कार्यालय प्राचार्य
स्व. डारन बाई तारम शासकीय महाविद्यालय गुरूर
जिला – बालोद, छ.ग, भारत
(हेमचंद यादव विश्वविद्यालय दुर्ग, छत्तीसगढ़, भारत से संबद्ध)
Ph No : 07749 – 265461 Email : gururgovernmentcollege@gmail.com Website : gcgurur.org.in

Department of Physics

Course Learning Outcomes of Physics in B. Sc (PCM)

From Session 2023 – 24

Program Level	Program Name	Class	Subject	Paper	Paper Name
U.G. (Certificate)	B.Sc. (PCM)	01st Year	Physics	01st	Mechanics
Total Marks: 50		Minimum Passing Marks: 17			Credit Value: Theory 04

Course learning outcome

CLO 01	Get knowledge about the vectors and differential equations used in physics.
CLO 02	Get an idea of different types of motions and conservation laws.
CLO 03	Get an idea about rotational motion and various properties of matter like elasticity and viscosity.
CLO 04	Understand various types of oscillatory motion and GPS system.
CLO 05	Get an idea about Frame of reference and special theory of relativity.
CLO 06	Solve numerical problems based on entire syllabus.

Broad contents of the course	Skills to be learned
• Vector and Differential equations • Fundamental of Dynamics • Collisions • Rotational Dynamics • Elasticity • Fluid Motion • Gravitation • Oscillation • Inertial and Non-inertial Systems • Relativity	• Learn to use of vector and differential equations in physics. • Learn basics of the kinematics and dynamics linear and rotational motion. • Learn the concepts of elastic in constant of solids and viscosity of fluids. • Develop skills to understand and solve the equations of Newtonian Gravity and central force problem. • Acquire basic knowledge of oscillation.

Program Level	Program Name	Class	Subject	Paper	Paper Name
U.G. (Certificate)	B.Sc. (PCM)	01st Year	Physics	02nd	Electricity and Magnetism
Total Marks: 50		Minimum Passing Marks: 17			Credit Value: Theory 04

Course learning outcome

CLO 01	Get knowledge about the vectors analysis and able to apply in electrostatic and Magnetostatics.
CLO 02	Get idea about electric fields, force and potential.
CLO 03	Get idea about Dielectric and Electric currents and also the application in AC circuits.
CLO 04	Get idea about Magnetic properties of material.
CLO 05	Get idea about Electromagnetic induction and Maxwell's equations and Electromagnetic wave propagation.
CLO 06	Solve numerical problems based on entire syllabus.

Broad contents of the course

- Vector Analysis
- Electric Field and Electric Potential
- Conservative nature of Electrostatic Field
- Electrostatic energy of system of charges
- Dielectric Properties of Matter
- Magnetic Field
- Magnetic Properties of Matter
- Electromagnetic Induction
- Electrical Circuits

Skills to be learned

- This course will help in understanding basic concepts of electricity and magnetism and their applications.
- Basic course in electrostatics will equips the student with required prerequisites to understand electrodynamics phenomena.

Program Level	Program Name	Class	Subject	Paper	Paper Name
U.G.	B.Sc. (PCM)	02nd Year	Physics	01st	Thermodynamics, Kinetic Theory and Statistical Physics

Course learning outcome

CO 01	Comprehend the basic concepts of thermodynamics, the first and the second law of thermodynamics, the concept of entropy and the associated theorems, the thermodynamic potentials and their physical interpretations.
CO 02	Learn about Maxwell's thermodynamic relations.
CO 03	Learn the basic aspects of kinetic theory of gases, Maxwell–Boltzmann distribution law, equitation of energies, and mean free path of molecular collisions, viscosity, thermal conductivity, diffusion and Brownian motion.
CO 04	Learn about the real gas equations, Vander Waal equation of state, and the Joule–Thompson effect.
CO 05	In the laboratory course, the students are expected to do some basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity, temperature coefficient of resistant, variation of thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.

