SEMESTER-I

BSc/Phy/SM//1/DSC/101–Mechanics

Credits: 3 **Max. Marks: 75**
Lectures: 45 **Final Term Exam.: 50**
Duration of Exam.: 3 Hrs. **Internal Assessment: 25**

Objective: The objective of this course is to teach the students fundamentals of Newtonian Mechanics, rigid body dynamic, concept of inverse square force and the special theory of relativity**.**

Course Outcomes: After successfully completing the course, student will be able to:
CO1: Learn the concept of conservation of energy, momentum, angular momentum and apply them to understand the basic problems in physics.
CO2: Understand the application of rotational dynamics motions in analyzing rolling with slipping. Write the expression for the moment of inertia about the given axis of symmetry for different uniform mass distributions.
CO3: Understand the concept of central force problem, gravitational energy and GPS. Applications of inverse square law.

CO4: Describe special relativistic effects and their effects on the mass and energy of a moving object and appreciate the nuances and important outcomes of Special Theory of Relativity.

Note for the Paper Setter: *The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt three more questions selecting at least one question from each unit.*

Unit-I

Fundamentals of Dynamics: Reference frames, Inertial and non-inertial frames of references, Conservative and non-conservative forces, fictitious forces, Concept of potential energy, Energy diagrams. Stable and unstable equilibrium, Elastic potential energy, Force as gradient of potential energy, Work &Potential energy, Impulse, Centre of Mass for a system of particles, Motion of center of mass (discrete and continuous), Expression for kinetic energy, Linear momentum and angular momentum for a system of particles in terms of center of mass values.

Collisions: Elastic and inelastic collisions between particles Centre of Mass and Laboratory frames.

Unit-II

Rotational Dynamics: Equation of motion of a rigid body, Rotational motion of a rigid body in general and that of plane lamina, Rotation of angular momentum vector about a fixed axis, Angular momentum and kinetic energy of a rigid body about principal axis, Torque, Principle of conservation of angular momentum, Moment of Inertia (discrete and continuous), Calculation of moment of inertia for rectangular, cylindrical and spherical bodies, Kinetic energy of rotation, Motion involving both translation and rotation, elementary Gyroscope.

Unit-III

Inverse Square Law Force: Forces in nature (qualitative), Central forces, Law of gravitation, Gravitational potential energy, Inertial and gravitational mass,

Special Theory of Relativity: Michelson-Morley Experiment and its outcome, Galilean transformation (velocity, acceleration)and its inadequacy, Postulates of Special Theory of Relativity, Lorentz Transformations, simultaneity, Lorentz contraction, Time dilation, Relativistic transformation of velocity, frequency and wave number, Relativistic addition of velocities, Variation of mass with velocity,

Text/Reference Books:

1. Classical Mechanics by H. Goldstein (2^{nd}Edition)
2. Berkeley Physics Course.Vol. 1.Mechanics, E.M. Purcell
3. Concepts of Modern Physics,Arthur Beiser
4. An introduction to Mechanics, D. Kleppner, R.J. Kolenkow, 2007, McGraw-Hill.
5. Mechanics, D.S. Mathur, S. Chand and Company Limited,2012.
6. Introduction to Special Relativity, R. Resnick, 2005, John Wiley andSons.
7. University Physics, F.W. Seers, M. W. Zemansky, H. D. Young, Addison-Wesley Pub. Co.
8. Fundamentals of Physics, Halliday, &Walker, Resnick John Wiley &Sons,Inc.

BSc/Phy/SM/1/DSC/102–Physics Lab-I

Credits: 1 (Practical) **Max. Marks: 25**
Teaching per week: 2 Hrs. **Duration of Exam: 2 Hrs.**

Objective: The objective of this course is to impart practical knowledge through design and performance of experiments.

Course outcomes: After successfully completing the course, student will be able to:
CO1: Hands on experience with different instruments and measurements of different physical quantities and related concepts in Physics.
CO2: Verify some fundamental principles, effects and concepts of physics through experimentation.
CO3: Perform experiments related to mechanics (compound pendulum), rotational dynamics (Flywheel), elastic properties (Young Modulus and Modulus of Rigidity) and fluid dynamics (verification of Stokes law, Searle method) etc.
CO4: Learn to present observations, results and analysis in suitable and presentable form.

