Vision: To build up the foundation for excellence and encourage the development of student by inculcating curiosity and interest in study of physics.

Mission:

- Awaken the young mindsand discover their talent in experimental physics.
- Explore the student with different techniques through different projects.
- Create the awareness in the student for living better life and contribution towards the society.

About Department:

The Department of physics was established in 2009 at non grant basis. The Department of was granted at 2014. The Department has two highly qualified and dedicated faculty members. Both faculty members are doctorate. Department offers courses for undergraduate student. The faculties are actively engaged in research activity. Some of the research areas of interest nontechnology and biophysics. Student visit at university and college level for their holistic development also Department has MoU with different colleges. The Student association Department has " Elixir" activities association provides unique platform for all the students for their innovative ideas and actively like seminar, debate, drawing, poster , life green class activity to create the awareness among the students for social responsibilities to the society.

Importance of Physics

Physics is a fascinating subject to study at college level, for a wide variety of reasons and it is also an important element in the education of chemists, engineers and computer scientists, as well as practitioners of the other physical and biomedical sciences. Physics builds the fundamental knowledge needed for the future technological advances, develops problem solving skills in students and provides more job opportunities in various fields. Its aim is to understand the fundamental principles that describe and govern all physical aspects of the universe. Physicists investigate by means of controlled experimentation and mathematical analysis. Physics includes the study of systems ranging from sub-atomic particles to the largest galaxies. It plays an important role in many of the liberal arts disciplines and contributes to society's development. Recognizing the importance of physics in contemporary life and the need to keep abreast of rapid technological advances, the department strives to give students not only an understanding of basic concepts, but also insights into recent developments.. It also provides flexibility, serving as a stepping stone to advanced work in related areas such as astronomy, engineering, materials science, atmospheric science and meteorology, oceanography, biophysics, environmental science and the medical and health-related fields.

Course outcomes:

B. Sc. I SEM I

At the end of the course students will be able,

1. To gain the basic knowledge about gravity of earth and to visualize planetary motion in universe

2. To understand mechanical properties of rigid body and its application in daily life

3. To learn the fundamentals of harmonic oscillator model including damped and forced oscillator

4. To acquire the knowledge of simple harmonic motion same frequency by using phenomenon of interference and superposition through geometrical construction using Lissagous figures

5. To learn the various mechanical parameters and phenomenon of elasticity and to solve the numerical

6. To gain daily routine application through fluid dynamics by using various phenomenon Bernoulli's poiseulles

B. Sc. I SEM II

At the end of the course students will be able

1. To understand atmospheric gases molecules under the basic conceptual of heat energy of system and surrounding with various laws and interpretation

2. To apply the laws of Thermodynamics and its phase diagram in daily routine application

3. To learn cooling and heating effect of daily routine applications

4. To gain the knowledge of electromagnetic waves this is used in various Spectroscopy

5. To apply electronics concept to prepare various electronic appliances

6. To use the electricity in daily application through ac current

B. Sc. II SEM III

At the end of course students will be able

1. To solve the mathematical methods Physicists often used including differential calculus, operators and integral calculus

2. To learn Maxwell equations and wave equations satisfied by electric and magnetic field
3. To understand the electrical conductivity in semiconductor materials and its electrical behavior
4. To acquire the knowledge of semiconductor device which is act as a back -bone of electronic device
5. To understand the concept any motion of an object can achieve the speed of light then possible event such as length is relative, time is relative, mass is relative
6. To learn basic fundamental of atmosphere and its natural phenomenon and event

B. Sc. II SEM IV

1. To understand the basic fundamental of optics and superposition of two waves
2. To learn the concept of bending of light
3. To understand the vertical constraint on electromagnetic wave of radiation
4. To acquire the information of single color wavelength monochromatic wave of Light
5. To learn the communication through fiber optics
6. To the understand the freely available source of energy

B. Sc. II SEM V

At the end of the course students will be able,

1. To become familiar with black body radiation, photoelectric effect and Compton effect

2. To acquire the knowledge about wave properties of particles and find the solution of Schrondingers equation

3. To gain the knowledge about vector atom model, X-ray

4. To understand the clear picture of nuclear composition and various nuclear model and gain deep knowledge about radioactivity, nuclear fission and fusion

