PHYSICS

(B. Sc. Part- I)

Semester I
(Paper-101, 102, 103)

Semester II
(Paper-201, 202, 203)

(2013-2014)
B. Sc. First Year (Semester I)  
Course- PHYSICS – Paper-I(101)  
(Property of Matter and Mechanics)  

Marks- 50  
Time-30 hours  

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.  

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.  

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.  

Unit IV:  

References & Text books-  
2. Properties of Matter, by- D. S. Mathur, ShamlalChritable Trust New Delhi  
3. Properties of matter, by- Brijjal  
5. General Properties of matter, by- J. C. Upadhyay, Ram Prasad & Sons  

**B. Sc. First Year (Semester I)**

**Course-PHYSICS - Paper-II (102)**

*(Electrostatics, Time varying fields &Electric Currents)*

**Marks- 50**

**Time-30 hours**

**Unit I:**

**Electrostatics**-Coulomb's 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.

**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.

**Unit III:**


**Unit IV:**


**Referencesand Text books** -

1. Electricity and Magnetism, by-Brijlal ,Subramanyam.
2. Fundamental of Magnetism and Electricity, by- D. N. Vasudiva.
8. Introduction to Electrodynamics, by- D. J. Griffiths.

B. Sc. First Year (Semester I)
Course - Physics Practical (103)

1. A student will have to perform at least ten experiments per semester and two experiments (from different fields) at the time of university practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is:
   - Two experiments (9 Marks each) - 18 Marks
   - Record book - 06 Marks
   - Viva Voce - 06 Marks

-----------
Total            30 Marks

List of the experiments-
1. Range and least count of Instruments, measurements using various instruments and error analysis (vernier caliper, screw gauge, traveling microscope, spectrometer etc.)
2. Young's modulus by cantilever.
3. Young's modulus by bending of beam.
4. Young's modulus by vibrational method.
5. Modulus of rigidity by Torsional pendulum.
7. Determination of \( \eta \) by statical method.
8. To determine Coefficient of Viscosity of water by Poiseulle's method.
9. Surface tension of a liquid by Quincke's method.
10. Surface tension of a liquid by Jagers method.
11. Surface tension of a liquid by Capillary rise method.
12. To determine the moment of inertia of a body using torsion pendulum.
13. To determine the moment of inertia of a fly-wheel.
16. To study charging and discharging of a condenser through a resistor \( R \).
17. To study growth/decay of current in LR circuit.
19. Frequency of A.C. Mains by sonometer.
21. Study of Transformer (parameters determination).
22. Verification of Kirchhoff's law, using electrical network.
23. To calculate low resistance by potentiometer.
25. Determination of dielectric constant of a solid.

B. Sc. First Year (Semester II)
Course – PHYSICS - Paper-I (201)
(Oscillations, Kinetic theory of gases and Thermodynamics)

Marks- 50
Time-30 hours

Unit I:

Damped oscillations- Differential equation of damped harmonic oscillator and its solution, Energy equation of damped oscillations, Power dissipation and quality factor.

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.

Unit III:
Transport phenomenon in gases- Transport of mass, momentum, energy and their relationship, dependence on temperature and pressure, Van der Waal’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 its efficiency, Carnot’s theorem.

Unit IV:
Thermodynamic- Entropy, Second law of thermodynamics, Thermodynamic scales of temperature, Third law of thermodynamics, Maxwell general relationship \[ \delta(T,S)/ \delta(x,y) = \delta(P,V)/ \delta(x,y) \] and its applications, Joules coefficient, Porous plug experiment, Liquefaction of gases- Boyle’s temperature and inversion temperature, Liquefaction of Helium, Air conditioning (Concept only).

References and Text books -
1. Waves and Oscillations, by-Stephenson.
3. Oscillation, waves and sound, by- Sharma and Saxena.

B. Sc. First Year (Semester II)
Course- PHYSICS - Paper-II (202)
(Gravitation, Astrophysics, Magnetism and Magneto Statics)
Marks- 50                     Time-30 hours

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.

Unit II:
Astrophysics- The constituents of universe (Solar system, Stars, Galaxies), Introductory study of solar systems, To measure size of a planet (d=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).

Unit III:
Magnetism- Introduction, Magnetic materials, Langevin’s theory of diamagnetism, its application as superconductor, Critical magnetic field and Meissner effect, Langevin’s theory of para magnetism, Ferromagnetism, Ferromagnetic domain, Curie temperature, Ferrimagnetisms, Ferrites and its applications, Antiferromagnetism, Neel temperature.

