B.Sc. (Physics) Syllabus (2012)

Semester	Paper	Paper nos.	Marks
Semester I	Paper I	PHY01(T)	100
Semester II	Paper II	PHY02(T)	60
Semester II	Paper II	PHY02(P)	40
Semester III	Paper III	PHY03(T)	60
Semester III	Paper III	PHY03(P)	40
Semester IV	Paper IV	PHY04(T)	60
Semester IV	Paper IV	PHY04(P)	40
Semester V	Paper V	PHY05(T)	70
Semester V	Paper V	PHY05(P)	30
Semester V	Paper VI	PHY06(T)	70
Semester V	Paper VI	PHY06(P)	30
Semester VI	Paper VII	PHY07(T)	70
Semester VI	Paper VII	PHY07(P)	30
Semester VI	Paper VIII	PHY08(T)	70
Semester VI	Paper VIII	PHY08(P)	30

Note: T = Theory; P = Practical

GENERAL NOTES ON THE SYLLABUS

1. The duration of examination for each theory paper will be of three hours.

2. Marks distribution of theory papers will be as follows:

	Full Marks	**Questions**
PHY01(T)	100	One compulsory problem oriented question carrying 20 marks and 4 other questions from the remaining 7 questions.
PHY02(T), PHY03(T) & PHY04(T)	60	One compulsory problem oriented question carrying 12 marks and 4 other questions out of the remaining 7 are to be answered each carrying 12 marks.

PHY05(T), PHY06(T), PHY07(T) & PHY08(T)	70	One compulsory problem oriented question carrying 14 marks and 4 other questions from the remaining 7 questions are to be answered each carrying 14 marks.

3. The Practical Examinations for each paper in B.Sc. that is PHY02(P), PHY03(P) , PHY04(P), PHY05(P) , PHY06(P), PHY07(P) and PHY08(P) will be of six hours duration and each student has to perform one experiment in the examination.

Semester-I

PHY01(T)
(Lectures =150)
(Marks = 100)

Mechanics, Optics, Acoustics

UNIT-I

Inertial and Non-inertial frames: Components of velocity and acceleration in different co-ordinate systems (planar motion only). Uniformly rotating frame, centripetal force and coriolis force with applications.

Central forces: Conservative nature of central forces, gravitational potential and field due to a thin spherical shell and solid sphere.

Systems of many particles: Motion of the centre of mass, linear momentum and angular momentum of system of particles, elastic and inelastic collisions, loss of kinetic energy due to direct impact of inelastic collision of two rigid bodies.

Relativity: Galilean relativity and its failure. Galilean transformations. Michelson-Morley experiment. Basic postulates of special relativity. Lorentz transformation, length contraction, simultaneity, time dilation,. Einstein velocity addition rule. Variation of mass with velocity, mass energy equivalence. (35)

UNIT-II

Degrees of freedom: Moment of inertia – parallel and perpendicular axes theorems, moment of inertia of shell, solid sphere, disk and cylinder about axis of symmetry. Euler's equations for force free motion of rigid bodies.

Hooke's law, elastic constants for an isotropic solid, inter relationship of elastic constants, torsion of cylinder, bending of beams, cantilever (weightless) supporting weights at free ends, beam supported at both ends.

Equation of continuity for fluids, Bernoulli's theorem (with proof and applications), fluid motion through a capillary tube(streamline flow), Poiseuille's equation, surface tension, capillarity and formation of droplets, pressure on the curved surface of a liquid, excess pressure inside an air bubble. (30)

UNIT III

Fermat's principle: Principle of extremum path. Application of Fermat's principle to reflection and refraction at plane and curved boundaries.

General theory of image formation: Cardinal points of an optical system, refraction through a thick lens , relation between the distances of cardinal points, combination of thin lens separated by a distance, cardinal points of Ramsden and Huygen's eye pieces, ideas of matrix optics, lens formula by matrix method.

Aberration in images: Chromatic aberration, achromatic combination of lenses in contact and separated lenses. Monochromatic aberrations and their reductions, aplanatic points of a sphere with proof, oil immersion objectives.

Optical instruments: eyepieces- Ramsden and Huygens. Relative merits and demerits of Ramsden and Huygen's eyepiece.

