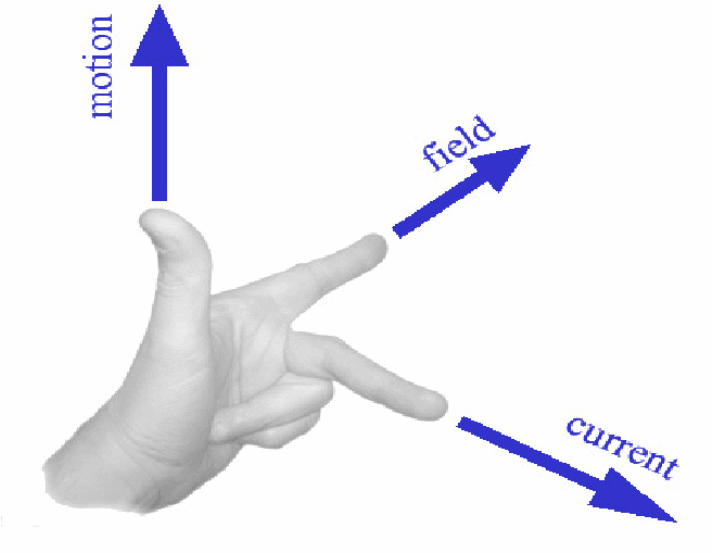
Goals and Objectives

GOALS	LEARNING OBJECTIVES
1. Provide students with scientific knowledge.	1.1. Students will learn the foundations of physics, as evidenced through solving problems in mechanics and electricity and magnetism.
	1.2. Students will learn the main areas of physics at the undergraduate level, as evidenced through solving problems in a. Modern Physics b. Classical Mechanics c. Electricity and magnetism d. Quantum mechanics e. Thermodynamics f. Condensed Matter Physics g. Atomic and Molecular Physics
2. Provide students with the analytical and problem solving skills.	2.1. Students will demonstrate analytical and problem solving skills at the introductory level (i.e. at B. Sc. I), as evidenced in elementary mechanics and electricity and magnetism.
	2.2. Students will demonstrate analytical and problem solving skills at B. Sc. II and B. Sc. III level, as evidenced in a. Modern Physics b. Classical Mechanics c. Electricity and magnetism d. Quantum mechanics e. Thermodynamics f. Condensed Matter Physics g. Atomic and Molecular Physics
3. Provide students with the laboratory skills.	3.1. Students will learn to carry out experiments in mechanics, electricity and magnetism at the introductory level i.e. at B. Sc. I.
	3.2. Students will learn the roles of hypotheses, measurement and analysis in the development of scientific theory at the introductory level as evidenced by laboratory reports.
	3.3. Students will learn to carry out long experiments at the intermediate and advanced level. (B. Sc. II and B. Sc. III)
4. Provide students with the experiment Presentation skills.	4.1. Students will learn how to write a laboratory report. (B. Sc. I, B. Sc. II & B. Sc. III)

Goals and Objectives: -

The curriculum aims at

- Producing graduates who are well grounded in the fundamentals of Physics and acquisition of the necessary skills, in order to use their knowledge in Physics in a wide range of practical application.
- Developing creative thinking and the power of imagination to enable graduates work in academia and industry for broader application.
- Accommodating their relevant fields in allied disciplines and to allow the graduates of Physics to fit into the inter-disciplinary environment.
- Relating the training of Physics graduates to the employment opportunities within the country.



Course Outcomes

Learning Outcomes

Student of B.Sc. Physics will be able to

- The student will demonstrate the ability to think critically and to use appropriate concepts to analyze qualitatively problems or situations involving physics.
- Demonstrate a rigorous understanding of the core theories and principles of Physics, which includes Mechanics, Electro-magnetism, Thermodynamics and Quantum Mechanics.
- The students will demonstrate the ability to use appropriate mathematical techniques and concepts to obtain quantitative solutions.
- Apply critical reasoning skills to model and solve Physics related Problems.
- Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles.
- Communicate scientific information in oral, written and graphical formats.

