DEPARTMENT OF PHYSICS
Government Degree College, Nagari
Outcomes of UG Course, B. Sc. in Physics
At the completion of B. Sc. in Physics students are able to:

➢ Demonstrate a rigorous understanding of the core theories & principles of physics, which includes mechanics, electromagnetism, thermodynamics, & quantum mechanics.

➢ Learn the Concepts as Quantum Mechanics, Relativity, introduced at degree level in order to understand nature at atomic levels.

➢ Provide knowledge about material properties and its application for developing technology to ease the problems related to the society.

➢ Understand the set of physical laws, describing the motion of bodies, under the influence of system of forces.

➢ Understand the relationship between particles & atom, as well as their creation & decay.

➢ Relate the structure of atoms & subatomic particles.

➢ Understand physical properties of molecule the chemical bonds between atom as well as molecular dynamics.

➢ Analyze the applications of mathematics to the problems in physics & develop suitable mathematical method for such application & for formulation of physical theories.

➢ Learn the structure of solid materials & their different physical properties along with metallurgy, cryogenics, electronics, & material science.

Understand the fundamental theory of nature at small scale & levels of atom & sub-atomic particles.

Course Objectives and Outcomes (Even Semester)

Sl. No.	Course Code	Course Name	Objectives	Outcomes
1	Course-V	**Modern Physics**	Develop an understanding on the concepts of Atomic and Modern Physics, basic elementary Quantum Mechanics and Nuclear Physics.	To learn about Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg's law, experimental techniques, Laue's method and powder diffraction method.
			Develop critical understanding of concept of Matter Waves and Uncertainty Principle.	To understand how the Planck's constant can be determined using Photocell and LEDs.
			Get familiarized with the principles of quantum mechanics and the formulation of Schrodinger wave equation and its applications.	To determine the Energy gap of a semiconductor using thermistor and junction diode.
			Examine the basic properties of nuclei, characteristics of Nuclear forces, salient features of Nuclear models and different nuclear radiation detectors	To get familiarized with the Nano materials, their unique properties and applications.
			Classify Elementary particles based on their mass, charge, spin, half-life and interaction.	To increase the awareness and appreciation of superconductors and their practical applications.
2.	Course-IV	**Electricity, Magnetism and Electronics**	To understand the concepts of electric field and electric potential due to point charge.	To understand Biot and Savart's law and Ampere's circuital law to describe and explain the generation of magnetic fields by electrical currents.
			To know Digital Electronics Concepts, Number systems - Conversion of binary to decimal system and vice versa. Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate,	To understand the operation of basic logic gates and universal gates and their truth tables.
			Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder, Parallel adder circuits.	To describe the operation of p-n junction diodes, Zener diodes, light emitting diodes and transistors
			To develop an understanding on the unification of electric and magnetic fields and Maxwell's equations governing electromagnetic waves.	To understand the operation of basic logic gates and universal gates and their truth tables.
			To understand the phenomenon of resonance in LCR AC-circuits, sharpness of resonance, Q-factor, Power factor and the comparative study of	To distinguish between the magnetic effect of electric current and electromagnetic induction and apply the related laws in appropriate

			series and parallel resonant circuits	circumstances.
3.	Course - VI	**Material Science**	To know the different types of materials.	To learn about Materials and Crystal Bonding: Materials, Classification, Crystalline, Amorphous, Glasses; Metals, Alloys, Semiconductors, Polymers, Ceramics, Plastics, Bio-materials, Composites, Bulk and nanomaterials. Review of atomic structure – Interatomic forces – Different types of chemical bonds – Ionic covalent bond or homopolar bond – Metallic bond – Dispersion bond – Dipole bond – Hydrogen bond – Binding energy of a crystal.
			Defects in the materials.	To learn about Defects and Diffusion in Materials: Introduction – Types of defects - Point defects- Line defects- Surface defects- Volume defects- Production and removal of defects- Deformation- irradiation- quenching- annealing-recovery - recrystallization and grain growth. Diffusion in solids- Fick's laws of diffusion.
			To identify the Mechanical behaviour of materials.	To learn about Mechanical Behavior of Materials: Different mechanical properties of engineering materials – Creep – Fracture – Technological Properties – Factors affecting mechanical properties of a material – Heat treatment - Cold and hot working – Types of mechanical tests – Metal forming process – Powder — Deformation of metals.
			To identify the different types of magnetic materials.	To learn about Magnetic Materials: Dia-, Para-, Ferri and Ferromagnetic materials, Classical Langevin theory of dia magnetism, Quantum mechanical treatment of Paramagnetism. Curie's law, Weiss's theory of ferromagnetism, Ferromagnetic domains. Discussion of B-H Curve. Hysteresis and energy Loss.