Broad contents of the course:

- Zeroth and First Law of Thermodynamics
- Second Law of Thermodynamics
- Entropy
- Thermodynamic Potentials
- Maxwell's Thermodynamic Relations
- Kinetic Theory of Gases :
  - Distribution of Velocities
  - Molecular Collisions
  - Real Gases

Skills to be learned:

- This basic course in thermodynamics will enable the student to understand various thermo dynamical concepts, principles.

Program Level	Program Name	Class	Subject	Paper	Paper Name
U.G.	B.Sc. (PCM)	02nd Year	Physics	02nd	Waves, Acoustics and Optics

Course learning outcome

CO 01	Recognize and use a mathematical oscillator equation and wave equation, and derive these equations for certain systems.
CO 02	Apply basic knowledge of principles and theories about the behaviour of light and the physical environment to conduct experiments.
CO 03	Understand the principle of superposition of waves, so thus describe the formation of standing waves.
CO 04	Use the principles of wave motion and superposition to explain the Physics of polarization, interference and diffraction.
CO 05	Understand the working of selected optical instruments like bi-prism, interferometer, diffraction grating, and holograms.
CO 06	In the laboratory course, student will gain hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Bi-prism etc. Resolving power of optical equipment can be learnt firsthand.
CO 07	The motion of coupled oscillators, study of Lissajous figures and behaviour of transverse, longitudinal waves can be learnt in this laboratory course.
CO 08	Understand the spontaneous and stimulated emission of radiation, optical pumping and population inversion. Three level and four level lasers. Ruby laser and He-Ne laser in details. Basic lasing.
CO 09	Measurement of Planck's constant by more than one method.
CO 10	Verification of the photoelectric effect and determination of the work Function of a metal.
CO 11	Determination of the charge of electron and e/m of electron.
CO 12	Determination of the ionization potential of atoms.
CO 13	Determine the wavelength of the emission lines in the spectrum of Hydrogen atom.

Broad contents of the course:

- Superposition of Two Collinear Harmonic Oscillations
- Superposition of Two Perpendicular Harmonic Oscillations
- Lissajous figures
- Waves Motion – General and Velocity
- Superposition of Two Harmonics Waves
- Wave Optics
- Interference and Michelson's Interferometer
- Diffraction
- Fraunhofer and Fresnel Diffraction
- Introduction to Lasers and Holography

Skills to be learned:

- He / she shall develop an understanding of various aspects of harmonic oscillations and waves specially.
  (i) Superposition of collinear and perpendicular harmonic oscillations.
  (ii) Various types of mechanical waves and their superposition.
- This course in basics of optics will enable the student to understand various optical phenomena, principles, workings and applications optical instruments.
- Learn to apply basic quantum physics to Ruby Laser, He-Ne Laser

Program Level	Program Name	Class	Subject	Paper	Paper Name
U.G.	B.Sc. (PCM)	03rd Year	Physics	01st	Relativity, Quantum Mechanics, Atomic Molecular and Nuclear Physics

Course learning outcome

CO01	Describe special relativistic effects and their effects on the mass and energy of a moving object.
CO02	Appreciate the nuances of Special Theory of Relativity (STR)
CO03	Understand historical development of quantum mechanics and ability to discuss and interpret experiments that reveal the dual nature of matter.
CO04	Understand the theory of quantum measurements, wave packets and uncertainty principle.
CO05	Understand the central concepts of quantum mechanics: wave functions, momentum and energy operator, the Schrodinger equation, time dependent and time independent cases, probability density and the normalization techniques, skill development on problem solving e.g. one dimensional rigid box, tunneling through potential barrier, step potential, rectangular barrier.
CO06	Understanding the properties of nuclei like density, size, binding energy, nuclear forces and structure of atomic nucleus, liquid drop model and nuclear shell model and mass formula.
CO07	Ability to calculate the decay rates and lifetime of radioactive decays like alpha, beta, gamma decay. Neutrinos and its properties and role in theory of beta decay.
CO08	Understand fission and fusion well as nuclear processes to produce nuclear energy in nuclear reactor and stellar energy in stars.
CO09	Understand various interactions of electromagnetic radiation with matter. Electron positron pair creation.
CO10	Verification of the law of the Radioactive decays and determines the mean life time of a Radioactive Sources, Study the absorption of the electrons from Beta decay. Study of the electron spectrum in Radioactive Beta decays of nuclei.