B. Sc. First Year (Semester- I)

Sr. No.	Contents	Course Outcomes
	B. Sc. First Year (Semester I) Course- PHYSICS – Paper-I(101) (Properties of Matter and Mechanics)	
1.	**Unit I:** **Elasticity-** Introduction, Hooke's law, Elastic constants (Y, K, η) and relation between them, Poisson's ratio, Elastic limit, Work done in stretching a wire, Bending of beam, Bending moment, External and internal bending moment, Cantilever supported at one end and at both end, Torsional pendulum, and Maxwell needle.	**Student will be able to** o Acquire the knowledge of Hooke's law, Elastic constants (Y, K, η) and bending moment. o Understand the physical concept of Work done in stretching a wire, Cantilever, Torsional pendulum, and Maxwell needle. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning.
2.	**Unit II:** **Viscosity**-Streamline and turbulent flow, Coefficient of viscosity, Equation of continuity, Euler's equation, Bernoulli's theorem and its applications (Lift of an Airplane, Atomizer) , Poiseuilli's formula, Reynolds number, Terminal velocity, Stokes law by the method of dimension, Variation of viscosity with temperature.	**Student will be able to** o Acquire the knowledge of Bernoulli's theorem and Poiseuilli's formula. o Understand the physical concept of Streamline and turbulent flow and Terminal velocity, Stokes law by the method of dimension, Variation of viscosity with temperature. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning
3.	**Unit III:** **Surface tension-**Introduction, Angle of contact and wetting, Surface energy, Surface tension by Jaeger's, Quincke's and Capillary rise methods. **Mechanics**-Newton's law of motion, motion in a plane, components of velocity and acceleration in different coordinate system, Centripetal acceleration, Coriolis force and its applications.	**Student will be able to** o Acquire the knowledge of Surface tension, Surface energy and Coriolis force. o Understand the physical concept of Angle of contact and wetting, capillarity and components of velocity and acceleration in different coordinate system. o Apply it to solve the numerical problems.

		○ Think critically. Enhance the learning
4.	**Unit IV:** **Mechanics**-System of particles, Center of mass, Equation of motion, Conservation of linear and angular momentum, Conservation of energy, Single stage and multistage rockets, Elastic and inelastic collisions, Moments of inertia and their products, Moment of inertia of cylinder and sphere, Principal moments and axes.	**Student will be able to** ○ Acquire the knowledge of Center of mass, and Moments of inertia and their products. ○ Understand the physical concept of Single stage and multistage rockets and Moment of inertia of cylinder and sphere. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
B. Sc. First Year (Semester I) **Course-PHYSICS - Paper-II (102)** **(Electrostatics, Time varying fields &Electric Currents)**		
5.	**Unit I:** **Electrostatics-**Coulombs law in vacuum in vector form, Force between two charges, Electric field intensity, Electric potential, Electric field intensity due to a point charge, Electric dipole, Electric dipole moment, Electric field intensity due to an electric dipole, Electric field as a negative gradient of potential, Conservative nature of the electric field.	**Student will be able to** ○ Acquire the knowledge of Coulombs law, Electric field intensity, Electric potential and Electric dipole. ○ Understand the physical concept of Force between two charges and Conservative nature of the electric field. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
6.	**Unit II:** **Dielectric-**Introduction, definition of polar and non polar molecules, Polarization of charges in a dielectric, Clausius - Mossitti equation, Three electric vectors D, E and P and relation between them, Concept of capacitance, Parallel plate capacitor without and with dielectric, application of Gauss's law to parallel plate capacitor.	**Student will be able to** ○ Acquire the knowledge of polar and non polar molecules and Clausius - Mossitti equation. ○ Understand the physical concept of Parallel plate capacitor without and with dielectric and Polarization of charges in a dielectric. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
7.	**Unit III:** **Time varying fields**-Electromagnetic	**Student will be able to** ○ Acquire the knowledge of

	induction, Faradays laws in differential and integral form, Lenz's law, self and mutual induction, Transformer, Construction, working and its parameters, Energy losses. **Electric Currents**-Current density, Equation of continuity, Kirchhoff's law, Rise and decay of current in LR and CR circuits, Decay of charge in LCR circuits.	Electromagnetic induction, Faradays laws in differential and integral form, Lenz's law and Kirchhoff's law. o Understand the physical concept of Transformer and Rise and decay of current in LR and CR circuits, Decay of charge in LCR circuits. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
8.	**Unit IV:** **Electric Currents**-Application of complex number in solving an a. c. circuit, j- operator method, A.C. applied to pure resistive, pure inductive and pure capacitive circuit, application of j- operator in LR,CR and LCR circuit, Resonance, Sharpness of resonance, Series resonance circuit (Calculate I, Z, Φ and fr), Q factor, Power in an a. c. circuit, Power factor.	**Student will be able to** o Acquire the knowledge of j-operator method and Power in an a. c. circuit. o Understand the physical concept of A.C. applied to pure resistive, pure inductive and pure capacitive circuit and Power factor. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
9.	**B. Sc. First Year (Semester I)** **Course - Physics Practical (103)**	**Student will be able to** o Analyze the physical principles involved in various physical phenomena. o Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles. o Perform experiment in scientific manner. o Communicate scientific information in oral, written and graphical formats. o Relates the experimental observations with theory to get REAL world Understanding. o Think scientifically for every physical phenomenon.