5. To acquire the knowledge of hybrid parameter and general principle of amplifier and their application

6. To apply the knowledge to make amplifier, oscillator and multivibrators

B. Sc. II SEM VI

At the end of the course students will be able,

1. To understand microstates and macro states of matter and to get the idea about Maxwell Boltzmann statics

2. To familiar about statically distribution and have a basic ideas about Bose Einstein and Fermi Dirac distribution and their application

3. To understand the crystal structure and clear understanding about X-ray diffraction and defects in crystal

4. To understand the Electrical properties of material and band structure

5. To study the Magnetic properties of material

6. To acquire the knowledge of superconductivity and nanotechnology and its application in modern world

Program Specific Outcome (PSOs)

1. To understand, adapted, create a learning environment and realize to students for core basic fundamental knowledge of major topics of physics.

2. To illustrate the competence in communication skills to students for communicating physics phenomenon, laws, basic principles, statement, theorem and application oriented problem solving numerical.

3. To apply the Knowledge of ways and methods to design and conduct an experiment demonstrating various perspectives of conceptual physics for students.

4. To realize an impacts of physics and science on overall development of the society and applies the conceptual understanding of the physics to general real world situations for student.

Program Outcome (POs),

At the end of program students are able to….

1. To familiarize with concepts, facts and figures related to various branches of sciences such as Physics, Chemistry, Botany, Zoology, Computer sciences.

2. To create an awareness of the impact of Science on the environment, society and development outside the scientific community.

3. To develop various skills in planning, performing and handling modern techniques, equipment, laboratory experiments and various software.

4. To develop scientific attitude in students which is major objective that make them open minded, critical observation, deep thinking and curiosity.

5. To conduct basic minor projects, camps, scientific research to provide inputs for societal benefits.

Syllabus prescribed by university:

1S-PHYSICS

(Mechanics, Properties of Matter, Waves and Oscillation).

UNIT-I : Kepler's laws of planetary motion, Newton's law of gravitation, acceleration due gravity, variation with altitude and depth, Gravitational field, Gravitational Potential; Gauss's theorem, gravitational potential and intensity due to uniform solid sphere at a point inside and outside the sphere. Numericals.

UNIT-II: Motion of a Rigid body; rotational motion; moment of inertia; Principle of Perpendicular & Parallel axes, Radius of Gyration; M.I of regular shaped bodies like ring, disc, hollow sphere, solid sphere, cylinder & bar about different axes. Linear momentum, angular momentum, Conservation of Linear Momentum & angular momentum. Numericals.

UNIT-III : Linear S.H.M, Angular S.H.M, Differential equations and solutions. Displacement, Velocity and acceleration, Kinetic and Potential energy. Simple pendulum, compound pendulum, Kater's Reversible pendulum, spring and mass system, Vibration of a magnet, bifilar oscillations, Damped and forced harmonic oscillations, Resonance. Numericals.

UNIT-IV: Superposition of two SHM of same frequency along the same line Interference, superposition of two mutually perpendicular SHM of same Frequency, Lissajous figures. Standing waves, velocity of longitudinal waves (Newton's formula) velocity of waves by Kundt's tube, velocity of transverse waves in stretched string, harmonics and overtones. Production and detection of ultrasonic waves and its applications. Numericals.

UNIT-V: Introduction of Elasticity; Hooke's Law of Elasticity, Three Elastic constants; Relation between, U, s, k and h. Bending of beam and Bending moment; Cantilever, Depression of centrally loaded beam, twisting couple, torsional pendulum; Maxwell's needle. Numericals.

UNIT-VI: Kinematics of moving fluids; Streamline and turbulent flow, viscous drag, Coefficient of viscosity, equation of continuity; Euler's equation, Bernoulli's theorem,

Poiseulle's equation, Reynold's number, Terminal velocity, Stokes' law, Variation of viscosity with temperature. Surface tension, angle of contact and wetting, Jaeger's method. Numericals.