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.

References and Text Books -
1. Modern’s abc of physics, Vol. II, by- Satish K. Gupta. (For Astro Physics, Unit 13).
5. Electricity and Magnetism, by- D. C. Tayal
6. Electricity and Magnetism, by- Rakshit, Chottopadhy
7. Electricity and Magnetism, by S. S. Atwood.
10. Foundation of Electrodynamics, by Theory, Rietz and Millford.

B. Sc. First Year (Semester II)

Course - Physics Practical (203)

1. A student will have to perform at least ten experiments per semester and two experiments (from different fields) at the time of university practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is-
   Two experiments (9 Marks each) - 18 Marks
   Record book - 06 Marks
   Viva Voce - 06 Marks

   Total 30 Marks

List of the experiments-
1. Acceleration due to gravity by compound pendulum.
2. To study damping of a bar pendulum.
3. To study oscillations of a rubber band and to draw potential energy curve for it.
4. To study the oscillation in a bifilar suspension arrangement.
5. To determine acceleration due to gravity by Kater’s reversible pendulum.
6. Study of Lissajous's figure
7. To determine the pressure coefficient of air by constant volume air thermometer.
8. To verify the Stefan’s law of radiation by using an incandescent lamp.
11. To determine the critical temperature and critical pressure of a gas.
12. To determine the coefficient of thermal conductivity of glass in the form of a tube.
13. To determine specific heat of a given liquid by method of cooling.
14. To find Y ratio of specific heat of gas by Clamert and Desormi's method.
15. Mechanical equivalent of heat by Calender-Barne’s constant flow method.
16. To determine the mechanical equivalent of heat (J) with the help of Joule’s calorimeter.
17. To determine temperature coefficient of resistance of platinum using platinum resistance thermometer.
18. Study of heating efficiency of electrical kettle with varying voltages.
19. To study the variation of total thermal radiation with temperature using the torch bulb filament.
20. To determine height of a building, altitude of sun and angular diameter of sun with the help of a sextant.
21. To determine the horizontal component of Earth's magnetic field and magnetic moment of the magnet.
22. To study the variation of magnetic field along the axis of a current carrying circular coil.
23. Study of magnetic field by vibration magnetometer.
24. To determine the dipole moment of a given liquid.
25. To determine magnetic susceptibility of FeCl₃.

**PHYSICS**

(B. Sc. Part- II)

Semester III
(Paper-301, 302, 303)

Semester IV
(Paper-401, 402, 403)

(2014-2015)
B. Sc. Second Year (Semester III)  
Course-PHYSICS - Paper-I (301)  
(Sound waves, Applied acoustic, Ultrasonic and Power supply)  

Marks- 50  
Time- 30 hours  

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.  

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.  

Unit III:  
Ultrasonic- Introduction, Properties and production of ultrasonic waves, piezoelectric effect, piezoelectric generator, Magnetostriction effect and oscillators, Frequency of ultrasonic waves, Application of ultrasonic waves (measurement of depth of sea, SONAR system and Medical science).  

Unit IV:  
Power supply- Introduction, rectification using half wave and full wave rectifiers (Find \(I_{dc}\), \(V_{dc}\), \(I_{rms}\), \(\eta\) and ripple 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.  

References and Text books -  
1. A Text Book of sound, by- Khanna, Bedi  
2. A Text Book of sound, by- L.P. Sharma, Saxena (S. Chand)  
6. A Text Book of Oscillations, Waves and Acoustics, by- Dr. M. Ghosh, Dr. D. Bhattacharya (S. Chand)

B. Sc. Second Year (Semester III)
Course- PHYSICS - Paper-II (302)
(Physical optics and Electromagnetic waves)

Marks- 50  Time- 30 hours

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, Fabry- Parrot Interferometer and its application.

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.

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 (Half and Quarter wave), Double prism.

Unit IV:
EM Waves- Introduction to EM spectrum related to wavelength, origin and 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 ($E_0/H_0 = \sqrt{\mu/\varepsilon}$), Characteristics impedance of dielectric, Poynting vector, Poynting theorem.

References and Text books -
1. Physics for Degree students for B. Sc. Second year, by- C. L. Arora, Dr. P. S. Hemne.
3. Optics, by- Brijlal and Subramayam.
8. Optics, by D. P. Khandelwal.
12. Electrodynamics, by Jordon

B. Sc. Second Year (Semester III)
Course - Physics Practical (303)

1. A student will have to perform at least ten experiments per semester and two experiments (from different fields) at the time of university practical examination in 6 hours.