B. Sc. First Year (Semester- II)

Sr. No.	Contents	Course Outcomes
	B. Sc. First Year (Semester II) **Course- PHYSICS – Paper-I(201)** **(Oscillations, Kinetic theory of gases and Thermodynamics)**	
1.	**Unit I:** **Free oscillations-** Introduction to linear and angular S.H.M., Differential equation of S.H.M. and its solution, Composition of two perpendicular linear S.H.M.s for 1:1 and 1:2 (analytical method), Lissajous's figure. **Damped oscillations-** Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.	**Student will be able to** ○ Acquire the knowledge of linear , angular S.H.M. and harmonic oscillator. ○ Understand the physical concept of Lissajous's figure and Power dissipation and quality factor. ○ Apply it to solve the numerical problems. ○ Think critically. ○ Enhance the learning.
2.	**Unit II:** **Forced oscillations-** Forced oscillation with one degree of freedom, Differential equation of forced oscillation and its solution, Resonance (Amplitude), Sharpness of resonance, Power dissipation, Quality factor and bandwidth. **Kinetic theory of gases-**Assumptions, Boyle's law, Equipartition of energy, Molecular collision, Mean free path and collision cross section, Estimate of molecular diameter and mean free path.	**Student will be able to** ○ Acquire the knowledge of Forced oscillation and Resonance (Amplitude). ○ Understand the physical concept of Power dissipation, Quality factor and bandwidth and Mean free path and collision cross section. ○ Apply it to solve the numerical problems. ○ Think critically. ○ Enhance the learning
3.	**Unit III:** **Transport phenomenon in gases-**Transport of mass, momentum, energy and their relationship, dependence on temperature and pressure, Van der wall's gas (Real gas, Equation of state), Critical constants. **Thermodynamic-**Thermodynamic variables, Thermal equilibrium and temperature, Zeroth law of thermodynamics, Thermodynamic processes (Reversible and Irreversible), Indicator diagram, First law of thermodynamics, Carnot's cycle and it's efficiency, Carnot's theorem.	**Student will be able to** ○ Acquire the knowledge of Transport of mass, momentum, energy and Thermodynamic variables. ○ Understand the physical concept of Van der wall's gas and Thermodynamic processes. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
4.	**Unit IV:** **Thermodynamic-**Entropy, Second law of thermodynamic, Thermodynamic scales of temperature, Third law of thermodynamics,	**Student will be able to** ○ Acquire the knowledge of Entropy, Thermodynamic scales of temperature and

	Maxwell general relationship[δ(T,S)/ δ(x,y) = δ(P,V)/ δ(x, y)] and it's applications, Joules coefficient, Porous plug experiment, Liquefaction of gases- Boyle's temperature and inversion temperature, Liquefaction of Helium, Air conditioning (Concept only).	Porous plug experiment. o Understand the physical concept of Maxwell general relationship[δ(T,S)/ δ(x,y) = δ(P,V)/ δ(x, y)] and Boyle's temperature and inversion temperature. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
B. Sc. First Year (Semester II) Course-PHYSICS - Paper-II (202) (Gravitation, Astrophysics, Magnetism and Magneto statics)		
5.	**Unit I:** **Gravitation-** Kepler's laws of Planetary motion (statement only), Newton's law of gravitation, Relation between G and g, Gravitational field, Gravitational potential, Gauss's theorem, Gravitational potential and intensity due to uniform solid sphere at a point inside and outside the sphere, Gravitational self energy of a galaxy.	**Student will be able to** o Acquire the knowledge of Kepler's laws, Newton's law of gravitation and Gauss's theorem. o Understand the physical concept of Gravitational field, Gravitational potential and Gravitational self energy of a galaxy. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
6.	**Unit II:** **Astrophysics-** The constituents of universe (Solar system, Stars, Galaxies), Introductory study of solar systems, To measure size of a planet (d=D.α), To measure distance of a planet by parallax method (D=b/θ), Mass of the sun and the planets(M=4π2r3/GT2), Structure of sun, Solar interior, surface temperature of sun (T=[R/r]1/2 .[S/σ]1/4), Solar luminosity, Stellar spectra, The Milky way (shape, size, clusters), Cosmological theories of the universe (Concept only).	**Student will be able to** o Acquire the knowledge of Solar system, Stars, Galaxies and Cosmological theories of the universe. o Understand the physical concept of To measure size of a planet (d=D.α), To measure distance of a planet by parallax method (D=b/θ), Mass of the sun and the planets(M=4π2r3/GT2). o Apply it to solve the numerical problems. o Think critically. Enhance the learning
7.	**Unit III:** **Magnetism**-Introduction, Magnetic materials, Langevin's theory of diamagnetism, its application as superconductor, Critical magnetic field and	**Student will be able to** o Acquire the knowledge of Langevin's theory of diamagnetism,Ferromagnetism and Ferrimagnetisms.