2S-Physics
(Kinetic theory, Thermodynamics and electric currents)

UNIT I : Ideal Gas - Kinetic theory of Gases (Assumption, equation without derivation), deduction of Boyle's law, interpretation of temp.; Estimation of R M S speed of molecule; Estimation of Avagadro's number; degrees of freedom; equipartition of energy; specific heat of monatomic gas; extension to di & tri-atomic gases.

Real Gas- Vander Waals gas equation of state, Comparison with experimental P-V curves, the critical constants; nature of Vander- Waals forces. Transport Phenomena in gases: Molecular Collision, mean free path, Brownian motion and collision cross section. Transport of mass, momentum and energy and interrelationship, dependence on temperature and pressure.

Numericals

UNIT II : The laws of thermodynamics - The zeroth law, P-V indicator diagrams, work done by and on the system; First law of thermodynamics, internal energy as a state function and other applications; Reversible and irreversible changes; Carnot Cycle and its efficiency for perfect gases, The Second law of thermodynamics; different versions of second law, Carnot theorem; Entropy, S-T diagram; Principle of increase of Entropy; The thermodynamic scale of temperature; its identity with the perfect gas scale. Impossibility of attaining the absolute zero, third law of thermodynamics. Numericals.

UNIT III: Liquefaction of Gases - Joule-Thomson effect, Joule's coefficient, Boyle and inversion temperature; Principle of regenerative cooling and Cascade Cooling, Liquefaction of hydrogen and helium Thermodynamic relationships- Thermodynamic Variables, Extensive and intensive, Maxwell's general relationship; application to Joule-Thomson cooling and adiabatic cooling in a general system. Clausius-clapeyron heat equation, thermodynamic Potentials and equilibrium of Thermodynamical systems, relation with thermodynamical variables.

UNIT-IV: Motion of Charged Particles in Electric and Magnetic fields:

(Note: The emphasis should be on Mechanical aspects, and not on the details of the apparatus mentioned which indicated as applications of principles involved.) E as an accelerating field, electron gun, case of discharge tube, linear accelerator (linac), E as a deflecting field, Transverse

magnetic field, Mass spectrograph, velocity selector, curvatures of tracks for energy determination of nuclear particles, Principle of cyclotron. Mutually perpendicular E and B fields, velocity selector, its resolution. Numericals.

UNIT-V : Network theorem: Thevenin's theorem, superposition theorem(mesh current analysis),Maximum power transfer theorem, some applications.

Ballistic galvanometer (theory, charge sensitivity, effect of damping), Application of B.G: Determination of capacitance and high resistance by method of leakage

Varying Currents: Steady currents, current density J, non steady current and continuity equation, Kirchoff's laws and analysis of multi-loop circuits, Rise and decay of currents in LR, Rise and decay & charge in CR circuits, and in LCR circuit, resonating frequency. Numericals.

UNIT-VI : Alternating Currents : A.C. currents, complex numbers and their applications in solving A.C. circuits using J operater, pure R, L, C and their combinations, reactance and impedance, series and parallel resonance, Q-.factor, power consumed by A.C. circuit, power factor. Self and mutual inductance, theory of transformer and energy losses in transformer.

Numericals

3S PHYSICS

Unit I: Mathematical background and Elecrostatics (12)

Gradient, divergence and curl of a vector fields and their physical significance, line surface and volume integral. Gauss divergence theorem, Stocks theorem. Work done on charge in electrostatic field, flux of electric field, force on moving charge, Lorentz force equation and definition of B. Ampere's force law, Ampere's Law and its applications.

Unit II: Magnetostatics and Maxwell's Equations (12)

Faraday's Law, Integral and differential form of faraday's law, displacement current and Maxwell's Equation, wave Equation satisfied by E and B. Plane electromagnetic wave in vacuum, Poynting vector and Poynting theorem.