(25)

UNIT IV

Interference of light: Fringes produced by a wedge-shaped thin film, fringes of equal thickness and equal inclination, Haidinger fringes. Theory of Newton's rings and experimental determination of wavelength of monochromatic light. Michelson interferometer, construction and production of fringes, its applications for the determination of wavelength, wavelength difference, standardization of the metre. Intensity distribution in multiple beam interference. Fabry-Perot interferometer, construction and production of fringes.

Diffraction of light: Fresnel diffraction, Fresnel half period zones, zone plates, straight edge, rectilinear propagation. Fraunhofer diffraction: Diffraction from a double-slit, N slits, theory of plane diffraction grating. Resolution of images, resolving power of Fabry-Perot interferometer and plane gratings.

Polarization: Different methods of polarization, methods of producing elliptically and circularly polarized light. Quarter wave plate and half wave plate, double refraction in uniaxial crystals (its electromagnetic theory). Rotation of plane of polarization, Fresnel's theory of optical rotation.

Dispersion and scattering: Theory of dispersion of light, absorption bands, normal and anomalous dispersion. Theory of Rayleigh scattering. (40)

UNIT V

Velocity of sound in fluid and solid. Ultrasonics: Production, detection and applications of ultrasonic waves. Principle of ultrasonography.

Sound and Noise: Intensity of sound, bel and decibel, limit of human audibility. Noise and noise reduction (qualitative discussions only).

Acoustics of buildings: Requirements of good auditorium, reverberation and optimum reverberation, Sabine's formula for reverberation time, live and dead room. (20)

Text Books recommended:

1. H. Chatterjee & R. Sengupta, A Treatise of General Properties of Matter, Central Book Agency Ltd. (2004)
2. A.B. Bhattacharya, R. Bhattacharya, Undergraduate Physics, Vol I, New Central Book Agency Pvt Ltd-(2007).
3.D.S. Mathur, Elements of Properties of Matter, S. Chand & Co. (2006)
4. N .Subramanyam , Brij Lal, A Text Book of Optics, S.Chand & Co (2005).
5. A.K.Ghatak, Physical Optics, Tata McGraw Hill of India, 2nd Edition (1997)
6 B.Ghosh, Principles of Acoustics, Sreedhar Publishers (2004)
7 A.B. Gupta, Modern Optics, Books and Allied (P) Ltd.(2006)

Reference Books recommended

1. H. Goldstein, C. Poole and J. Safko, Classical Mechanics, Pearson (2002).
2. J.C. Upadhyay ,Classical Mechanics, Himalaya Publishing House (2005)
3.G. Aruldhas ,Classical Mechanics, Prentice Hall of India (2008)
4.Chakrabarti and Chowdhury, A Text book on Waves and Acoustics, Central 2nd Edition (1982.)
5.P. K Chakrabarti, Geometrical and Physical Optics , New Central Book Agency (P) Ltd. (1997)
6. A.B. Bhattacharjee & R. Bhattacharjee , University Physics I , New Central Book Agency (2007).

Semester –III

PHY03(T) Thermal Physics, Waves
(Lectures =90) (Marks=60)

UNIT I

Review of kinetic theory of gases. Limitations of the perfect gas equation PV=RT. Van der Waals correction, Van der Waals equation and evaluation of critical constants of a gas. Law of equipartition of energy with proof and its application to obtain $\gamma = C_P/C_V$ of a gas, determination of γ by Ruchartd's method.

Transport phenomena: Concept of calculation of mean free path, Claussius mean free path and estimation of molecular diameter. Viscosity and thermal conductivity of a gas. Theory of Brownian motion (Einstein's approach).

Laws of thermodynamics: The zeroth law, indicator diagram, work done, the first law, internal energy. Reversible and irreversible changes, Carnot cycle, Carnot theorem, second law of

thermodynamics, entropy as thermodynamic variable, principle of increase of entropy, entropy of a perfect gas, entropy and unavailable energy. Thermodynamic scale of temperature and its identity with perfect gas scale. Impossibility of attaining absolute zero, third law of thermodynamics.

(25)

UNIT II

Liquefaction of gases. Boyle temperature and inversion temperature. Principle of regenerative cooling and cascade cooling.

Black body radiation, temperature dependence, Planck's quantum postulate, Planck's Law, Stefan-Boltzmann law, pressure of radiation, spectral distribution of black body radiation. Wein displacement law, Rayleigh-Jeans laws, agreement with experiment.