	Meissner effect, Langevin's theory of para magnetism, Ferromagnetism, Ferromagnetic domain, Curie temperature, Ferrimagnetisms, Ferrites and its applications, Antiferromagnetism, Neel temperature.	○ Understand the physical concept of Critical magnetic field and Meissner effect. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
8.	**Unit IV:** **Magneto statics**- Concept of magnetic field, Lorentz force equation, Magnetic dipole moment, angular momentum and gyro magnetic ratio, Biot- Saverts law, It's applications (B due to steady current in a long straight wire, B along the axis of circular coil), Ampere's law, It's applications(B for a solenoid, A Toroid), Magnetization current, Magnetic vectors, Gauss law of magnetization.	**Student will be able to** ○ Acquire the knowledge of Biot- Saverts law and Ampere's law. ○ Understand the physical concept of Magnetic dipole moment, angular momentum and gyro magnetic ratio and Magnetic vectors. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
9.	**B. Sc. First Year (Semester II))** **Course - Physics Practical (203)**	**Student will be able to** ○ Analyze the physical principles involved in various physical phenomena. ○ Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles. ○ Perform experiment in scientific manner. ○ Communicate scientific information in oral, written and graphical formats. ○ Relates the experimental observations with theory to get REAL world Understanding. ○ Think scientifically for every physical phenomenon.

B. Sc. Second Year (Semester- III)

Sr. No.	Contents	Course Outcomes
B. Sc. Second Year (Semester III) Course- PHYSICS – Paper-I(301) (Sound waves, Applied acoustic, Ultrasonic and Power supply)		
1.	**Unit I:** **Waves in media-** Speed of transverse wave on a string, Group velocity and phase velocity and their relation and measurement, Standing waves, Harmonics, Quality of sound, Human ear and its response (Diagrammatic introduction only), Limit of human audibility, Intensity and loudness, Bel and decibel, the musical scale, Temperaments and musical instruments.	**Student will be able to** o Acquire the knowledge of Group velocity and phase velocity. o Understand the physical concept of Human ear and its response and the musical scale. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning.
2.	**Unit II:** **Applied acoustic-** Transducers and their characteristics (Crystal microphone, Moving coil loud speaker), Recording and reproduction of sound (Magnetic tape, Cine film, Compact disc), Acoustic of building, Reverberation and reverberation period, Sabine's formula, Factors affecting the acoustics of building, Requirements for good acoustics.	**Student will be able to** o Acquire the knowledge of Transducers and Acoustic of building. o Understand the physical concept of Recording and reproduction of sound and Sabine's formula, Factors affecting the acoustics of building. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning
3.	**Unit III:** **Ultrasonic-** Introduction, Properties and production of ultrasonic waves, piezoelectric effect, piezoelectric generator, Magnetostriction effect andoscillators, Frequency of ultrasonic waves, Application of ultrasonic waves (measurement of depth of sea, SONAR system and Medical science).	**Student will be able to** o Acquire the knowledge of piezoelectric effect and SONAR system. o Understand the physical concept of production of ultrasonic waves and measurement of depth of sea. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
4.	**Unit IV:** **Power supply**-Introduction, rectification using half wave and full wave rectifiers	**Student will be able to** o Acquire the knowledge of half wave and full wave