Unit-III: Solid State Electronics Devices-I – (12)

Physics of semiconductors: Introduction to semiconductors; Charge carriers & electrical conduction through semiconductors; Doping, extrinsic semiconductors; Fermi level & energy level diagrams; Drift current in semiconductor, mobility, conductivity; Hall effect, Hall coefficient, Semiconductor diode & its biasing, LED, Varactor diode.

Unit-IV: Solid State Electronics Devices-II – (12)

Introduction to BJT; working of BJT; modes of operation; Current gains á and â, their relation; CB & CE characteristics; JFET- construction & working, characteristics of FET; Basic concept of Difference amplifier, IC-OP AMP, electrical parameters of OP AMP, inverting & noninverting modes; OP AMP as adder, subtractor, differentiator & integrator.

Unit: V: Special Theory of Relativity (12)

Postulates of Special Theory of Relativity, Lorentz transformations, Length contraction, Time dilation, relativistic addition of velocities, relativity of mass, Einstein's Mass - energy relation, Numericals.

Unit: VI: Atmosphere and Geophysicss (12)

Structure of earth – The crust, mantle, core. Part of the earth – As a planet; The Atmosphere, The lithosphere, The Hydrosphere Composition of Atmosphere Earthquakes – Causes, terminologies associated with earthquakes. Type of earthquakes scale of intensity, recording of earthquakes. Radiation in the atmosphere, Propagation of energy through vacuum, Intensity of radiation, Scattering, absorption and reflection of solar radiation by the atmosphere. Moisture and clouds: mechanism that produces clouds ,Cloud produced by mixing and by cooling.

4SPHYSICS

Unit I: Geometrical optics and interference (12)

Cardinal points of an optical system, equivalent focal length and power of coaxial lens system, Interference in thin films due to reflected and transmitted light, interference in wedge shaped thin film, Newton's ring by reflected light, measurement of wavelength of monochromatic light by Newton's, ring, determination of refractive index of liquid by Newton's rings.

Unit II: Diffraction (12)

Fresnel and Fraunhofer Diffraction, Fresnel half period zone, zone plate construction and theory. Double slit diffraction, Plane diffraction grating; construction and elementary theory, determination of wavelength of monochromatic light by using grating. Resolution of images, Rayleigh's criteria for resolution, R. P. of grating.

Unit III: Polarization (12)

Concept of polarization, optic axis, double refraction, polarization by double refraction, phase retardation plate :- Quarter wave plate, half wave plate, (Nicol prism-production and analysis of polarized light). Theory of production of elliptically and circularly polarized light, production and detection of elliptically and circularly polarized light. Half shade polarimeter, blue of the sky.

Unit IV: Laser (12)

Introduction to Maser, Absorption, spontaneous and stimulated emission, population inversion, pumping characteristics of laser beam. Main components of laser system, three level and four level laser system. Ruby laser, He-Ne laser, semiconductor laser, application of laser. Holography-principle.

Unit V: Fiber optics (12)

introduction of fiber optics, total internal reflection, structure and classification of optical fiber. Propagation of light wave in an optical fiber, Acceptance angle and numerical aperture, dispersion, fiber losses, fiber optic communication. Advantages and Disadvantages of optic fibers, application of fiber optics.

Unit VI: Renewable Energy Sources (12)

Introduction to various renewable energy sources – Solar energy, Wind energy, ocean energy- Waves & tides, geothermal energy, Hybrid Systems, Hydrogen energy systems, Fuel cells.

Solar energy - Solar radiations on earth - availability and seasonal variations, Solar constant, Spectral distribution, Measurement of solar radiation and sun shine.