List of Experiments:

1. Measurement of Length (or diameter) using Travelling Microscope.
2. Moment of Inertia of a Fly Wheel
3. Moment of Inertia of irregular body using a Torsion Pendulum.
4. Surface Tension by Jaeger's Method.
5. Young Modulus by Bending of Beam.
6. Modulus of rigidity of material of wire by Maxwell's Needle.
7. Elastic constant by Searle's method.
8. Viscosity of water by its flow through a uniform capillary tube.
9. Acceleration due to Gravity 'g' by bar pendulum.
10. To study the Motion of spring and calculate spring constant & value of Acceleration due to Gravity.
11. To compare Moment of Inertia of a solid Sphere, Hollow Sphere and solid Disc of same mass with the help of Torsion Pendulum.

References:

1. B.Sc. Practical Physics, C.L. Arora, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M.Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
4. Practical Physics, S.L. Gupta and V. Kumar, PragatiPrakashan Meerut
5. Modern Approach to Practical Physics, R.K.Singla, Modern Publishers, Jalandhar
6. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

BSc/Phy/SM/1/DSC/103– Electricity and Magnetism

Credits: 3 **Max. Marks: 75**
Lectures: 45 **Final Term Exam.: 50**
Duration of Exam.: 3Hrs. **Internal Assessment: 25**

Objective: The course on Electricity and Magnetism deals with Coulomb's law, Electric field, potential formulation of electrostatic, Capacitors, Magnetism and magnetic materials along with the applications of these concepts.

Course Outcomes: After successfully completing the course, student will be able to:

Note for the Paper Setter: *The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions will be set unit-wise comprising of two questions from each of the three units. The candidates are required to attempt three more questions selecting at least one question from each unit.*

Unit-I

Electrostatics: Electric field, Electric field lines, Electric flux, Divergence of electrostatic field, Gauss' Law with applications, Conservative nature of Electrostatic Field, Electrostatic Potential, Potential and Electric Field of a dipole, Force and Torque on a dipole, Electrostatic energy of system of charges, Energy per unit volume in electrostatic field, Electrostatic energy of a charged sphere, Conductors in an electrostatic Field, Surface charge and force on a conductor, Laplace's and Poisson equations, Laplace equation in three dimension, The Uniqueness Theorems.

Unit-II

The method of images: Point charge in the presence of grounded conducting sphere, Solution of Laplace equation by separation of variables for Cartesian and spherical coordinates, Multipole expansion of potential due to arbitrary charge distribution.

Dielectric Properties :Dielectric medium, Polarization, Bound charges in a polarized dielectric and their physical interpretation, Electric displacement, Gauss's theorem in dielectrics, Parallel plate capacitor completely filled with dielectric, dielectric constant.

Unit-III

Magnetism: Lorentz force law, Magnetic forces, Magnetostatics: Biot-Savart's law &its applications (i) circular coil (ii) solenoid carrying current, Divergence and curl of magnetic field, Ampere's circuital law and it's applications for simple current configurations, Magnetic vector potential.

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

Text/Reference Books:

1. D.J. Griffith, Introduction to Electrodynamics, 3rd Edn, 1998, Benjamin Cummings.
2. Electricity and Magnetism, EdwardM.Purcell, 1986,McGraw-HillEducation.
3. Electricity and Magnetism, J.H. Fewkes& J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
4. University Physics, Ronald Lane Reese, 2003, ThomsonBrooks/Cole.
5. Electricity and Magnetism, Reitz and Milford (Prentice Hall of India)

6. Electricity and Magnetism,A.S.Mahajanand A.A. Rangwala(Tata Mc GrawHill)
7. Electricity and Magnetism, Edward M Purcell, 1986, McGraw-Hill Education
8. Electricity and Magnetism, J.H. Fewkes& J. Yarwood, Vol. I, 1991, Oxford University Press.
9. Introduction to Electrodynamics, D.J. Griffiths, 3rdEdn 1998 Benjamin Cummings.
10. Electricity and Magnetism, R. Murugeshan, S.Chand& Com. Pt. Ltd., New Delhi
11. Electromagnetic Fields and waves, K.D. Prasad, Satya Prakashan, New Delhi

BSc/Phy/SM/1/DSC/104–Physics Lab-II

Credits:1 (Practical) **Max. Marks: 25**
Teaching per week: 2 Hrs. **Duration of Exam: 2 Hrs.**

Objective: The objective of this course is to impart practical knowledge through design and performance of experiments.

