CORE COURSE (HONOURS IN PHYSICS)

Semester I

Time – 3hrs F.M.: 100 [60(End sem)+15(Int)+25(Pr)] Credit- 6

PHYSICS-CC I: MATHEMATICAL
PHYSICS-I (Credits: Theory-04, Practicals- 02)
Theory: 40 Classes (1 hr duration)

The emphasis of course is on applications in solving problems of interest to physicists.
The students are to be examined entirely on the basis of problems, seen and unseen.

UNIT-I

Calculus:

Calculus of functions of more than one variable: Partial derivatives, exact and inexact differentials. Integrating factor, with simple illustration. Calculus of variation: Euler equation, Constrained Maxima/ minima using Lagrange Multipliers. **(4 Lectures)**

Dirac Delta function and its properties:

Definition of Dirac delta function. Representation as limit of a Gaussian function and rectangular function. Properties of Dirac delta function **(3 Lectures)**

UNIT-II

Orthogonal Curvilinear Coordinates:

Orthogonal Curvilinear Coordinates. Derivation of Gradient, Divergence, Curl and Laplacian in Cartesian, Spherical and Cylindrical Coordinate Systems. Comparison of velocity and acceleration in cylindrical and spherical coordinate system. **(7 Lectures)**

UNIT-III

Vector Calculus:

Recapitulation of vectors: Properties of vectors under rotations. Scalar product and its in variance under rotations. Vector product, Scalar triple product and their interpretation in terms of area and volume respectively. Scalar and Vector fields. **(5 Lectures)**

UNIT-IV

Vector Differentiation: Directional derivatives and normal derivative. Gradient of a scalar field and its geometrical interpretation. Divergence and curl of a vector field. Del and Laplacian operators. Vector identities, **(8 Lectures0**

UNIT-V

Vector Integration: Ordinary Integrals of Vectors. Multiple integrals, Jacobian. Notion of infinitesimal line, surface and volume elements. Line, surface and volume integrals of Vector fields. Flux of a vector field. Gauss' divergence theorem, Green's and Stokes Theorems and their applications (no rigorous proofs). **(13 Lectures)**

Reference Books:

- Mathematical Methods for Physicists, G.B. Arfken, H.J. Weber, F.E. Harris, 2013,7th Edn., Elsevier.
- An introduction to ordinary differential equations, E.A. Coddington, 2009, PHI learning.
- Calculus of variations: Eulers equation, Constrained Maxima/Minima using Langragian Multipliers
- Differential Equations, George F. Simmons, 2007, McGraw Hill.
- Mathematical Tools for Physics, James Nearing, 2010, Dover Publications.
- Mathematical methods for Scientists and Engineers, D.A. McQuarrie, 2003, Viva Book
- Advanced Engineering Mathematics, D.G. Zill and W.S. Wright, 5 Ed., 2012, Jones and Bartlett Learning
- Advanced Engineering Mathematics, Erwin Kreyszig, 2008, Wiley India.
- Essential Mathematical Methods, K.F.Riley&M.P.Hobson, 2011, Cambridge Univ. Press
- Mathematical Physics and Special Relativity --M. Das, P.K. Jena and B.K. Dash (Sri Krishna Prakashan) 2nd Edition 2009
- Mathematical Physics--H. K. Dass, Dr. Rama Verma (S. Chand Higher Academics) 6th Edition 2011.
- Mathematical Physics –C. Harper, (Prentice Hall India) 2006.
- Mathematical Physics-Goswami (Cengage Learning) 2014
- Mathematical Method for Physical Sciences -- M. L. Boas (Wiley India) 2006

PHYSICS LAB- CC - I LAB:
20 Classes (2 hr duration)

The aim of this Lab is not just to teach computer programming and numerical analysis but to emphasize its role in solving problems in Physics.