| | | | To investigate the dielectric constant. | To learn about Dielectric Materials: Dielectric constant, dielectric strength and dielectric loss, polarizability, types of dielectric materials, applications; ferroelectric, piezoelectric and pyroelectric materials. |

Course Objectives and Outcomes (Odd Semester)

Sl. No.	Course Code	Course Name	Objectives	Outcomes
1	1-1-126 R20	**Mechanics, Waves and Oscillations**	*To understand Newton's laws of motion and motion of variable mass system and its application to rocket motion and the concepts of impact parameter, scattering cross section.*	1. To gain knowledge on motion of variable mass system, Collisions in two and three dimensions, Rutherford scattering problem. 2. To understand the concepts of rotational kinematics of rigid body, Moment of inertia tensor, Euler equations, Precision of top, equinoxes and Gyroscope.
			To apply the rotational kinematic relations, the principle and working of gyroscope and its applications and the precessional motion of a freely rotating symmetric top.	To gain understanding on conservative forces, equation of motion under central forces, Keppler's laws. To know about GPS (global positioning system).
			To comprehend the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.	Also learn about Galelian-Lorentz frames of references, Lorentz transformations, Michelson-Morley experiment, Postulates of special theory of relativity, length contraction, time delation, addition of masses, mass energy relation and 4 vector notation.
			To understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence. *between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic Oscillator Appreciate the formulation of the problem of coupled*	1. To learn about physical properties of Simple Harmonic Motion (SHM), Torsional pendulum, Compound pendulum and their applications, Lissajous figures. 2. To be able to solve the diffreential equations for forced harmonic oscillator and damped harmonic oscillator and compare the results with simple harmonic oscillator.

			oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.	Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.
			Understand postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence. Examine phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator. Appreciate the formulation of the problem of coupled oscillations and solve them to obtain normal modes of oscillation and their frequencies in simple mechanical systems.	. *Figure out the formation of harmonics and overtones in a stretched string* To learn about basics of ultrasonics, production detection of ultrasonics, measurement of frequency and velocity of ultrasonics and the applications of ultrasonics.
2	3-2-116	**WAVE OPTICS**		To understand the principle of superposition, coherence, Interference by division of wave front and amplitude, Fresnel's bi-prism, thin film interference, wedge shaped film interference, Newton's rings, Michelson's interferometer and their applications to sodium D lines and thickness of thin film.
				To learn about Fresnel and Fraunhoffer diffraction, Fraunhofferdiffrraction due to single slit, double slit, N-slit, grating. They would also learn about Fresnel's half period zones, zone plate, phase reversal zone plates, comparison of zone plate & convex lens, interference & diffraction.
				To learn about methods of polarization, Brewster's law, Malus law, Nicol prism, Quarter wave plate, half wave plate, babinet's compensator and optical activity analysis by Laurent's half shade polarimeter.

				To understand the principles of optical fiber communication, classification of optical fibers, applications of optical fiers.
				To learn about principles of LASER, Einstein coefficients, He-Ne laser, Ruby laser, applications of laser, principles of holography, limitations of Gabor's hologram and applications of holography.
3.	3-3-116	**HEAT AND THERMODYNAMICS**	It is the study of the study of energy relationships involving heat, mechanical energy and other forms of energy.	To *Understand the basic aspects of kinetic theory of gases, Maxwell- Boltzman distribution law, equip partition of energies, mean free path of molecular collisions and the transport phenomenon in ideal gases.*
			It originates attempts to improve the efficiency of the steam engine.	*To Gain knowledge on the basic concepts of thermodynamics, the first and the second law of thermodynamics, the basic principles of refrigeration ,the concept of entropy, the thermodynamic potentials and their physical interpretations.*
			It deals with many other aspects other than the theory of the steam engine.	*To Understand the working of Carnot's ideal heat engine, Carnot cycle and its efficiency.*
			To d*ifferentiate between principles and methods to produce low temperature and liquefy air and also understand the practical applications of substances at low temperatures*	*To develop critical understanding of concept of Thermodynamic potentials, the formulation of Maxwell's equations and its applications.*
			To know the how to estimate surface temperature of Sun.	*To examine the nature of black body radiations and the basic theories.*