2. The distribution of practical/laboratory work of 30 marks is-
   - Two experiments (9 Marks each) - 18 Marks
   - Record book - 06 Marks
   - Viva Voce - 06 Marks

   -------------------
   Total 30 Marks

List of the experiments-
1. Study the speed of waves on stretched string.
2. Determination of velocity of sound using volume resonator.
3. To determine frequency of A. C. Mains with a Sonometer using single/two magnetic wire.
4. To determine unknown frequency and to verify the law of inverse variation of frequency and volume of air by Helmholtz resonator.
5. To determine the velocity of sound wave in air (gas) with Kundt’s tube.
6. To determine the radius of curvature of the lower surface of a plano-convex lens by using Newton’s ring apparatus.
7. Study of wavelength of light using Newton’s ring.
8. To study the variation of the fine width with color of light.
9. To study the characteristics of micro phone.
10. Study of loudspeaker (woofer, squawker, tweeter) as a transducer.
11. Study of Piezoelectric effect.
12. To Study the current regulation and ripple factor of half wave / full wave rectifier using semiconductor diodes with L and Π type filter.
13. To study the characteristics of zener diode.
14. To study the zener diode voltage regulating characteristics.
15. To study the regulation characteristics of zener regulated and IC 741 regulated power supply.
16. To determine the velocity of ultrasonic waves in a given liquid.
17. To produce interference pattern using Lloyd’s mirror and to determine the wavelength of sodium light.
18. To determine the dispersive power of a prism.
19. Study of polarization of light by reflection (Brewster’s law).
20. To find R.I. of glass by using Brewster’s law.
21. To determine the resolving power of a grating.
22. To study diffraction at straight edge and to determine the wavelength of monochromatic light.
23. To determine the resolving power of a telescope.
25. To determine the wavelength of prominent lines of mercury by plane transmission grating.

B. Sc. Second Year (Semester IV)
Course- PHYSICS - Paper-I (401)
(Solid state physics, X-ray and Laser)

Marks- 50 Time- 30 hours

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- NaCl, diamond, CsCl, ZnS etc.

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.

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 law and Bragg’s diffraction conditions in direct and reciprocal lattice, Laue’s pattern, Bragg’s spectrometer and its applications (wavelength determination and simple cubic structure determination).

Unit IV:

References and Text books –
2. Cryptography Applied to SSP, by- O. N. Shrivastave
4. Introduction to Solid State Physics, by- C. Kettel.
5. Modern Physics, by- R. Mugadesham
6. Modern Physics, by- J. B. Rajam
7. Modern Physics, by- Kumar, Krishane, Nandeem
10. Lasers andNon linear optics. By- B. B. Laud
12. Optics and LASER, by- V. K. Sewane
13. Introduction to Lasers, by- Dr. Avadhanulu, Dr. P. S. Hemne.

**B. Sc. Second Year (Semester IV)**

**Course-PHYSICS - Paper-II (402)**

**(Solid state electronics, and Molecular physics)**

**Marks- 50**  
**Time- 30 hours**

**Unit I:**

**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.

**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.

**Unit III:**

**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 andanharmonic oscillator, Rotational-vibrational spectra, Born Oppenheimer approximation.

**Unit IV:**

**Raman spectroscopy**- Raman effect, Classical and quantum explanation, Experimental set up, Raman spectra andmolecular structure, Applications of Raman effect, Electronic spectra, Dissociation energy, Frank-Condon principle, Elementary ideas of NMR and ESR andtheir applications in spectroscopy.

**References and Text books** -

5. Basic Electronics (Solid State) by- B. C. Theraja.
6. Atomic and Molecular Physics, by- ULP publications, Prof. C. Mande.
7. Elements of Spectroscopy, by- Pragatiprakashan, Guptskumar Sharma.
9. Advanced Molecular Physics, by- Shriram and Sharma.