- *Highlights the use of computational methods to solve physical problems*
- *The course will consist of lectures (both theory and practical) in the Lab*
- *Evaluation done not on the programming but on the basis of formulating the problem*
- *Aim at teaching students to construct the computational problem to be solved*
- *Students can use any one operating system Linux or Microsoft Windows*

Topics	Description with Applications
Introduction and Overview	Computer architecture and organization, memory and Input/output devices.
Basics of scientific computing	Binary and decimal arithmetic, Floating point numbers, algorithms, Sequence, Selection and Repetition, single and double precision arithmetic, underflow &overflow emphasize the importance of making equations in terms of dimensionless variables, Iterative methods.
Errors and error Analysis	Truncation and round off errors, Absolute and relative errors, Floating point computations.
Review of C & C++ Programming fundamentals	Introduction to Programming, constants, variables and data types, operators and Expressions, I/O statements, scanf and printf, c in and c out, Manipulators for data formatting, Control statements (decision making and looping statements) (*If---statement. If---else Statement. Nested if Structure. Else---if Statement. Ternary Operator.*
	Goto Statement. Switch Statement. Unconditional and Conditional Looping. While Loop. Do-While Loop. FOR Loop. Break and Continue Statements. Nested Loops), Arrays (*1D & 2D*) and strings, user defined functions, Structures and Unions, Idea of classes and objects
Programs:	Sum & average of a list of numbers, largest of a given list of numbers and its location in the list, sorting of numbers in ascending descending order, Binary search
Random number generation	Area of circle, area of square, volume of sphere, value of π.

Referred Books:

- Introduction to Numerical Analysis, S.S. Sastry, 5thEdn. , 2012, PHI Learning Pvt. Ltd.
- Schaum's Outline of Programming with C++. J. Hubbard, 2000, McGraw---Hill Pub.
- Numerical Recipes in C: The Art of Scientific Computing, W.H. Pressetal, 3rdEdn. 2007, Cambridge University Press.
- A first course in Numerical Methods, U.M. Ascher& C. Greif, 2012, PHI Learning.
- Elementary Numerical Analysis, K.E. Atkinson, 3rdEdn. , 2007 , Wiley India Edition.
- Numerical Methods for Scientists & Engineers, R.W. Hamming, 1973, Courier Dover Pub.
- An Introduction to computational Physics, T. Pang, 2nd Edn., 2006,Cambridge Univ. Press.

CORE COURSE (HONOURS IN PHYSICS)

Semester I

PHYSICS-CC II: MECHANICS

(Credits: Theory-04, Practicals-02) Theory: 40 Classes (1hr duration)

Time – 3hrs F.M.: 100 [60(End sem)+15(Int)+25(Pr)] Credit- 6

UNIT-I

Rotational Dynamics: Centre of Mass and Laboratory frames. Angular momentum of a particle and system of particles. Torque. Principle of conservation of angular momentum. Rotation about a fixed axis. Moment of Inertia. Perpendicular and parallel axis thermo. Calculation of moment of inertia for rectangular, cylindrical and spherical bodies. Kinetic energy of rotation. Motion involving both translation and rotation.

(10 Lectures)

Non-Inertial Systems: Non-inertial frames and fictitious forces. Uniformly rotating frame. Lawsof Physics in rotating coordinate systems. Centrifugal force .Coriolis force and its applications.

(3 Lectures)

UNIT-II

Elasticity: Relation between Elastic constants. Twisting torque on a Cylinder or Wire.

(3 Lectures)

Fluid Motion: Kinematics of Moving Fluids: Poiseuille's Equation for Flow of a Liquid through a Capillary Tube. **(2 Lectures)**

UNIT-III

Gravitation and Central Force Motion: Law of gravitation. Gravitational potential energy. Inertial and gravitational mass. Potential and field due to spherical shell and solid sphere.