Course outcomes: After successfully completing the course, student will be able to:
CO1: Hands on experience with different instruments and appreciate the beauty of different concepts and related experiments in Physics.
CO2: Verify some fundamental principles, effects and concepts of physics through experiments. Gaining knowledge related to LCR circuits, Ballistic galvanometer, magnetic field and inductance of two coils.
CO3: Perform experiments related to A.C. mains, D.C. voltage and current. Learn experimentation with Thevenin, Norton and Superposition theorems.
CO4: Learn to present observations, results and analysis in suitable and presentable form.

List of Experiments

1. To use Multimeter for measuring Resistance, A.C. and D.C. Voltage and Current, checking of electrical fuses.
2. Low resistance by Carey Foster's bridge with calibration.
3. Determination of Impedance of an A.C. circuit and its verification.
4. Frequency of A.C. mains using an electromagnet.
5. Frequency of A.C. mains Electrical vibrator.
6. High resistance by substitution method.
7. To study the characteristics of a series RC Circuit.
8. To determine an unknown Low Resistance using Potentiometer.
9. To determine an unknown Low Resistance using Carey Foster's Bridge
10. To compare capacitances using De'Sauty's bridge.
11. Measurement of field strength B and its variation in a solenoid (determine dB/dx).
12. To determine self-inductance of a coil by Anderson's bridge.
13. To study response curve of a Series LCR circuit and determine its (a) Resonant frequency, (b) Impendence at resonance, (c) Quality factor Q, and (d) Band width.
14. To study the response curve of a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor Q.
15. Measurement of charge and current sensitivity and CDR of Ballistic Galvanometer.
16. Determine a high resistance by leakage method using Ballistic Galvanometer.
17. To determine self-inductance of a coil by Rayleigh's method.
18. To determine the mutual inductance of two coils by Absolute method.

References:

1. B.Sc. Practical Physics, C.L. Arora, 2005-2006, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M.Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
4. Practical Physics, S.L. Gupta and V. Kumar, PragatiPrakashan Meerut
5. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
6. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House.

BSc/Phy/SM/1/MIC/101: Elements of Modern Physics

Credits: 4 **Max. Marks: 100**
Lectures: 60 **Final Term Exam.: 70**
Duration of Exam: 3 Hrs. **Internal Assessment: 30**

Objective: The aim of this course is to aware the students about the developments in physics in the last century by introducing the concepts of quantization, dual nature of matter, basic quantum mechanics and cosmology.

Course Outcomes: Students will be awared on foundations of modern physics, experiments forming basis of quantum mechanics, atomic structure, wave concepts, uncertainty principle and basic idea of cosmology.

Note for the Paper Setter: *The question paper will consist of nine questions in all. All questions carry equal marks. The first question will be compulsory and will consist of seven short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

UNIT – I

Introduction to electromagnetic spectra, Properties of Thermal Radiation, Spectral Distribution of Blackbody Radiation, Kirchhoff's Law, Stefan-Boltzmann Law and Wien's Distribution and Displacement law, Rayleigh-Jean's Law, Ultraviolet Catastrophe, Planck's postulates of black body radiation, Planck's Law of Blackbody Radiation and its experimental verification. Photoelectric effect, Einstein's explanation and its experimental verification (R. Millikan). Compton scattering, Pair production and annihilation, Bremsstrahlung effect, Cherenkov radiation. X-ray Spectra of atoms and its production.