	(Find $I_{d.c.}$, $V_{d.c.}$, I_{rms},η andripple factor), Working of Full wave bridge rectifier, Filters, Difference between regulated and unregulated power supply, line and load regulation, voltage stabilization, Zener diode as voltage regulator, IC voltage regulation.	rectifiers. o Understand the physical concept of regulated and unregulated power supply. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
B. Sc. Second Year (Semester III) Course-PHYSICS - Paper-II (302) (Physical optics and Electromagnetic waves)		
5.	**Unit I:** **Interference of light-** Introduction, Interference in equal thickness thin film, Phase change on reflection, refraction and transmitted system. Newton's ring and its application to determine the wavelength and refractive index, Michelson Interferometer and its application to wavelength determination and wavelength difference,	**Student will be able to** o Acquire the knowledge of Interference and Michelson Interferometer. o Understand the physical concept of Newton's ring and its application. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
6.	**Unit II:** **Diffraction of light-** Introduction, Fresnel's diffraction- Half period zones, Zone plates, Diffraction due to straight edge and due to narrow slit. Fraunhoffer diffraction- Fraunhoffer diffraction at a single slit, at circular aperture, Plane diffraction grating and its application, Resolving power of grating, Rayleigh's criterion for resolution.	**Student will be able to** o Acquire the knowledge of Fresnel's diffraction and Fraunhoffer diffraction. o Understand the physical concept of Half period zones, Zone plates and Resolving power of grating. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
7.	**Unit III:** **Polarization-** Introduction, Brewster's law, Polarization by scattering (concept only), Blue color of the sky(only idea), Uniaxial and biaxial crystal , positive and negative crystal, ordinary and extraordinary rays, Nicol prism, its application as an analyzer and polarizer, Double refraction in uniaxial crystal, phase retardation plate (Halfand Quarter wave), Double prism.	**Student will be able to** o Acquire the knowledge of Brewster's law and Nicol prism. o Understand the physical concept of Polarization by scattering and Uniaxial and biaxial crystal. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
8.	**Unit IV:** **EM Waves-** Introduction to EM spectrum related to wavelength, origin and	**Student will be able to** o Acquire the knowledge of EM spectrum and Maxwell's

	characteristics of EM waves, Physical significance of Maxwell's equations, EM wave equations (in conducting medium and in free space), It's transverse nature, Plane polarized EM wave (E0/H0=), Characteristics impedance of dielectric, Poynting vector, Poynting theorem.	equations. o Understand the physical concept of origin and characteristics of EM waves and Poynting vector, Poynting theorem. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
9.	**B. Sc. Second Year (Semester III))** **Course - Physics Practical (303)**	**Student will be able to** o Analyze the physical principles involved in various physical phenomena. o Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles. o Perform experiment in scientific manner. o Communicate scientific information in oral, written and graphical formats. o Relates the experimental observations with theory to get REAL world Understanding. o Think scientifically for every physical phenomenon.

B. Sc. Second Year (Semester- IV)

Sr. No.	Contents	Course Outcomes
	B. Sc. Second Year (Semester IV) Course-PHYSICS - Paper-I (401) (Solid state physics, X-ray and Laser)	
1.	**Unit I:** **Solid state physics-** Introduction, Crystal structure, periodicity, lattices and basis, fundamental translation vector, unit cell and primitive cell, Miller indices, allowed rotations, lattice types, lattice planes, Bravais lattices, packing fraction, coordination number, Inter-planer distances, Crystal structures-Na Cl, diamond, CsCl, ZnS etc.	**Student will be able to** o Acquire the knowledge of Crystal structure and Miller indices. o Understand the physical concept of periodicity, lattice planes, Bravais lattices, packing fraction, coordination number, Inter-planer distances. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning.
2.	**Unit II:** **X-ray-**Introduction, discrete and continuous X-ray spectra, Main feature of continuous X-ray spectra, Characteristics X-ray spectra, Duane-Hunt law, X- ray emission spectra, Moseley law its importance and applications, Auger effect, X-ray absorption spectra, applications of X-rays in various fields.	**Student will be able to** o Acquire the knowledge of discrete and continuous X-ray spectra. o Understand the physical concept of Duane-Hunt law, X- ray emission spectra, Moseley law its importance and applications. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning
3.	**Unit III:** **Solid state physics-** Reciprocal lattice, Wigner Seitz cell, Geometrical relation between direct and reciprocal lattice, Laue's theory of X-ray diffraction, Bragg's lawand Bragg's diffraction conditions in direct andreciprocal lattice, Laue's pattern, Bragg's spectrometer and its applications (wavelength determination and simple cubic structure determination).	**Student will be able to** o Acquire the knowledge of Reciprocal lattice, Wigner Seitz cell and Bragg's diffraction. o Understand the physical concept of Bragg's spectrometer and its applications. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
4.	**Unit IV:**	**Student will be able to**