(3 Lectures)

Motion of a particle under a central force field. Two-body problem and its reduction to one-body problem and its solution. The energy equation and energy diagram. Kepler's Laws. Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness .Basic idea of global positioning system (GPS).Physiological effects on astronauts. **(6 Lectures)**

UNIT-IV

Oscillations: SHM: Simple Harmonic Oscillations. Differential equation of SHM and itssolution. Kinetic energy, potential energy, total energy and their time-average values. Damped oscillation. Forced oscillations: Transient and steady states; Resonance, sharpness of resonance; power dissipation and Quality Factor. **(5 Lectures)**

UNIT-V

Special Theory of Relativity: Michelson-Morley Experiment and its outcome. Postulates of Special Theory of Relativity. Lorentz Transformations. Simultaneity and order of events. Lorentz contraction. Time dilation. Relativistic transformation of velocity, frequency and wave number. Relativistic addition of velocities. Variation of mass with velocity. Massless Particles. Mass-energy Equivalence. Relativistic Doppler effect. Relativistic Kinematics. Transformation of Energy and Momentum. Energy-Momentum Four Vector.

(8 Lectures)

Reference Books:

- An introduction to mechanics, D. Kleppner, R.J. Kolenkow, 1973, McGraw-Hill.
- Mechanics, Berkeley Physics, vol.1, C.Kittel, W.Knight, et.al. 2007, Tata McGraw-Hill.
- Physics, Resnick, Halliday and Walker 8/e. 2008, Wiley.
- Analytical Mechanics, G.R. Fowles and G.L. Cassiday. 2005, Cengage Learning.
- Feynman Lectures, Vol. I, R.P.Feynman, R.B.Leighton, M.Sands, 2008, Pearson Education
- Introduction to Special Relativity, R. Resnick, 2005, John Wiley and Sons.
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.

Additional Books for Reference

- Mechanics, D.S. Mathur, S. Chand and Company Limited, 2000
- University Physics. F.W Sears, M.W Zemansky, H.D Young 13/e, 1986, Addison Wesley
- Physics for scientists and Engineers with Modern Phys., J.W. Jewett, R.A.Serway, 2010, Cengage Learning
- Theoretical Mechanics, M.R. Spiegel, 2006, Tata McGraw Hill.
- Mechanics - J. C. Slater and N. H. Frank (McGraw-Hill)

PHYSICS LAB-CC- II LAB
20 Classes (2hr duration)

1. To study the random error in observations.
2. To determine the height of a building using a Sextant.
3. To study the Motion of Spring and calculate (a) Spring constant, (b) **g** and (c) Modulus of rigidity.
4. To determine the Moment of Inertia of a Flywheel.
5. To determine **g** and velocity for a freely falling body using Digital Timing Technique
6. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).
7. To determine the Young's Modulus of a Wire by Optical Lever Method.
8. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
9. To determine the elastic Constants of a wire by Searle's method.
10. To determine the value of g using Bar Pendulum.
11. To determine the value of g using Kater's Pendulum

Reference Books

- Advanced Practical Physics for students, B. L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Edn, 2011, KitabMahal

CORE COURSE (HONOURS IN PHYSICS)□

Semester II

Time – 3hrs F.M.: 100 [60(End sem)+15(Int)+25(Pr)] Credit- 6

PHYSICS-CC- III: ELECTRICITY AND MAGNETISM
(Credits: Theory-04, Practicals-02)
Theory: 40 Classes (1hr duration)

UNIT-I

Electric Field and Electric Potential

Electric field: Electric field lines. Electric flux. Gauss' Law with applications to charge distributions with spherical, cylindrical and planar symmetry. **(3 Lectures)**

Conservative nature of Electrostatic Field. Electrostatic Potential .Laplace's and Poisson equations. he Uniqueness Theorem. Potential and Electric Field of a dipole. Force and Torque on a dipole. **(3 Lectures)**

UNIT-II

Electrostatic energy of system of charges .Electrostatic energy of a charged sphere. Conductors in an electrostatic Field. Surface charge and force on a conductor. Capacitance of a system of charged conductors. Parallel-plate capacitor. Capacitance of an isolated conductor. Method of Images and its application to: (1) Plane Infinite Sheet and (2) Sphere. **(4 Lectures)**