UNIT – II

Atomic structure: Rutherford scattering, Rutherford's model and its drawbacks, Bohr atomic model; quantization rule, atomic stability, calculation of energy levels for hydrogen like atoms and their spectra, effect of nuclear mass on spectra, Correspondence principle, Franck-Hertz experiment.Wave properties of matter: De-Broglie wavelength and matter waves; Wave-particle duality, Davison and Germer experiment, wave packets, phase velocity, group velocity and their relations. Electron microscope. Uncertainty principle: Heisenberg's uncertainty principle; Estimating minimum energy of a confined particle using uncertainty principle, Energy-time uncertainty principle. Applications.

UNIT – III

Two slit interference experiment with photons, atoms and particles; linear superposition principle as a consequence; Matter waves and wave amplitude; Schrodinger equation for non-relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of a wave function, probabilities and normalization; Probability and probability current densities in one dimension. Concept of wave function: Origin and probability interpretation of wave function, properties of wave-function. One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as example.

UNIT – IV

Cosmology: The Expansion of the Universe, The Cosmic Microwave Background Radiation, Dark Matter, The General Theory of Relativity, Tests of General Relativity, Stellar Evolution and Black Holes, Cosmology and General Relativity, The Big Bang Cosmology, The Formation of Nuclei and Atoms, Experimental Cosmology.

Reference Books:

1. Concepts of Modern Physics, Arthur Beiser, 2002, McGraw-Hill.
2. Introduction to Modern Physics, Rich Meyer, Kennard, Coop, 2002, Tata McGraw Hill
3. Modern Physics, KnnethS.Krane, John Wiley & Sons, Inc.
4. Modern Physics, Raymond A. Serway, Clement J. Moses, Curt A. Moyer, 2005, CENGAGE Learning.
5. Principles of Modern Physics, A.K. Saxena, 2007, NarosaPubli

BSC/PHY/SM/1/MDC/101
Basic Mathematics

Marks (Theory): 50 **Marks (Total): 75**
Marks (Internal Assessment): 25 **Time : 3 Hrs**
Credits: 03

Note for the Paper Setter: *The question paper will consist of seven* ***questions*** *in all. The first question will be compulsory and will consist of* ***four*** *short questions of* ***2*** *marks each covering the whole syllabus. In addition,* ***six more*** *questions of 14* ***marks each*** *will be set unit-wise comprising of* ***two*** *questions from each of the* ***three*** *units. The candidates are required to attempt* ***one compulsory question*** *and* ***three more questions*** *selecting at least one question from each unit.*

Course Outcomes: This course will enable the students to:

1. Understand types of matrices, algebra of matrices, properties of determinants, adjoint of a matrix, inverse of a matrix, solution of a system of linear equations.
2. Know about the Characteristic equation, rank, Eigen vectors and eigen values of a matrix.
3. Know about the differentiation of standard functions, derivatives of higher order and their use in finding maxima and minima of certain functions.
4. Find Integration as an inverse of differentiation summation, area under a curve, indefinite integrals of standard form, reduction formulae.

Unit: I

Matrices & Determinants: Definition of a matrix. Types of matrices; Algebra of matrices; Properties of determinants; Calculation of values of determinants upto third order, Adjoint of a matrix, elementary row or column operations; Finding inverse of a matrix through adjoint and elementary row or column operations. Solution of a system of linear equations.

Matrices & Determinants: Characteristic equation, Statement of Cayley Hamilton theorem. Rank of matrix, Eigen vectors and eigen values using matrices, Diagonalization, similarity transformation of matrices.

Unit:II

Differential Calculus: Differentiation of standard functions, theorems relating to the derivative of the sum, difference, product and quotient of functions, derivative of trigonometric functions, inverse trigonometric functions, logarithmic functions and exponential functions, differentiation of implicit functions, logarithmic differentiation, derivative of functions, expressed in parametric form, derivatives of higher order. (Only formulae to be given and applications to be emphasized).Maxima and minima.

Unit: III

Integral Calculus: Integration as an inverse of differentiation summation, area under a curve, indefinite integrals of standard form, method of substitution, method of partial fractions, integration by parts, definite integrals, reduction formulae, definite integrals of limit of sum and geometrical interpretation.