Phase space, μ-space, Γ-space, Gibb's ensemble, division of phase space into phase cells and volume of a phase cell, calculation of number of states in terms of volume in phase space. Qualitative ideas of microcanonical, canonical and grand canonical ensembles with examples. (20)

UNIT III

Simple harmonic motion: Superposition of two SHM's acting at right angles to each other having (a) same frequencies and (b) different frequencies in the ratio 1:2. Lissajous figures and their uses. Oscillations of two masses connected by a spring.

Damped and forced oscillations : Damped SHM, energy of damped SHM, Q-value of damped oscillations , forced vibrations with one degree of freedom, transient and steady state oscillations, power in forced vibrations, sharpness of resonance and quality factor.

Waves: Linear equation of plane progressive wave and its general solution. Plane waves and spherical waves. Energy and energy density of plane progressive waves.

Waves in continuous media: Speed of transverse waves on a uniform string, speed of longitudinal waves in a fluid, interference of sound waves, combination of tones. Group velocity and phase velocity.

Vibrating Strings: Theories of plucked string and struck string. Energy of vibrating strings.

Fourier Analysis: Fourier series and Fourier coefficients, simple examples – square wave, saw-tooth wave, triangular wave. Fourier analysis of non-periodic functions. (30)

UNIT IV

Failure of classical physics. Old quantum theory. Wave nature of matter and de-Broglie relation. Demonstration of probabilistic nature of quantum mechanics by the two-slit experiment. Statement and significance of Heisenberg uncertainty principle and illustration of this principle by a single-slit electron diffraction and Heisenberg's microscope. Application of uncertainty principle to prove the non-existence of electron in the nucleus and calculation of binding energy of electron in hydrogen atom.

Concept of wave function and physical interpretation of the wave function. Normalization of a wave function with examples. Derivation of one dimensional time-dependent and time-independent Schrodinger equations (without use of operator).

(15)

Text Books recommended:

1. M.W. Zemansky & R.H. Dittman, Heat and Thermodynamics, McGraw Hill, Singapore, 7th Edition, 1997.
2. B.K. Agarwal and M. Eisner,Statistical Mechanics, New Age International Publishers,2nd Edition, 1998.
3. H.J Pain, The Physics of Vibrations and Waves, John Wiley & Sons 3rd Edition (1998)
4. B. Ghosh , Principles of Acoustics, Shreedhar Publishers-1992
5. S.N. Sen, Acoustics, Waves and Oscillations, New Age Int. (2002)
6.Undergraduate Physics , A.B.Bhattacharya , New Central Book Agency (2007)
7.R .N. Choudhuri, Waves and Oscillations, New Age Int. (2007).
8. A.K. Ghatak and S. Lokanathan, Quantum Mechanics, Mc Millan, 1992.
9.P. T. Mathew Quantum Mechsnics, Tata McGraw Hill-1978
10. R. Murugeshan, Modern Physics, S.Chand & Co., 2006.

Reference Books recommended:

1. B.B. Laud ,Fundamental Statistical Mechanics, New Age International Publishers, 1994.
2. Franks Crawford, Waves: Berkeley Physics Course (SIE), Tata Mc Graw Hill, 2007.

PHY03(P) **List of experiments** Marks = 40

1. Determination of the co-efficient of linear expansion of a solid by using Pullinger's apparatus and optical lever.
2. Determination of the specific heat of a liquid by the method of cooling.
3. Determination of the co-efficient of thermal conductivity of a good conductor by Searle's method.
4. Determination of the refractive index of a prism by a spectrometer using monochromatic light.
5. Determination of the magnifying power of a telescope by angular method.
6. Determination of the radius of curvature of a lens by Newton's ring method.
7. Determination of the grating constant by using a spectrometer.
8. Determination of the power of the combination of two thin convex lenses in contact by displacement method.
9. Determination of the speed of waves on stretched strings.
10. Determination of the frequency of a tuning fork by Melde's method.

Text Books recommended:

1. C.L. Arora, B.Sc. Practical Physics, S Chand (2005)
2. S. Ghosh, A Text Book of Practical Physics, New Central Book (2001)
3. K.G. Mazumdar A Text Book on Practical Physics , Syndicate Press (2006).