Dielectric Properties of Matter: Electric Field in matter. Polarization, Polarization Charges .Electrical Susceptibility and Dielectric Constant. Capacitor (parallel plate, spherical, cylindrical) filled with dielectric. Displacement vector **D**. Relations between **E**, **P** and **D**. Gauss' Law in dielectrics. **(4 Lectures)**

UNIT-III

Magnetic Field: Magnetic force between current elements and definition of Magnetic Field **B**.Biot-Savart's Law and its simple applications: straight wire and circular loop. Current Loop as a Magnetic Dipole and its Dipole Moment (Analogy with Electric Dipole). Ampere's Circuital Law and its application to (1) Solenoid and (2) Toroid. Properties of **B**: curl and divergence. Vector Potential. Magnetic Force on (1) point charge (2) current carrying wire (3) between current elements. Torque on a current loop in a uniform Magnetic Field. Ballistic Galvanometer**:** Torque on a current Loop. Ballistic Galvanometer: Current and Charge Sensitivity. Electromagnetic damping. Logarithmic damping.CDR. **(12 Lectures)**

UNIT-IV

Magnetic Properties of Matter: Magnetization vector (**M).** Magnetic Intensity (**H).** Magnetic Susceptibility and permeability .Relation between **B, H, M**. Ferromagnetism. B-H curve and hysteresis. **(4 Lectures)**

Electromagnetic Induction: Faraday's Law. Lenz's Law. Self-Inductance and Mutual Inductance. Reciprocity Theorem. Energy stored in a Magnetic Field. **(2 Lectures)**

UNIT-V

Electrical Circuits: AC Circuits: Kirchhoff's laws for AC circuits. Complex Reactance and Impedance. Series LCR Circuit: (1) Resonance, (2) Power Dissipation and (3) Quality Factor,
and (4) Band Width. Parallel LCR Circuit. **(4 Lectures)**

Network theorems: Ideal Constant-voltage and Constant-current Sources. Network Theorems: Thevenin theorem, Norton theorem, Superposition theorem, Reciprocity theorem, Maximum Power Transfer theorem. Applications to dc circuits. **(4 Lectures)**

Reference Books:

- Electricity, Magnetism & Electromagnetic Theory, S. Mahajan and Choudhury, 2012, Tata McGraw
- Electricity and Magnetism, Edward M. Purcell, 1986 McGraw-Hill Education
- Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn., 1998, Benjamin Cummings.
- Feynman Lectures Vol.2, R.P.Feynman, R.B.Leighton, M. Sands, 2008, Pearson Education
- Elements of Electromagnetics, M.N.O. Sadiku, 2010, Oxford University Press.
- Electricity and Magnetism, J.H.Fewkes&J.Yarwood. Vol. I, 1991, Oxford Univ. Press.

PHYSICS LAB-CC - III LAB
20 Classes (2hr duration)

1. Use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, (d) Capacitances, and (e) Checking electrical fuses.
2. To study the characteristics of a series RC Circuit.
3. To determine an unknown Low Resistance using Potentiometer.
4. To determine an unknown Low Resistance using Carey Foster's Bridge.
5. To compare capacitances using De'Sauty's bridge.
6. Measurement of field strength B and its variation in a solenoid (determine dB/dx)
7. To verify the Thevenin and Norton theorems.
8. To verify the Superposition, and Maximum power transfer theorems.
9. To determine self inductance of a coil by Anderson's bridge.
10. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impedance at resonance, (c) Quality factor Q, and (d) Band width.
11. To study the response curve of a parallel LCR circuit and determine its (a) Antiresonant frequency and (b) Quality factor Q.
12. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer
13. Determine a high resistance by leakage method using Ballistic Galvanometer.
14. To determine self-inductance of a coil by Rayleigh's method.
15. To determine the mutual inductance of two coils by Absolute method.

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Laboratory Manual of Physics for undergraduate classes, D.P.Khandelwal, 1985, Vani Pub.