Books Recommended:

1. Seymour Lipschutz; Linear Algebra, Schaum's series publications.
2. Santi Narayan; Differential Calculus.
3. Santi Narayan; Integral Calculus.

Hindi -I

हिंदी भाषा परिचय सामान्य :

HINDI/AEC/101

Credit – 2

Duration: 2 Hours per week

परीक्षा समय**घंटे 2** :

कुल अंक :50

लिखित परीक्षा :35 अंक

आंतरिक मूल्यांकन: 15 अंक

Note for the Paper Setter: The question paper will consist of five questions in all. The first question will be compulsory and will consist of seven short questions of 1 marks each covering the whole syllabus. In addition, four more questions of 14 marks each will be set unit-wise comprising of two questions from each of the two units. The candidates are required to attempt one compulsory question and two more questions selecting one question from each unit.

पाठ्यक्रम के उद्देश्य:

हिंदी भाषा की विकास.करवाना परिचय से यात्रा-

पाठ्यक्रम के अपेक्षित परिणाम

1. हिंदी भाषा के विकास व उसकी बोलियों का ज्ञान होगा
2. हिंदी भाषा के विविध रूप व प्रयोजनमूलकता से परिचित होंगे

खंडएक—

हिंदी भाषाविकास एवं उद्भव :

हिंदी की उपभाषाएं एवं बोलियों का वर्गीकरण

ब्रज एवं परिचय सामान्य का बोली खड़ी और अवधि ,प्रवृत्तियाँ

खंड दो-

कंप्यूटर-परिभाषा, स्वरूप एवं महत्व

पारिभाषिक शब्दावली – बैंकिंग, वाणिज्य, मंत्रालय, उपक्रम, निगम, औद्योगिक क्षेत्र व मीडिया क्षेत्र

अनुवाद लेखन- अर्थ परिभाषा, स्वरूप, महत्व,प्रकिया प्रकार

टिप्पणी लेखन ,परिभाषा अर्थ -नियम, लेखन विधि, उदाहरण

संदर्भ सूची:

1. हिंदी भाषा का उद्भव एवं विकास तिवारी उदयनारायण ,
2. भाषा विज्ञान तिवारी भोलानाथ .डॉ ,
3. हिंदी भाषा का इतिहास वर्मा धीरेन्द्र लेखक ,
4. समसामयिक भाषा विज्ञाननारंग वैष्ना लेखक ,
5. हिंदी1965 इलाहबाद ,महल किताब ,बाहरी हरदेव ,विकास और उद्भव :

BSC/PHY/SM/1/SEC/101
Electrical Circuits & Networks (Theory)

Credits: 03 (Theory) **Max.Marks:75**
Lectures: 45 **Final Term Exam: 50**
Duration of Exam.: 3 Hrs. **Internal Assessment :25**

Objective: The objective of this course is to impart knowledge of electrical circuits and networks.

Course outcomes: After successfully completing the course, student will be able to:
CO1: Enable the students to design and trouble shoots the electrical circuits, networks and appliances through hands-on mode. Understanding electrical circuits.
CO2: Enhancing knowledge of electrical drawing, symbols, generators and transformers.
CO3: Learning technical skills of electric motors, rectifiers, capacitors, phase reversal electrical protection, and overload devices.
CO4: Learning basics for professional skills of electrical wiring, splices, shunting, inductors, Inductance and impedance.

Note for the Paper Setter: *The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 mark each covering the whole syllabus. In addition, four more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt three more questions selecting at least one question from each unit.*

Unit-I

Basic Electricity Principles: Voltage, Current, Resistance, and Power. Ohm's law. Series, parallel, and series-parallel combinations. AC Electricity and DC Electricity. Familiarization with multimeter, voltmeter and ammeter. Understanding Electrical Circuits: Main electric circuit elements and their combination. Rules to analyze DC sourced electrical circuits. Current and voltage drop across the DC circuit elements. Single-phase and three-phase alternating current sources. Rules to analyze AC sourced electrical circuits.