4. B.L. Worsnop and H.T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.-1984
5.M. Nelkon and Jon Ogborn, Advanced level Practical Physics.4th Edition . -2006
6.D.P. Khandelwal, A laboratory manual of Physics for Undergraduate classes, Vani Publication House.-1985
7. Chauhan & Singh, Advanced Practical Physics, Pragati Prakashan.-2002
8. B. Saraf et al, Physics through experiments Vol I & II-1975

Semester –V

PHY05(T) Mathematical Physics, Quantum Mechanics
(Lectures =105)
(Marks = 70)

UNIT I

Vectors: Gradient of a scalar, divergence and curl of a vector field, line, surface and volume integrals, flux of a vector field, Gauss' divergence theorem, Green's theorem, Stokes' theorem (with proofs).

Curvilinear co-ordinates, orthogonal curvilinear co-ordinates. Conditions for orthogonality. Gradient in terms of curvilinear co-ordinates, divergence and curl in terms of curvilinear co-ordinates. Laplacian in terms of orthogonal curvilinear co-ordinates, cylindrical and spherical polar co-ordinates as a special curvilinear system.

Matrices: Different types of matrices, properties of symmetric, skew- symmetric, hermitian and skew-hermitian matrices. Characteristic equation, eigenvalues and eigenvectors of a matrix and diagonalization of matrix (only for 2x2 matrices).

Complex variables: Preliminary ideas of Complex number, functions of complex variables, analytic functions, Cauchy-Riemann conditions, Cauchy's theorem (with proof), Cauchy's integral formulae (with proof), simply and multiply connected regions. Taylor series and Laurent series (both without proof), poles and residues, Cauchy residue theorem (with proof), application of residue theorem in integrals of functions having

imple poles. (24)

UNIT II

Ordinary differential equations: General method of solutions of second order linear equations, meaning of ordinary point, singular point and regular singular point. Frobenius method of solution.

(a) Legendre polynomial: Convergent solution of Legendre differential equation, its transformation to polynomial solution $P_n(x)$. Generating function of $P_n(x)$, recurrence relation for $P_n(x)$, Rodrigue's formula for $P_n(x)$, orthogonality of $P_n(x)$. Calculation of potential and intensity at a point for an electric dipole with the help of $P_n(x)$.

(b) Hermite Polynomial:
Convergent solution of Hermite differential equation, its transformation to polynomial solution $H_n(x)$. Generating function, recurrence relations, Rodrigue's formula, orthogonalityof $H_n(x)$.

Partial differential equations: Solutions of partial differential equations by the method of separation of variables. Application to solution of : heat flow equation in one dimension, equation of vibrating string, Laplace's equation in two dimension (cartesian and polar co-ordinates). (24)

UNIT III

Gamma and Beta functions:
Definition of gamma and beta functions as definite integrals, recursion formula for gamma functions, evaluation of $\Gamma(1/2)$. Relationship between gamma and beta functions, Legendre Duplication formula, Evaluation of definite integrals of the types:

$$\int_0^\infty x^2 e^{-ax^2}\,dx \;;\quad \int_0^\infty \frac{x^3}{e^x-1}\,dx \;;\quad \int_{-\infty}^{+\infty} e^{-ax^2+bx}\,dx$$

Tensor analysis: Concept of tensor with examples, contravariant and covariant tensors up to rank 2, mixed tensors, addition and subtraction, outer and inner products of tensors, contraction of a tensor, symmetric and anti-symmetric tensors, the Kronecker delta. (9)

UNIT IV

Particle as a wave packet, Gaussian wave packet, phase velocity and group velocity, velocity of wave packet, spreading of a wave packet, probability density, probability current density, conservation of probability density.

Postulates of quantum mechanics, quantum mechanical operators, eigenvalues and eigenvectors of an operator, Schrodinger equation as an operator equation, Hamiltonian operator, Hermitian operator and its properties, adjoint of an operator, linear operator, commutation and anti-commutation of operators, momentum operator, energy operator, matrix representation of an operator.

Expectation values of an operator with examples, Ehrenfest theorem. Derivation of Heisenberg's uncertainty relation $\Delta p_x \Delta x \geq \hbar/2$ by operator method.(24)

UNIT-V

One-dimensional applications of time independent Schrodinger equations: particle in an infinitely-deep potential well, quantum tunneling through a potential barrier, step potential-reflection and transmission coefficients, particle in a shallow well and linear harmonic oscillator.

