and its application as Astable and Monostable Multivibrator.

➢ **After going through the practical course, the students should be able**

- To measure (a) Voltage, and (b) Frequency of a periodic waveform using CRO .
- To verify and design AND, OR, NOT and XOR gates using NAND gates.
- To minimize a given logic circuit.
- Half adder, Full adder and 4-bit Binary Adder.
- Adder-Sub tractor using Full Adder I.C.
- To design an astable multivibrator of given specifications using 555 Timer.
- To design a monostable multivibrator of given specifications using 555 Timer.
- To study IV characteristics of PN diode, Zener and Light emitting diode
- To study the characteristics of a Transistor in CE configuration.
- To design a CE amplifier of given gain (mid-gain) using voltage divider bias.

- To design an inverting amplifier of given gain using Op-amp 741 and study its frequency response.

Course Code: PHY-G-DSE-T-02 & PHY-G-DSE-P-02
Semester : Sem VI
Topic Name : Solid State Physics & LAB

Course Outcome: After successful completion of this course, students should be able to learn:

- Classification of solid materials into Crystal and Amorphous; their difference in aspect of structure electrical , optical etc.
- Elementary Lattice Dynamics: Lattice Vibrations and Phonons. Qualitative description of the phonon in solids.
- Magnetic Properties of Matter: Dia-, Para-, Ferri- and Ferromagnetic Materials.
- Dielectric Properties of Materials: Polarization. Local Electric Field at an Atom.
- Ferroelectric Properties of Materials: Structural phase transition
- Elementary band theory: Kronig Penny model. Band Gap
- Superconductivity: Experimental Results. Critical Temperature

➢ **After going through the practical course, the students should be able**
- To determine the Coupling Coefficient of a Piezoelectric crystal.
- To measure the Dielectric Constant of a dielectric Materials with frequency
- To determine the refractive index of a dielectric layer using SPR
- To draw the BH curve of Fe using Solenoid & determine energy loss from Hysteresis.
- To measure the resistivity of a semiconductor (Ge) with temperature by four- probe method (room temperature to 150 °C) and to determine its band gap.

❖ SKILL ENHANCEMENT COURSE

Course Code: **PHY-G-SEC-T-01**
Topic Name : **Renewable Energy and Energy Harvesting**

Course Outcome: After successful completion of this course, students should be able to

1.Understand the importance of non conventional energy sources.
2. Understand basic aspects of solar energy.
3. Understand basic principles of wind energy conversion.
4. Understand the basic ideas of geothermal energy and oceans energy resources and recognize their merits and demerits.

Course Code: **PHY-G-SEC-T-02**
Topic Name : **Weather Forecasting**

Course Outcome: After successful completion of this course, students should be able to

1. Understand the causes and effects of different weather phenomenon.
2. Learn about the basic forecasting techniques.

Course Code: **PHY-G-SEC-T-03**
Topic Name : **Electrical circuits and Network skills**

Course Outcome: After successful completion of this course, students should be able to

1. Develop skills to design the electrical circuits, networks and appliances through hands-on mode.
2. Gain practical experience of troubleshooting the electrical circuits, networks and appliances.

Course Code: **PHY-G-SEC-T-04**
Topic Name : **Basic Instrumentation skills**

Course Outcome: After successful completion of this course, students should be able to

1. Get exposure with various aspects of instruments and their usage through hands-on mode.
2. Learn to use of CRO as a versatile measuring device.
3. Learn to use of Digital multimeter.