	Laser-Introduction to Laser(purity of spectral line, spatial and temporal coherence),Einstein's relation, absorption, spontaneous and stimulated emission, Population inversion, Optical pumping, characteristics of laser beam, three level andfour level laser system, Ruby laser, He-Ne laser, Semiconductor laser, Application of lasers.	○ Acquire the knowledge of spatial and temporal coherence. ○ Understand the physical concept of Population inversion, Optical pumping and He-Ne laser. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
B. Sc. Second Year (Semester IV) Course-PHYSICS - Paper-II (402) (Solid state electronics, and Molecular physics)		
5.	**UnitI:** **Solid state electronics-** Light emitting diode, Solar Cell, Photovoltaic cell, Bipolar transistor- Construction and working, transistor characteristics in CE and CB Mode, Graphical analysis of CE configuration. Hybrid parameters, Equivalent circuit at low frequency in CE mode, Thermal Runaway, Stabilization, Heat sink, Stability factor, Bias stabilizing circuits.	**Student will be able to** ○ Acquire the knowledge of Light emitting diode, Solar Cell, Photovoltaic cell, Bipolar transistor. ○ Understand the physical concept of Construction and working, transistor characteristics in CE and CB Mode. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
6.	**Unit II:** **Field Effect Transistor-** Construction, and working principal of JFET, Difference between BJT and JFET, Characteristics of JFET, Parameters , JFET as an amplifier (input and output impedance, voltage gain), Advantage of JFET over BJT.MOSFET-Types of MOSFET, Construction and working of MOSFET, Characteristics of MOSFET, Special features of MOSFET.	**Student will be able to** ○ Acquire the knowledge of JFET and MOSFET. ○ Understand the physical concept of Construction, and working principal of JFET and MOSFET. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
7.	**UnitIII:** **Molecular physics-** Quantization of vibrational and rotational energies, types of molecules based on moment of inertia, rigid diatomic molecules, Intensity distribution in rotational levels, Diatomic molecules as harmonic and unharmonic oscillator, Rotational-vibrational spectra, Born Oppenheimer approximation.	**Student will be able to** ○ Acquire the knowledge of vibrational and rotational energies. ○ Understand the physical concept of rigid diatomic molecules, Intensity distribution in rotational levels. ○ Apply it to solve the

		numerical problems. o Think critically. Enhance the learning
8.	**Unit IV:** **Raman spectroscopy-** Raman effect, Classical and quantum explanation, Experimental set up, Raman spectra and molecular structure, Applications of Raman effect, Electronic spectra, Dissociation energy, Frank-Condon principle, Elementary ideas of NMR and ESR and their applications in spectroscopy.	**Student will be able to** o Acquire the knowledge of Raman spectra and molecular structure. o Understand the physical concept of Elementary ideas of NMR and ESR. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
9.	**B. Sc. Second Year (Semester IV)** **Course - Physics Practical (403)**	**Student will be able to** o Analyze the physical principles involved in various physical phenomena. o Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles. o Perform experiment in scientific manner. o Communicate scientific information in oral, written and graphical formats. o Relates the experimental observations with theory to get REAL world Understanding. o Think scientifically for every physical phenomenon.

B. Sc. Final Year (Semester- IV)

Sr. No.	Contents	Course Outcomes
	B. Sc. Final Year (Semester V) Course-PHYSICS - Paper-I (501) (Atomic physics, free electron theory and Statistical physics)	
10.	**Unit I:** **Atomic physics-** Introduction (Revision of Bohr's model, Somerfield and Chadwick), Vector atom model, Stern-Gerlach experiment, Spinning of electron, Space quantization, Selection rules, Quantum numbers, L-S and J-J Coupling, Pauli's exclusion principal, Hunds rule, Zeeman effect, Normal Zeeman effect, Anomalous Zeeman effect, Stark effect.	**Student will be able to** o Acquire the knowledge of Vector atom model and L-S and J-J Coupling. o Understand the physical concept of Stern-Gerlach experiment and Normal Zeeman effect, Anomalous Zeeman effect, Stark effect. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning.
11.	**Unit II:** **Free electron theory-** Drude Lorentz model, Mean free path, Electrical and thermal conductivity, Wiedemann Franz law (Derivation), Density of states, Fermi energy, Fermi temperature. Band theory of solids- Bloch theorem (statement only), Kroning Penny model, Concept of hole, Hall effect, Energy bands in solid, distinction between metal, semiconductor and insulator.	**Student will be able to** o Acquire the knowledge of Mean free path and Fermi energy. o Understand the physical concept of Kroning Penny model and Hall effect, Energy bands in solid. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning
12.	**Unit III:** **Statistical physics-** μ- space, Gamma space, probability distribution, thermodynamic probability, Principle of a priori probability, Boltzmann's entropy relation, accessible and inaccessible estates, macro and micro states, Maxwell- Boltzmann distribution law, its application to molecular speed, distinction between mean, r. m. s.and most probable speed values.	**Student will be able to** o Acquire the knowledge of accessible and inaccessible estates. o Understand the physical concept of Maxwell-Boltzmann distribution law, its application to molecular speed. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
13.	**Unit IV:** **Statistical physics-** Bose-Einstein statistics, its application to black body radiation,	**Student will be able to** o Acquire the knowledge of M-B, B-E and F-D statistics.