CORE COURSE (HONOURS IN PHYSICS)

Semester II

PHYSICS-CC - IV: WAVES AND OPTICS

(Credits: Theory-04, Practicals-02) Theory: 40

Classes (1hr duration)

Time – 3hrs F.M.: 100 [60(End sem)+15(Int)+25(Pr)] Credit- 6

UNIT-I

Geometrical optics: Fermat's principle, reflection and refraction at plane interface, Matrix formulation of geometrical Optics. Idea of dispersion. Application to thick lenses, Ramsden and Huygens eyepiece. **(4 Lectures)**

Wave Motion: Plane and Spherical Waves. Longitudinal and Transverse Waves. Plane Progressive (Travelling) Waves. Wave Equation. Particle and Wave Velocities. Differential Equation. Pressure of a Longitudinal Wave. Energy Transport. Intensity of Wave. Water Waves: Ripple and Gravity Waves. **(4 Lectures)**

UNIT-II

Superposition of two perpendicular Harmonic Oscillations: Graphical and Analytical Methods. Lissajous Figures (1:1 and 1:2) and their uses. Superposition of N harmonic waves. **(2 Lectures)**

Wave Optics: Electromagnetic nature of light. Definition and properties of wave front Huygens Principle. Temporal and Spatial Coherence.**(3 Lectures)**

UNIT-III

Interference: Division of amplitude and wavefront. Young's double slit experiment. Lloyd's Mirror and Fresnel's Biprism. Phase change on reflection: Stokes' treatment. Interference in Thin Films: parallel and wedge-shaped films. Fringes of equal inclination (Haidinger Fringes); Fringes of equal thickness (Fizeau Fringes). Newton's Rings: Measurement of wavelength and refractive index. **(8 Lectures)**

UNIT-IV

Interferometer: Michelson Interferometer-(1) Idea of form of fringes (No theory required), (2)Determination of Wavelength, (3) Wavelength Difference, (4) Refractive Index, and (5) Visibility of Fringes. Fabry -Perot interferometer. **(5 Lectures)**

UNIT-V

Fraunhofer diffraction: Single slit. Circular aperture, Resolving Power of a telescope .Double-slit. Multiple slits. Diffraction grating. Resolving power of grating. **(7 Lectures)**

Fresnel Diffraction: Fresnel's Assumptions. Fresnel's Half-Period Zones for Plane Wave. Explanation of Rectilinear Propagation of Light. Theory of a Zone Plate: Multiple Foci of a Zone Plate. Fresnel's Integral, Fresnel diffraction pattern of a straight edge, a slit and a wire.

(7 Lectures)

Reference Books

- Waves: Berkeley Physics Course, vol. 3, Francis Crawford, 2007, Tata McGraw-Hill.
- Fundamentals of Optics, F.A. Jenkins and H.E. White, 1981, McGraw-Hill
- Principles of Optics, Max Born and Emil Wolf, 7th Edn., 1999, Pergamon Press.
- Optics, Ajoy Ghatak, 2008, Tata McGraw Hill
- The Physics of Vibrations and Waves, H. J. Pain, 2013, John Wiley and Sons.
- The Physics of Waves and Oscillations, N.K. Bajaj, 1998, Tata McGraw Hill.
- Optics – Brijlal &Subramaniam- (S. Chand Publication) 2014.
- Geometrical and Physical Optics – R.S. Longhurst, Orient Blackswan, 01-Jan-1986
- Vibrations and Waves -- A. P. French, (CBS) Indian print 2003
- Optics, E. Hecht (PearsonIndia)

PHYSICS LAB- CC- IV LAB
20 Classes (2hr duration)

1. To determine the frequency of an electric tuning fork by Melde's experiment and verify λ^2 –T law.
2. To investigate the motion of coupled oscillators.
3. To study Lissajous Figures.
4. Familiarization with: Schuster`s focusing; determination of angle of prism.
5. To determine refractive index of the Material of a prism using sodium source.
6. To determine the dispersive power and Cauchy constants of the material of a prism using mercury source.
7. To determine the wavelength of sodium source using Michelson's interferometer.
8. To determine wavelength of sodium light using Fresnel Biprism.
9. To determine wavelength of sodium light using Newton's Rings.
10. To determine the thickness of a thin paper by measuring the width of the interference fringes produced by a wedge-shaped Film.
11. To determine wavelength of (1) Na source and (2) spectral lines of Hg source using plane diffraction grating.
12. To determine dispersive power and resolving power of a plane diffraction grating.