Broad contents of the course

- Special Theory of Relativity
- One dimensional potential problem of bound states and scattering.
- Elementary introduction of nuclear physics with emphasis on
  - (i) Nuclear Structure
  - (ii) Nuclear Forces
  - (iii) Nuclear Decays
  - (iv) Fission and Fusion

Skills to be learned

- Learn about inertial and non-inertial systems and essentials of special theory of relativity.
- Comprehend the failure of classical physics and need for quantum physics.
- Grasp the basic foundation of various experiments establishing the quantum physics by doing the experiments in laboratory and interpreting them.
- Formulate the basic theoretical problems in one, two and three dimensional physics and solve them.

Program Level	Program Name	Class	Subject	Paper	Paper Name
U.G.	B.Sc. (PCM)	03rd Year	Physics	02nd	Solid State Physics, Solid State Devices and Electronics

Course learning outcome

CO 01	A brief idea about crystalline and amorphous substances, about lattice, unit cell, miller indices, reciprocal lattice, concept of Brillouin zones and diffraction of X-rays by crystalline materials.
CO 02	Knowledge of lattice vibrations, phonons and in depth of knowledge of Einstein and Debye theory of specific heat of solids.
CO 03	At knowledge of different types of magnetism from diamagnetism to ferromagnetism and hysteresis loops and energy loss.
CO 04	Secured an understanding about the dielectric and ferroelectric properties of materials.
CO 05	Understanding above the band theory of solids and must be able to differentiate insulators, conductors and semiconductors.
CO 06	Understand the basic idea about superconductors and their classifications.
CO 07	To carry out experiments based on the theory that they have learned to measure the magnetic susceptibility, dielectric constant, trace hysteresis loop. They will also employ to four probe methods to measure electrical conductivity and the hall set up to determine the hall coefficient of a semiconductor.
CO 08	Understand the basic of electronics like semiconductors and its properties and types, Diodes, Transistors and its different configurations, FET, Rectifier and its types, Amplifier and Oscillators.
CO 09	Understand the idea of basic digital electronics like Number Systems used in Digital electronics, Boolean Algebra, Logic Gates and its properties, Generate Various Gates.

Broad contents of the course:

- Crystalline and amorphous substances, lattice, unit cell, miller indices, reciprocal lattice. Brillouin zones and diffraction of X-rays by crystalline materials.
- Lattice vibrations and phonons
- Different types of magnetism
- Dielectric and ferroelectric materials.
- Band theory of solids
- Insulators, conductors and semiconductors.
- Superconductors and their classifications.
- Semiconductors and their Classifications
- Diodes, Transistors, Amplifiers, Filters, Oscillators and Gates

Skills to be learned:

- Learn basics of crystal structure and physics of lattice dynamics.
- Learn the physics of different types of material like magnetic materials, dielectric materials, metals and their properties.
- Understand the physics of insulators, semiconductor and conductors with special emphasis on the elementary band theory of semiconductors.
- Comprehend the basic theory of superconductors.
- Understand the Basics of Electronics devises.
- Understand the Basics of Digital Electronics.

====

H. O. D.
Department of Mathematic
Government College Gurur
Dist. Balod (C.G.)

Co-ordinator
IQAC
Government College Gurur
Dist. Balod (C.G.)

Principal
Govt. College, Gurur
Dist. - Balod (C.G.)