	Planck's radiation law, Estimation of temperature of sun, Bose- Einstein condensation. Fermi-Dirac distribution and its application to free electrons in a metal, concept of negative temperature, Fermi level and Fermi temperature, comparison between M-B, B-E and F-D statistics.	○ Understand the physical concept of Fermi-Dirac distribution and its application to free electrons in a metal. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
B. Sc. Final Year (Semester V) Course-PHYSICS - Paper-II (502) (Quantum mechanics, NanomaterialsandNanotechnology)		
14.	**Unit I:** **Quantum mechanics-** Failure of classical physics to explain black body spectra, Planck's radiation law, Compton Effect, Wave particle duality, de Broglie's hypothesis, Concept of wave and group velocity, Experimental demonstration of matter waves, Davisson and Germer experiment, Heisenberg's uncertainty principle and Thought experiment.	**Student will be able to** ○ Acquire the knowledge of black body spectra and Compton Effect. ○ Understand the physical concept of de Broglie's hypothesis, Concept of wave and group velocity. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
15.	**Unit II:** **Quantum mechanics-**Schrodinger's equation (Time dependent and time independent equations), Physical significance of wave function Ψ, Operators, Expectation values of a dynamical quantities, Ehrenfest's theorem, Eigen value and Eigen functions, Particle in a box, Application to free particle in a one and three dimension.	**Student will be able to** ○ Acquire the knowledge of wave function Ψ. ○ Understand the physical concept of Schrodinger's equation (Time dependent and time independent equations. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
16.	**Unit III:** **Nanomaterials-**Introduction to Nanoscience and Nanotechnology, Difference between Nanomaterials and bulk materials, Reduction of dimensions 3D, 2D, 1D, 0D materials, various morphologies of nanomaterials, Bottom up and top down approaches, size dependent physical properties, Nano cluster.	**Student will be able to** ○ Acquire the knowledge of Nanoscience and Nanotechnology. ○ Understand the physical concept of Reduction of dimensions 3D, 2D, 1D, 0D materials. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
17.	**Unit IV:**	**Student will be able to**

	Nanotechnology-Different methods of synthesis of nanomaterials (Wet chemical, Sol-gel, and HCRTechnique), Determination of size of nanoparticles by particle analyzer(BET) and Debye-Scherer's formula, Characterization technique of SEM and TEM , application of nanomaterials in various fields (General).	○ Acquire the knowledge of Different methods of synthesis of nanomaterials. ○ Understand the physical concept of Determination of size of nanoparticles by particle analyzer(BET) and Debye-Scherer's formula. ○ Apply it to solve the numerical problems. ○ Think critically. Enhance the learning
18.	**B. Sc. Final Year (Semester V)** **Course - Physics Practical (503)**	**Student will be able to** ○ Analyze the physical principles involved in various physical phenomena. ○ Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles. ○ Perform experiment in scientific manner. ○ Communicate scientific information in oral, written and graphical formats. ○ Relates the experimental observations with theory to get REAL world Understanding. ○ Think scientifically for every physical phenomenon.

B. Sc. Final Year (Semester- VI)

Sr. No.	Contents	Course Outcomes
	B. Sc. Final Year (Semester VI) Course-PHYSICS - Paper-I (601) (Relativity, Nuclear physicsandBio Physics)	
19.	**Unit I:** **Relativity-** Frame of reference, Inertial and non inertial frames, Galilean transformation equations, Galilean invariance, Michelson-Morley experiment, Postulates of the special theory of relativity, Lorentz transformations, Length contraction, Time dilation, Velocity addition theorem, , Variation of mass with velocity, Mass energy equivalence.	**Student will be able to** o Acquire the knowledge of Lorentz transformations, Length contraction and Time dilation. o Understand the physical concept of Galilean invariance and Michelson-Morley experiment. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning.
20.	**Unit II:** **Nuclear physics-** G.M. counter, Wilson cloud chamber, Cyclotron, Linear accelerator, Nuclear reaction, Discovery of neutron, Packing fraction, Mass defect and binding energy, Nuclear fission, Liquid drop model, Chain reaction, Nuclear reactors, Nuclear fusion, Cosmic ray, Elementary particles, Shell model of the nucleus.	**Student will be able to** o Acquire the knowledge of G.M. counter, Wilson cloud chamber, Cyclotron, Linear accelerator. o Understand the physical concept of Nuclear reactors, Nuclear fusion, Cosmic ray, Elementary particles. o Apply it to solve the numerical problems. o Think critically. o Enhance the learning
21.	**Unit III:** **Nuclear physics-** Alpha decay, Range of α particle, Geiger Nuttal law, Magnetic spectrometer for energy of α particle, Tunneling, Gamow's theory of α decay, β-decay, Measurement of energy of β particle and end point energy, Neutrino theory of β-decay, γ- decay, Energy of γ photon.	**Student will be able to** o Acquire the knowledge of Gamow's theory of α decay, β- decay. o Understand the physical concept of Geiger Nuttal law, Magnetic spectrometer for energy of α particle. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
22.	**Unit IV:** **Bio physics-**History of bio physics, Bio Potential- compound action Potentials of the	**Student will be able to** o Acquire the knowledge of Bio Potential- compound