Reference Books

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
- A Text Book of Practical Physics, I. Prakash& Ramakrishna, 11th Ed., 2011, KitabMahal
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition,reprinted 1985, Heinemann Educational Publishers
- A Laboratory Manual of Physics for undergraduate classes, D .P. Khandelwal, 1985, Vani

Semester I / III
Generic Elective (GE) (for other Departments / Disciplines

Time – 3hrs F.M.: 100 [60(End sem)+15(Int)+25(Pr)] Credit- 6

PHYSICS, GE:-I : MECHANICS
(Credits: Theory-04, Practicals-02)
Theory: 40 Classes (1hr duration)

UNIT-I

Vectors: Vector algebra. Scalar and vector products. Derivatives of a vector with respect to time, Gradient, Divergence and Curl.**(2 Lectures)**

Ordinary Differential Equations: 1st order homogeneous differential equations. 2nd orderhomogeneous differential equations with constant coefficients. **(2 Lectures)**

Laws of Motion: Frames of reference. Newton's Laws of motion .Dynamics of a system of particles. Centre of Mass. **(4 Lectures)**

Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy .Motion of rockets. **(2 Lectures)**

UNIT-II

Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum. **(3 Lectures)**

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only).Satellite in circular orbit and applications. Geosynchronous orbits. Basic idea of global positioning system (GPS).Weightlessness. **(7Lectures)**

UNIT-III

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions .Kineticand Potential Energy, Total Energy and their time averages .Damped oscillations. **(6 Lectures)**

UNIT-IV

Elasticity: Hooke's law- Stress-strain diagram - Elastic moduli -Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants - Work done in stretching and work done in twisting a wire - Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion - Torsional pendulum-Determination of Rigidity modulus and moment of inertia - q, η and σ by Searle's method. **(8 Lectures)**

UNIT-V

Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation. Relativistic addition of velocities. **(6 Lectures)**

Note: *Students are not familiar with vector calculus. Hence all examples involved differentiation either in one dimension or with respect to the radial coordinate*

Reference Books:

- University Physics. F.W. Sears, M.W. Zemansky and H.D. Young, 13/e, 1986. Addison-Wesley
- Mechanics Berkeley Physics, Vol..1: Charles Kittel, et. al. 2007, Tata McGraw-Hill.
- Physics – Resnick, Halliday& Walker 9/e, 2010, Wiley
- University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
- Properties of Matter - D.S. Mathur (S.Chand publication) 2013
- Mechanics- D.C.Tayal (Himalaya Publication) 2013
- Classical Dynamics of Particles and Systems –S. T. Thornton (Cengage Learning) 2012
- Analytical Mechanics-Fowles (CengageLearnings) 2014
- Classical Mechanics-M.Das,P.K.Jena, M.Bhuyan and R.N.Mishra (Srikrishna Publication)

PHYSICS LAB: GE –I LAB:

MECHANICS 20 Classes (2hr duration)

1. Measurements of length (or diameter) using verniercaliper, screw gauge and travelling microscope.
2. To determine the Height of a Building using a Sextant.
3. To determine the Moment of Inertia of a Flywheel.
4. To determine the Young's Modulus of a Wire by Optical Lever Method.
5. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.
6. To determine the Elastic Constants of a Wire by Searle's method.
7. To determine g by Bar Pendulum.
8. To determine g by Kater's Pendulum.
9. To study the Motion of a Spring and calculate (a) Spring Constant, (b) g.