Angular momentum: Orbital angular momentum operators in Cartesian coordinates and their commutation relations, e.g. $[l_i, l_j]$ and $[l_i, l^2]$. Angular momentum operators in spherical polar coordinates; eigenvalues and eigenvectors of l_z and l^2 ; spin operators and their eigenvalues and eigenvectors, Pauli's spin operators and their properties. Schrodinger equation for hydrogen atom in spherical polar coordinates, separation into radial part and angular part, solution of the radial equation for obtaining energy eigenvalues. (24)

Text Books recommended:

1. B.D. Gupta, *Mathematical Physics*, Vikash Publishing House, (2002)
2. A.W. Joshi, Matrices and Tensors, Wiley Eastern (2004)
3. A.K. Ghatak and S. Lokanathan, Quantum Mechanics, Mc Millan, 1992.
4. S. Gasiorowicz., Quantum Physics, John Wiley (2005).
5. G. Aruldhas, Quantum Mechanics, Prentice Hall of India (2002)

Reference Books recommended:

1. G.Arfken, *Mathematical methods for Physicists*, Academic Press Inc.(Indian edition- Prism Book Pvt. Ltd. 53/2 Bull Temple Road, Basabanagudi, Bangalore- 560019, India)- 2005

2. Schaum's outline series: Murray R Spiegel, *Vector Analysis and an introduction to Tensor Analysis*, Mc Graw Hill (2002)

3. Schaum's outline series: Murray R Spiegel, *Comp. Variables*, Mc Graw Hill, (2002)

4. C. Harper, *Introduction to Mathematical Physics*, Prentice Hall of India Pvt. Ltd.(1993)
5. Mathew and Walker, Mathematical Physics -1971
6. W. Greiner, Quantum Mechanics (An Introduction), Springer (2001).

PHY05(P) **List of experiments** Marks = 30

1. Determination of the co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Determination the velocity of ultrasonic waves in liquid.
3. To measure the width of single slit from the study of its Fraunhoffer diffraction.
4. Determination of the wavelength of sodium light using biprism.
5. Determination of the specific rotation of solution using polarimeter.

Text Books recommended:

1:C.L. Arora, B.Sc. Practical Physics, S Chand (2005)
2. S. Ghosh, A Text Book of Practical Physics, New Central Book (2001)
3. K.G. Mazumdar, A Text Book on Practical Physics , Syndicate Press (2006)
4. S. Ghosh, A Text Book of Advanced Practical Physics, New Central Book (2001).
5. B.L. Worsnop and H.T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.-1991

6.M.Nelkon and Jon Ogborn, Advanced level Practical Physics .4th Edition-2006

7. D.P. Khandelwal, A laboratory manual of Physics for Undergraduate classes, Vani Publication House.-1985
8. Chauhan & Singh, Advanced Practical Physics, Pragati Prakashan.-2002
9. B. Saraf et al, Physics through experiments Vol I & II-1975

PHY06(T) Electrodynamics, Electronics-II
(Lectures =105)
(Marks = 70)

UNIT I

Differential form of Gauss' law-Poisson and Laplace's equations, Uniqueness theorem (with proof). Maxwell's equations for time dependent electromagnetic field in vacuum and in material media, boundary conditions.

Electric field inside matter: Polarization and polarization vector, potential and field due to polarized matter, applied to sphere. Gauss' Law in dielectric and the displacement field, electric susceptibility and dielectric constant, boundary conditions satisfied by **E** and **D** at the interface between two homogeneous dielectrics, dielectric sphere in a uniform field, capacitor filled with dielectrics, polar and non-polar molecules, induced dipoles, Clausius-Mossoti relation. (22)

UNIT II

NAMELIST statement
COMMON statement
EQUIVALENCE statement
EXTERNAL statement
END statement
OPEN FILE statement.

(20)

Text Books recommended:

1. D.J. Griffith, Introduction to Electrodynamics, PHI, 3rd edition (2004)
2. B.B. Laud, Electromagnetics, New Age Pub. 2nd edition, (1987) reprint, 2005
3. D.C. Tayal, Electricity & Magnetism, Himalaya Pub. (1998)
4. J.D. Jackson, Classical Electrodynamics, 3rd edition, Wiley, New York 1998.
5. B.L. Theraja, Basic Electronics, S. Chand & Co. (2005).
6. S.L. Gupta & V. Kumar, Handbook of Electronics, Pragati Prakashan. Latest Edn. (2004).
7. D.C. Tayal, Basic Electronics, Himalaya Publications (2005).
8. C. Xavier, Fortran 77 and Numerical Analysis, New Age International (2001)
9. V. Rajaraman, Computer Programing in Fortran 77, PHI (2001)