5S PHYSICS

Unit I: Origin of Quantum Mechanics (12 L)

1. Historical Background: Failure of classical wave theory in explaining Black body radiation and Photoelectric Effect; Compton Effect Qualitative explanation only
2. Assumptions of Planck's Quantum Theory
3. Wave Particle Duality
4. Matter Waves: De Broglie Hypothesis, Davisson Germer experiment
5. Concept of Wave Packet, Phase velocity, group velocity and relation between them.
6. Heisenberg's uncertainty principle: Different forms of uncertainty principle; Thought experiments: single slit diffraction and Gamma ray microscope

Unit II: The Schrodinger equation and its applications (12 L)

1) Wave function and its physical significance
2) Schrodinger time dependent equation
3) Separation in time dependent and time independent Parts
4) Operators in quantum Mechanics
5) Eigen functions and Eigen values
6) Particle in one dimensional and three dimensional box (Energy eigen values)
7) Qualitative analysis of potential barrier Tunneling effect)
8) Simple Harmonic Oscillator (Qualitative analysis of Zero point energy)

Unit III: Atomic and Molecular Spectrocopy (12 L)

Vector Atom Model: Quantum Numbers, Stern Gerlach experiment; selection rules, l-s and j-j coupling, Types of spectra – Emission & absorption spectra.

X-rays: Continuous X-ray spectrum, Duane and Hunt's law, characteristic X-ray spectra, Mosley's law.

Raman Effect: stoke's and anti-stoke's lines, Quantum theory of Raman effect, Experimental arrangement for Raman Spectroscopy.

Unit IV: Nuclear Physics (12 L)

Detection of charged particles; G. M. counter, Binding energy and Mass defect, stability of nuclei Alpha Decay: Range of Alpha particles, Geiger – Nuttal law and Gamow's explanation of alpha decay (qualitative) Beta decay: Types and Pauli's Neutrino Hypothesis Nuclear Fission, Nuclear fusion (concepts only), Nuclear reactors.

Unit V: Hybrid parameters- low frequency equivalent of CE amplifier & its analysios., Bais stability & thermal runway (qualitative). General principles of amplifier classification, RC coupled amplifier, equivalent circuits & gain at low, medium & high frequency (qualitative), gain-frequency response. Noise & distortion in electronic circuits.

Unit VI: Feedback in amplifiers- negative feedback, advantages of negative feedback, positive feedback. Phase shift, Wein bridge, Hartley & Colpits Oscillators. Multi-vibrators – astable, monostable & bistable.

6S PHYSICS

STATISTICAL MECHANICS AND SOLID STATE PHYSICS

UNIT-I: Statistical Mechanics

Phase space, unit cell, microstates, macrostates, energy states, density of energy states, probability & thermodynamic probability, principle of equal a priori probabilities, most probable distribution, Boltzman entropy relation. Maxwell Boltzman statistics, and its application to molecular speed distribution, Average speed, rms speed & most probable velocity.

UNIT-II: Distinguishable & indistinguishable particles, concepts of boson &fermions. Bose – Einstein statistics : Thermodynamic probability, most probable distribution, application of BE statistics to black body radiation. Fermi- Dirac distribution: Thermodynamic probability, Most probable distribution ,Fermi function, Fermi energy & Fermi temperature.

UNIT-III: Crystallography

Solids: - Amorphous and Crystalline Materials; Unit Cell. Millar Indices, Reciprocal Lattice, Coordination Number. Types of Lattices: Diffraction of x-rays by Crystals. Bragg's Law: Determination of lattice parameters of NaCl crystal. Defects in solids – points, line & plane defects.

UNIT -IV: Electrical Properties of Materials

Motion of electron:- Free electrons; conduction electrons, electron collision; mean free path, conductivity & Ohm's law; density of states; concept of Fermi energy. Band structure : Electron in periodic potential, nearly free electron model (qualitative), energy band, energy gap, metals, isulators and semiconductors.

UNIT-V : Magnetic Properties of Materials

Atomic magnetic moment; magnetization vector; magnetic susceptibility; Dia -, Para-, and Ferromagnetic Materials; Classical Langevin Theory of dia and Paramagnetic Domains; Quantum Mechanical Treatment of Paramagnetism; Curie's law, Weiss's law;. Hysteresis and Energy Loss.

UNIT-VI: Superconductivity & Nano Technology

Superconductivity: Introduction to Superconductors; Critical Temperature; Critical magnetic field; Meissner -effect; Type I and type II Superconductors, Idea of BCS theory (No derivation), Cooper pair; Applications of superconductors.