	human body, Electrocardiogram for heart (ECG), Electroencephalogram for brain (EEG), Electroretinogram for eye retina (ERG), Electromyogram for muscle (EMG) andSonography(Working mechanism). Bioinstruments- Basic principle, construction and working of colorimeters, Spectrophotometer, PH-Meter and centrifuge measurement.	action Potentials of the human body. o Understand the physical concept of Electrocardiogram for heart (ECG), Electroencephalogram for brain (EEG), Electroretinogram for eye retina (ERG), Electromyogram for muscle (EMG). o Apply it to solve the numerical problems. o Think critically. Enhance the learning
B. Sc. Final Year (Semester VI) Course-PHYSICS - Paper-II (602) (Electronics, Fiber optics, Communication and Digital electronics)		
23.	**Unit I:** **Amplifiers-** Classification of amplifiers, multistage amplifiers, Operational amplifier-parameters, Basic idea of IC-741, Application of Op. Amp. as inverting, Non inverting, Adder, Subtractor, Integrator and Differentiator, Oscillators- Concept of feedback, Physical consideration of tuned circuits, Phase shift oscillator, Hartley oscillator, Colpitts oscillator.	**Student will be able to** o Acquire the knowledge of amplifiers, multistage amplifiers and Oscillators. o Understand the physical concept of Application of Op. Amp. as inverting, Non inverting, Adder, Subtractor, Integrator and Differentiator. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
24.	**Unit II:** **Fiber optics**-Importance of optical fiber, Propagation of light waves in optical fiber, Basic structure, Stepped index monomodefiber, Graded index fiber, Acceptance angle and acceptance cone, Numerical aperture, Fiber losses and their units (basic concept), Electrical and optical band width, bandwidth length product, Dispersion in optical fiber.	**Student will be able to** o Acquire the knowledge of optical fiber and Fiber losses and their units (basic concept). o Understand the physical concept of Stepped index monomodefiber, Graded index fiber, Acceptance angle and acceptance cone. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
25.	**Unit III:** **Communication-**Introduction, amplitude modulation -Frequency spectrum,	**Student will be able to** o Acquire the knowledge of amplitude modulation and

	Modulation factor, over modulation, Percentage modulation, Expression for Power and Currents in AM wave, disadvantages, Frequency modulation - Frequency deviation, Carrier swing, Modulation index, Deviation ratio, Expression for FM wave, Frequency spectrum, significant side band terms, FM band width, Merits and demerits.	Frequency modulation. o Understand the physical concept of Modulation factor, over modulation and significant side band terms. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
26.	**UNIT IV:** **Number Systems-** Unitary systems, Binary, decimal, octal, hexadecimal and their interconversions, Binary coded decimal (BCD), Addition and subtraction of binary numbers, 1S, 2S and 10S compliment, basic logic gates, NOR, NAND, Ex-OR, Ex-NOR and their truth table, Half adder, Full adder, Half subtractorand full subtractor, Boolean equations, DeMorgan's theorem and its verification.	**Student will be able to** o Acquire the knowledge of Unitary systems, Binary, decimal, octal, hexadecimal and basic logic gates. o Understand the physical concept of Addition and subtraction of binary numbers, 1S, 2S and 10S compliment and NOR, NAND, Ex-OR, Ex-NOR and their truth table, Half adder, Full adder. o Apply it to solve the numerical problems. o Think critically. Enhance the learning
27.	**B. Sc. Final Year (Semester VI)** **Course - Physics Practical (603)**	**Student will be able to** o Analyze the physical principles involved in various physical phenomena. o Demonstrate proficiency in the observation, analysis and interpretation of concept and result with known Principles. o Perform experiment in scientific manner. o Communicate scientific information in oral, written and graphical formats. o Relates the experimental observations with theory to get REAL world Understanding. o Think scientifically for every physical phenomenon.