Unit-II

Generators and Transformers: DC Power sources. AC/DC generators. Inductance, capacitance, and impedance.Operation of transformers. Electric Motors: Single-phase, three-phase & DC motors. Basic design. Interfacing DC or AC sources to control heaters & motors. Speed & power of ac motor. Solid-State Devices: Resistors, inductors and capacitors. Diode and rectifiers. Components in Series or in shunt. Electrical Protection: Relays. Fuses and disconnect switches. Circuit breakers,

Unit-III

Overload devices: Ground-fault protection. Grounding and isolating. Phase reversal. Surgeprotection. Interfacing DC or AC sources to control elements (relay protection device). ElectricalWiring: Different types of conductors and cables. Basics of wiring-Star and deltaconnection, Voltage drop and losses across cables and conductors. Instruments to measure current, voltage, power in DC and AC circuits. Insulation. Solid and stranded cable. Conduit. Cable trays.Splices: wirenuts, crimps, terminal blocks, split bolts, and solder.

Reference Books:

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja.
3. Performance and design of AC machines - M G Say ELBS Edn.

Environmental Studies – I
EVS/VAC/101

Credits: 2
Duration of Examination: **2 Hrs**

Internal Assessment: 15
Semester End Examination: 35
Total Marks: 50

Objective: The objective of this paper is to create the awareness among the students towards Environmental concepts and issues for smooth life of species and human at earth.

UNIT I

Introduction to Environment: The multidisciplinary nature of environmental studies: Definition, scope and importance, need for public awareness. Environmental Ethics: anthropocentric and eco-centric perspective. Natural resources: Renewable and non-renewable resources: Natural resources and associated problems. Forest resources: use and over-exploitation, Deforestation, Timber extraction, mining, dams and their efforts on forests and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, dams- conflicts over water and problems. Minerals resources: Use and exploitation, environmental effects of extracting and using minerals resources. Food resources: World food issues, changes caused by agriculture and overgrazing, effects of modern agriculture on agro ecosystem, agrochemical issues, water logging, salinity, Energy resources; Growing energy needs, renewable and non-renewable energy resources. Land resources: Land as resource: land degradation man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable life style. Sustainable development: concept, initiatives for sustainable development: regional, state and global, Sustainable Development Goals.

UNIT II

Ecosystem: Concept, Structure and Function. Producers, Consumers and Decomposers, Energy flow in the ecosystem, Concept and type of ecological succession, Food chains, food webs and Ecological pyramids, Introduction, types, characteristics features, structure and function of the following ecosystem: Forest ecosystem, Grassland ecosystem, desert ecosystem, Aquatic eco system (Ponds, streams, lakes, rivers, oceans, estuaries). Biodiversity and its conservation: Introduction-Definition: Genetic, species and Ecosystem diversity, Bio-geographical classification of India. Value of Biodiversity: consumptive use, productive use, social, ethical; aesthetic and optional. Biodiversity at local, National and Local levels. India as Mega-diverse a Nation. Hot spots of Biodiversity. Threats to biodiversity, Habitat loss, poaching of wildlife, man-wildlife conflicts. Endemic species, conservation of biodiversity: In situ and Ex-situ, conservation of biodiversity. Convention on biological diversity, Aichi targets. Water pollution: Natural and anthropogenic sources of water pollution and their effects. Marine pollution, Thermal pollution, Eutrophication, Ground water pollution. Air pollution: Sources, Classification and properties of air pollutants (Particulate matter, Inorganic gaseous pollutants, Organic gaseous pollutants), Smog, Acid rain, Ozone layer depletion, Green house effects, Global warming, Effects of air pollution on Human Health Soil pollution: Soil pollution from the use of agrochemicals (viz. Fertilizers and Pesticides), Heavy metals, Industrial effluents and Detrimental effects of soil pollutant, Remedial measures for soil pollution. Types and sources Solid waste, Electronic waste Radioactive and Noise pollution: Definition Sources of radioactive pollution, Radioactivity, effects of radioactive pollution, Sound pressure level, Frequency, noise monitoring and sound level meter, Sources and effects of noise pollution, Effects of noise pollution on human health. Role of individual in prevention of pollution.