**B. Sc. Second Year (Semester IV)**

**Course - Physics Practical (403)**

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is-
   
   Two experiments (9 Marks each) - 18 Marks
   Record book - 06 Marks
   Viva Voce - 06 Marks

   ---------------
   Total 30 Marks

List of the experiments:
1. To determine wavelength of LASER beam using plane diffraction grating or cylindrical obstacle.
2. To study the divergence of a LASER beam.
3. To study LASER as a monochromatic coherent source.
4. Study of total internal reflection using LASER.
5. Measurement of the focal length of a given convex lens using LASER.
6. Goniometric study of crystal faces using models.
7. To construct SC, BCC, FCC and to find packing fraction, coordination number.
8. To determine lattice parameter ‘a’ of a unit cell of a cubic crystal using X-ray diffraction film.
9. To determine the energy gap of a semiconductor using four probe method.
10. To determine energy gap of a semiconductor using PN junction diode in reverse bias mode.
11. To determine the dielectric constant of a solid and its polarisability by resonance method.
13. Identification of unknown element from line emission spectra.
14. To determine the Rydberg constant for Hydrogen.
15. Study of characteristics of LED.
16. To study the characteristics of photo diode and use as light sensor (LDR).
17. Study of Solar cell as a Photo voltaic cell.
18. Study of characteristics of transistor in common base mode.
19. Study of characteristics of transistor in common emitter mode.
20. To study the variation of gain with frequency of single stage common emitter amplifier.
21. To study the frequency response of a single stage transformer coupled transistor amplifier.
22. To study variation of gain of CE amplifier with load at fixed frequency.
23. Study of characteristics of field effect transistor.
24. Study of FET as an amplifier.
25. To determine the Hybrid parameters of a transistor.
B. Sc. Final Year (Semester V)  
Course-PHYSICS - Paper-I (501)  
(Atomic physics, free electron theory and Statistical physics)  

Marks- 50  
Time- 30 hours  

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.  

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.  

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.  

Unit IV:  

References and Text books –  
1. Atomic and Molecular Physics, by- ULP publications, Prof. C. Mande.  
2. Introduction of Atomic Physics, by- White  
3. Atomic and Nuclear Physics, by- T. A. Littlefield, N. Thorley  
4. Atomic and Nuclear Physics, by- S. N. Ghoshal.  
5. Atomic Physics (Modern Physics), by- S. N. Ghoshal.  
8. Atomic and Nuclear Physics, by N. Subramanyam, Brijlal.
9. Statistical Mechanics, by Kamal Singh
10. Quantum Mechanics, Statistical Mechanics and Solid state physics, by Chattopadhyay and P. C. Rakshit

B. Sc. Final Year (Semester V)

Course-PHYSICS - Paper-II (502)
(Quantum mechanics, NanomaterialsandNanotechnology)

Marks- 50 Time- 30 hours

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.

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.

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.

Unit IV:
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).

References and Text books -
2. Fundamentals of Quantum Mechanics, by P. R. Waghmare
4. Quantum Mechanics, by Mathews and Venketesan.

**B. Sc. Final Year (Semester V)**

**Course - Physics Practical (503)**

1. A student will have to perform at least ten experiments per semester and two experiments (from different fields) at the time of university practical examination in 6 hours.
2. The distribution of practical/laboratory work of 30 marks is-
   - Two experiments (9 Marks each) - 18 Marks
   - Record book - 06 Marks
   - Viva Voce - 06 Marks

Total 30 Marks

List of the experiments-
1. To study the absorption spectra of iodine vapour and to determine its dissociation energy and force constant.
2. To estimate the temperature of sodium flame by studying the reversal of the spectral lines (D-line).
3. To determine the electric charge of an electron by Millikan’s oil drop method.
4. To determine the value of e/m of an electron by Busch’s helical beam method.
5. To determine the value of e/m of an electron by Thomson method.
6. To determine electronic charge and work function of the cathode material using photocell.
7. To determine the plank’s constant ‘h’ by vacuum type photocell using DPMS.
8. To determine Planck’s constant by photo cell.
9. To determine Planck’s constant by solar cell.
10. To determine Hall coefficient and mobility of charge carriers in a semiconductor.
11. To verify the laws of probability distribution throwing one coin, two coins and ten coins.
12. Study of statistical distribution from the given data and to find most probable, average value and RMS value.
13. Study of random decay of nuclear disintegration and determination of decay constant using one colored face dice.
14. To show that deviation of probability of an event from theoretical value decreases with increase in number of events.
15. Determination of average grain size of a particle from X-Ray diffraction spectra using Debye-Scherrer Formula.
17. Determination of size of nano particles by particle analyzer (BET).
18. To determine the transmission coefficient of a transmitting plate using photometer.
19. To determine the electro-chemical equivalent of hydrogen using Hoffman’s tube.
20. To measure A. C. / D. C. voltage using a C. R. O. and to calculate its deflection sensitivity.
21. To determine the unknown frequency/to compare the frequency of two unknown signals using C. R. O.
22. To study and trace different wave forms of oscillator using C. R. O.
23. Measurement of thermo emf.
24. To determine the concentration of sugar solution by half shade polarimeter.