Reference Books recommended:

1. E. M. Purcell, Berkeley Physics Course, *Electricity and magnetism*, McGraw Hill, 1965.
2. Edward C. Jordan & Keith G. Balmain, *Electromagnetic waves and Radiating systems*, Prentice Hall of India Pvt. Ltd.(Eastern Economy Edition- 2nd Edition 2000 Indian reprint)

8. Chauhan & Singh, Advanced Practical Physics, Pragati Prakashan.
9. B. Saraf et al, Physics through experiments Vol I & II

PHY06(T) Electrodynamics, Electronics-II
(Lectures =105)
(Marks = 75)

UNIT I

Differential form of Gauss' law-Poisson and Laplace's equations, Uniqueness theorem (with proof). Maxwell's equations for time dependent electromagnetic field in vacuum and in material media, boundary conditions.

Electric field inside matter: Polarization and polarization vector, potential and field due to polarized matter, applied to sphere. Gauss' Law in dielectric and the displacement field, electric susceptibility and dielectric constant, boundary conditions satisfied by **E** and **D** at the interface between two homogeneous dielectrics, dielectric sphere in a uniform field, capacitor filled with dielectrics, polar and non-polar molecules, induced dipoles, Clausius-Mossoti relation. (22)

UNIT II

Electromagnetic Potentials: Magnetic vector potential A and scalar potential Φ, Poisson's equation for A in terms of current density, solution for line and surface current, calculation of vector potential for an infinitely long solenoid. Gauge transformations, Coulomb and Lorentz gauge.

Electromagnetic waves: The wave equation, plane wave solution for Maxwell's equations, orthogonality of E, B and propagation vector. Poynting vector, energy and momentum propagation, reflection and transmission at dielectric boundaries, normal incidence. (23)

UNIT III

FET. Similarities and dissimilarities of FET and BJT, JFET, static and transfer characteristics of JFET, pinch off voltage, idea of MOSFET.

Ideal OP AMP, differential amplifier, transfer characteristics of OP AMP, offset parameters, differential gain, CMRR. Applications of OP AMP as adder, integrator and differentiator.

Multistage amplifiers, analysis of RC coupled CE amplifier, transformer coupled amplifier, feedback amplifiers, gain with feedback. Analysis of Colpitt's and Hartley's oscillators.

Elements of communication systems, features of radio communication, elementary aspects of optical communication, optical fibres. (25)

UNIT-IV

Digital signals, analog vs digital, binary system, binary to decimal and decimal to binary, binary arithmetic-addition and subtraction, signed binary numbers, two's complement scheme.

Boolean algebra (elementary aspects only), de'Morgan's theorems, TTL Logic families, multiplexer, demultiplexer, digital comparator. (15)

UNIT V

Classification of computers: analog and digital. Flowchart and algorithm , to determine the roots of a of a quadratic equation, summation of arithmetic series. Fortran (77) characters: integer, constant, real constant, complex constant, logical constant. Fortran variables: real variables, double precision, logical variables, subscripted variables, arrays. Library functions.

Fortran statements :

(A) Executable statements :(with illustration):

(i) Assignment statement

(ii) Input statement: formatted and unformatted

(iii) Control statement and its classification, i.e.

(a) GOTO statement, unconditional GOTO statement, computed GOTO statement and assigned GOTO statement

(b) IF statement: arithmetic IF, logical IF, IF THEN, ELSE, ENDIF.

(c) DO statement: DO loop, ENDDO.

(d) CONTINUE statement

(e) STOP statement

(f) PAUSE

(iv) Output statement: formatted and unformatted

(v) RETURN statement (related to subprogram)

(B) Non-executable statement(with examples and illustration)

DIMENSION statement

IMPLICIT statement

EXPLICIT statement

FORMAT statement

NAMELIST statement

COMMON statement

EQUIVALENCE statement

EXTERNAL statement

END statement

OPEN FILE statement

Text Books recommended:

1. D.J. Griffith, Introduction to Electrodynamics, PHI, 3rd edition (2004)
2. B.B. Laud, Electromagnetics, New Age Pub. 2nd edition, (1987) reprint, 2005
3. D.C. Tayal, Electricity & Magnetism, Himalaya Pub. (1998)
4. J.D. Jackson, Classical Electrodynamics, 3rd edition, Wiley, New York 1998.
5. B.L. Theraja, Basic Electronics, S. Chand & Co. (2005).
6. S.L. Gupta & V. Kumar, Handbook of Electronics, Pragati Prakashan. Latest Edn. (2004).
7. D.C. Tayal, Basic Electronics, Himalaya Publications (2005).
8. C. Xavier, Fortran 77 and Numerical Analysis, New Age International (2001)
9. V. Rajaraman, Computer Programing in Fortran 77, PHI (2001)

Reference Books recommended:

1. E. M. Purcell, Berkeley Physics Course, *Electricity and magnetism*, McGraw Hill, 1965.
2. Edward C. Jordan & Keith G. Balmain, *Electromagnetic waves and Radiating systems*, Prentice Hall of India Pvt. Ltd.(Eastern Economy Edition- 2nd Edition 2000 Indian reprint)
3. J. R. Reitz, F. J. Milford and R. W. Christy, *Foundations of Electromagnetic theory*, Narosa Publishing House, 3rd edition,1993.
4. J. D. Ryder, Electronics Fundamentals and Applications, Prentice Hall of India Pvt. Ltd.(2003).

5. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India Pvt. Ltd. (2004).
6. V. K. Mehta and R. Mehta, Principles of Electronics, S. Chand & Co. (2005).
7 A.B. Bhattacharjee, R. Bhattacharjee, University Physics II, New Central Book Agency 2007
8.The Feynman Lectures on Physics Vol II, Pearson Education India , 2008

PHY06(P) **List of experiments** Marks = 25

1. Determination of Young's modulus (Y) of glass using Cornu's Method.
2. Determination of Plank's constant by photocell or by heating method.
3. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method.
4. Determination of the forward and reverse bias characteristics of a Zener diode and to measure the value of breakdown voltage.
5. Determination of the reduction factor of a tangent. galvanometer and also the value of horizontal component of earth's magnetic field by electrolysis method.
6. Determination of the monochromatic wavelength by Michelson interferometer.

Text Books recommended:

1.C.L. Arora, B.Sc. Practical Physics, S Chand (2005)
2. S. Ghosh, A Text Book of Practical Physics, New Central Book (2001)
3. K.G. Mazumdar, A Text Book on Practical Physics , Syndicate Press (2006)

3. J. R. Reitz, F. J. Milford and R. W. Christy, *Foundations of Electromagnetic theory*, Narosa Publishing House, 3rd edition,1993.
4. J. D. Ryder, Electronics Fundamentals and Applications, Prentice Hall of India Pvt. Ltd.(2003).
5. B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India Pvt. Ltd. (2004).
6. V. K. Mehta and R. Mehta, Principles of Electronics, S. Chand & Co. (2005).
7 A.B. Bhattacharjee, R. Bhattacharjee, University Physics II, New Central Book Agency 2007
8.The Feynman Lectures on Physics Vol II, Pearson Education India , 2008

PHY06(P) **List of experiments** Marks = 30

1. Determination of Young's modulus (Y) of glass using Cornu's Method.
2. Determination of Plank's constant by photocell or by heating method.
3. Determination of the specific charge (e/m) of an electron by magnetron/Thomson's method.
4. Determination of the forward and reverse bias characteristics of a Zener diode and to measure the value of breakdown voltage.
5. Determination of the reduction factor of a tangent. galvanometer and also the value of horizontal component of earth's magnetic field by electrolysis method.
6. Determination of the monochromatic wavelength by Michelson interferometer.

Text Books recommended:

1.C.L. Arora, B.Sc. Practical Physics, S Chand (2005)
2. S. Ghosh, A Text Book of Practical Physics, New Central Book (2001)
3. K.G. Mazumdar, A Text Book on Practical Physics , Syndicate Press (2006)
4. S. Ghosh, A Text Book of Advanced Practical Physics, New Central Book (2001).
5. B.L. Worsnop and H.T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.-1991
6.M.Nelkon and Jon Ogborn, Advanced level Practical Physics .4th Edition.-2006
9. D.P. Khandelwal, A laboratory manual of Physics for Undergraduate classes, Vani Publication House.-1985
10. Chauhan & Singh, Advanced Practical Physics, Pragati Prakashan.2002
9. B. Saraf et al, Physics through experiments Vol I & II-1975