Nano Technology: Introduction to nano size materials, brief History of Nano materials, Effect of reduction of dimensions on physical properties; quantum size effect; Applications of nano materials in different fields

Literature-List of text book, reference book, notes if any:

1) Mechanics – Chadha T.K.
2) Waves and Oscillations – Chaudhary R.N.
3) University Physics I Mechanics of Particles waves and Oscillations
4) Kamal, Anwar
5) Mechanics – Shukla R.K.
6) Mechanics – Shrivastava P.K.
7) Properties of Matter – Murugeshan R
8) Properties of Matter – Brijlal
9) Text book of vibrations and waves – Puri, MacMillan Publisher India Ltd.
10) Barkeley Physics course Vol. I Eno Purcell Ed. (McGraw Hill)
11) The Feymann Lectures in Physics – Vol. I, R.P.Feymann, R.B.Lighton & M. Sands
12) Mechnics & properties of matter – D.S.Mathur
13) Fundamental of Physics – Halliday & Resncik (6th edition)
14) Concepts of Physics Vol I & Vol II by H.C.Varma Heat and thermodynamics – D.S.Mathur
15) Text book of Heat – J.B.Rajam
16) Heat and thermodynamics – Rajam & Arora
17) Heat – Rajkumar & Sharma
18) Electricity & Magnetics – Chakraborty P.
19) Foundations of Physics Vol. I & Vol. II – Gambhir R.S.
20) Electromagnetics – Laud B.B.
21) Electromagnetic field & waves – Sarwate V.V. Laser and non-linear optics – B B Laud.

22) Optoelectronics and fiber optics communication – C.K Sarkar,

23) An introduction to fiber optics – R. Allen Shotwell

24) Optics – Ajoy Ghatak.

25) Optical fiber Communication – John M. Senior

26) Principles of optics – B.K.Mathur

27) Optics and laser – V.K. Sewane

28) 27.Optics and atomic physics – D.P.Khandelwal.

29) Non Conventional Energy Sources, G. D. RAI(4th edition), Khanna Publishers, Delhi.

30) Solar Energy, S.P. Sukhatme (second edition), Tata Mc. Graw Hill Ltd, New Delhi.

31) Solar Energy Utilisation, G. D. RAI (5th edition), Khanna

32) Publishers,Delhi.

33) Principles of Solar Energy - Kreith Kreider.

34) Renewable Energy - BentSarensen.

35) Thermodynamics and statistical mechanics-Brijlal Subramanium

36) Statistical Mechanics – An Elementary Outline – Avijit Lahiri –

37) Universities Press

38) Statistical and Thermal physics - By Lokanathan, R.S. Gambhir,

39) Fundamentals of statistical and thermal physics - By F.Reif

40) Perspectives of modern physics - By A. Beiser

41) Fundamental of Statistical Mechanics - By B.B. Laud

42) A primer of Statistical Mechanics - By R.B. Singh

43) Statistical Mechanics - By Gupta, Kumar

44) Solid State Physics, S.O.Pillai, 3rd Edition, New Age International

45) (P) Ltd, Publisher, (1999).

46) Solid State Physics – By Kakani and Hemrajani, S. Chand Publication.

47) Solid State Physics - By Saxena, Gupta and Saxena, Pragati Prakation.

48) Introduction to Solid State Physics, Charles Kittel, John Wiley and Sons, 7th Edition.

49) Solid State Physics, A.J.Dekker, Macmillan India Ltd, (1998).

50) Solid State Physics, R.K. Puri, V.K. Babbar, S. Chand Publication.

51) Problems in Solid State Physics, S.O. Pillai, New Age International (P) Ltd.

52) Solid State Physics, Palanyswamy.

53) Solid State Physics, David, Snoke, Pearson Publication.

54) Introduction to Nanoscience & Nanotechnology by K. K. Chattopadhyay and A. N.Banerjee, Publisher: PHI Learning and Private Limited

55) Nanotechnology, Rakesh Rathi, S Chand & Company, New Delhi

56) Nanotechnology: Principles and Practices by Sulbha K Kulkarni,

57) Capital Publishing Co. New Delhi.