B. Sc. Final Year (Semester VI)
Course-PHYSICS - Paper-I (601)
( Relativity, Nuclear physicsand Bio Physics)

Marks- 50
Time- 30 hours

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.

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.

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.

Unit IV:
Bio physics-History of bio physics, Bio Potential- compound action Potentials of the human body, Electrocardiogram for heart (ECG), Electroencephalogram for brain (EEG), Electoretinogram for eye retina (ERG), Electromyogram for muscle (EMG) and Sonography (Working mechanism).
Bioinstruments- Basic principle, construction and working of colorimeters, Spectrophotometer, PH-Meter and centrifuge measurement.

Reference and Text books -
01. Nuclear Physics, by- S. N. Ghoshal.
02. Atomic and Nuclear physics, by- N. Subramanyam, Brijlal.
03. Introduction to Nuclear physics, by-H. A. Enge.
05. Introduction to special theory of Relativity, by- Shrivastava
07. Introduction to theory of Relativity, by - P. G. Bergmann
08. Introduction to Bio Physics, by - P. Narayanan, New Age Publications.
09. Medical Instrumentation, by - Khandpur TMH.
10. Text Book of Bio Physics, by - R. N. Roy

**B. Sc. Final Year (Semester VI)**

**Course-PHYSICS - Paper-II (602)**

**(Electronics, Fiber optics, Communication and Digital electronics)**

**Marks- 50**

**Time- 30 hours**

**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.

**Unit II:**

**Fiber optics**- Importance of optical fiber, Propagation of light waves in optical fiber, Basic structure, Stepped index monomode fiber, 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.

**Unit III:**

**Communication**- Introduction, amplitude modulation - Frequency spectrum, 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.

**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 subtractor and full subtractor, Boolean equations, DeMorgan’s theorem and its verification.

**References and Text books** -

5. Laser and Optical fiber communication, by- P. Sarah.
7. Optical fiber communication, by-John M. Senior.
8. Communication Electronics, by- A. Kumar
10. Digital Principle and Application, by- Malvino and Leach
11. Digital Electronics and It’s Application, by- R. P. Jain

### B. Sc. Final Year (Semester VI)

#### Course - Physics Practical (603)

1. A student will have to perform at least **ten** experiments per semester and **two** experiments (from different fields) at the time of university practical examination in 6 hours.

2. The distribution of practical/laboratory work of 30 marks is-
   - Two experiments (9 Marks each) - 18 Marks
   - Record book - 06 Marks
   - Viva Voce - 06 Marks

<table>
<thead>
<tr>
<th>Total</th>
<th>30 Marks</th>
</tr>
</thead>
</table>

List of the experiments-

1. To draw the histogram of theoretical Gaussian curve.
2. Recording and analysis of ECG Signals.
3. Verification of Beer’s- Lambert’s law.
4. To determine pH value of Amino acids.
5. Measurement of BP and recording of Kortov sound.
7. Measurement of skin resistance using GSR.
8. To draw the plateau curve of a given Geiger Mueller counter
12. To construct and study the working of a phase shift oscillator.
15. Study of Amplitude modulation.
16. Study of diode as an AM detector.
17. Study of diode as clipper, clamper and voltage doublers.
18. Study of Frequency modulation using IC.
19. Study of FM detector using IC.
20. Study of basic gates (AND, OR, NOT)
21. Study of logic gates (using IC) and verification of De Morgan’s theorem.
22. To study the characteristics of NAND/NOR gate and its use as a universal gate.
23. Verification of laws of Boolean algebra using NAND gate.
24. Study of Ex- OR gate as a half adder and full adder.
25. Study of Ex- OR gate as a half subtractor and full subtractor.

Books for Experimental Physics –

5. Laboratory Physics, Part A and B, by- Berkeley Physics Laboratory.
9. Introduction to Experimentation, by- B. J. Brinkwork(The English University Press Ltd.).
11. Experimental Physics, by-C. Daish( Hodderand Sons, 1970).
16. Experiments in Modern Physics, by-Olon.
18. Advanced Practical Physics, by S. S. Sharma (Business Promotion Bureau, Delhi).
19. B. Sc. Practical Physics by- Harnam Singh (S Chand).
21. Experiments in Electronics, by-S. V. Subramanyam( Macmillan India Ltd.).
22. Experimental Crystal Physics, by-W. A. Wooster, A. Breton.


27. Solar Cells, by M. A. Green.