Reference Books:

- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers.
- A Text Book of Practical Physics, InduPrakash and Ramakrishna, 11th Edition, 2011, KitabMahal, New Delhi.

PHY. DSC-I OF SEM-I IS SAME AS PHY.GE-I, OF SEM-I / III

Semester II

PHYSICS- GE-II : ELECTRICITY , MAGNETISM AND EMT (Credits: Theory-04, Practicals-02)

Theory: 40 Classes (1hr duration)

Time – 3hrs F.M.: 100 [60(End sem)+15(Int)+25(Pr)] Credit- 6

UNIT-I

Vector Analysis: Scalar and Vector product, gradient, divergence, Curl and their significance,

Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). **(4 Lectures)**

Electrostatics: Electrostatic Field, electric flux, Gauss's theorem of electrostatics. Applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor **(4 Lectures)**

UNIT-II

Electrostatic Potential, Potential energy and Dielectrics

Electric potential as line integral of electric field, potential due to a point charge, electric dipole, uniformly charged spherical shell and solid sphere. Calculation of electric field from potential. Capacitance of an isolated spherical conductor .Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector .Gauss's theorem in dielectrics. Parallel plate capacitor completely filled with dielectric.

(8 Lectures)

UNIT-III

Magnetism:

Magnetostatics : Biot-Savart's law and its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field .Magnetic vector potential. Ampere's circuital law. **(4 Lectures)**

Magnetic properties of materials: Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of dia-, para-and ferromagnetic materials.

(4 Lectures)

UNIT-IV

Electromagnetic Induction: Faraday's laws of electromagnetic induction, Lenz's law, self and mutual inductance, L of single coil, M of two coils. Energy stored in magnetic field**. (4 Lect)**

Growth and decay of currents in LR, LC and RC circuits, Reactance and impedance in AC circuits, Series and parallel LCR Circuits, Resonance and Band Width, Q-factor and Power factor.

(4 Lectures)

UNIT-V

Maxwell`s equations and Electromagnetic wave propagation: Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, polarization. **(8 Lectures)**

Reference Books:

• Electricity and Magnetism, Edward M. Purcell, 1986, McGraw-Hill Education
• Electricity & Magnetism, J.H. Fewkes&J.Yarwood. Vol. I, 1991, Oxford Univ. Press
• Electricity and Magnetism, D C Tayal, 1988, Himalaya Publishing House.
• University Physics, Ronald Lane Reese, 2003, Thomson Brooks/Cole.
• D.J.Griffiths, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
•Electricity and Magnetism- K.K Tewari (S. Chand Higher Academics)2013

PHY. DSC-II OF SEM-II IS SAME AS PHY.GE-II OF SEM-II / IV

GE LAB: ELECTRICITY, MAGNETISM AND EMT 20
Classes (2hr duration)

1. To use a Multimeter for measuring (a) Resistances, (b) AC and DC Voltages, (c) DC Current, and (d) checking electrical fuses.
2. Ballistic Galvanometer:

(i) Measurement of charge and current sensitivity

(ii) Measurement of CDR

(iii) Determine a high resistance by Leakage Method

(iv) To determine Self Inductance of a Coil by Rayleigh's Method.

3. To compare capacitances using De'Sauty's bridge.
4. Measurement of field strength B and its variation in a Solenoid (Determine dB/dx)
5. To study the Characteristics of a Series RC Circuit.
6. To study a series LCR circuit LCR circuit and determine its (a) Resonant frequency, (b) Quality factor
7. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and

(b) Quality factor Q

8. To determine a Low Resistance by Carey Foster's Bridge.
9. To verify the Thevenin and Norton theorems
10. To verify the Superposition, and Maximum Power Transfer Theorems

Reference Books

- Advanced Practical Physics for students, B.L.Flint&H.T.Worsnop, 1971, Asia Publishing House.
- Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
- A Text Book of Practical Physics, I.Prakash& Ramakrishna, 11th Ed.2011, KitabMahal

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