Suggested Readings:

1. Agarwal, K.C. 2001 *Environmental Biology*, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, *The Biodiversity of India*, Mapin Publishing Pvt. Ltd., Ahmedabad- 380013, India.
3. Clerk RS., *Marine Pollution;* Clanderson Press Oxford.
4. Down to Earth, Centre for Science and Environment.
5. Hawkins R.E., *Encyclopedia of Indian Natural History*, Bombay Natural History Society, Bombay.
6. Mhaskar A.K, *Matter Hazardous*, Techno-Science Publications.
7. Townsend C., Harper J, and Michael Begon, *Essentials ecology*, Blackwell Science.

Note for the Paper Setter: *The question paper will consist of* ***five*** *questions in all. The first question will be compulsory and will consist of* ***seven*** *short questions of* ***1*** *marks each covering the whole syllabus. In addition,* ***four*** *more questions of* ***14 marks each*** *will be set unit-wise comprising of* ***two*** *questions from each of the* ***two*** *units. The candidates are required to attempt* ***one compulsory question*** *and* ***two more questions*** *selecting at least one question from each unit.*

Semester-II

BSc/Phy/SM/2/DSC/105– Thermal Physics

Credits: 3 **Max. Marks: 75**
Lectures: 60 **Final Term Exam.: 50**
Duration of Exam.: 3 Hrs. **Internal Assessment: 25**

Objective: The course on thermal physics is framed with the objective that students are able to understand basic concepts of thermos-dynamical systems. Students will be able to understand heart, work, temperature, entropy and the laws of thermodynamics. Behaviour of real gases as thermos-dynamical systems has also been included.

Course Outcomes: After successfully completing the course, student will be able to:
CO1: Learn about Kinetic interpretation of Temperature, the real gas equations, Van der Waal equation of state and Brownian motion.
CO2: Learn the basic aspects of kinetic theory of gases, Maxwell-Boltzman distribution law, equitation of energies, mean free path of molecular collisions, viscosity, thermal conductivity, diffusion.
CO3: Understand the basic concepts of thermodynamics, the first and the second law of thermodynamics, Joule Thomson effect, Joule-Thomson(Porous plug)experiment, the concept of entropy and the associated theorems, calculations of entropy reversible& irreversible process, T-S diagram and Nernst heat law (third law of thermodynamics).
CO4: Derive the Clausius-Clapeyron and Clausius latent heat equations and understand their significance. The students will also be able to learn about Maxwell's thermodynamic relations their physical interpretations.

Note for the Paper Setter: *The question paper will consists of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt three more questions selecting at least one question from each unit.*

Unit-I

Zeroth and First Law of Thermodynamics: Extensive and intensive thermodynamic variables, Thermodynamic equilibrium, zeroth law and Concept of Temperature, Work and heat, State functions, First law of thermodynamics, Internal energy, Applications of first law, General relation between Cp and Cv, Work done during isothermal and adiabatic processes.

Unit-II

Entropy and Third law of Thermodynamics: Concept of entropy, Clausius theorem, Clausius Inequality, Second Law of Thermodynamics in terms of Entropy, Entropy of a Perfect Gas and Universe, Entropy Changes in Reversible and Irreversible Processes, Principle of Increase of Entropy, Third Law of Thermodynamics, Unattainability of absolute zero, T-S Diagrams, Phase Change, Classification of Phase Changes.

Unit-III

Thermodynamic Potentials: Extensive and Intensive Thermodynamic Variables; Internal Energy; Definition, importance, properties and applications of Chemical Potential, Enthalpy, Gibbs function and Helmholtz function. **Maxwell's Thermodynamic Relations:** Derivations of Maxwell's Relations and their applications: (1) Clausius- Clapeyron equation(2) Cp- Cvvalue, (3) Energy equations (4) Change of temperature during adiabatic process.Van -der Waal's Equation of State for Real Gases.

Thermo-electricity: Seeback effect, Paltier effect, Thomson effect and their explanations.

Text/Reference Books:

1. A Treatise on Heat: MeghnadSahaand B.N. Srivastava, IndianPress
2. Thermal Physics: S. Garg, R. Bansal and Ghosh, Tata McGraw-Hill
3. Concepts in Thermal Physics: S.J. Blundell and K.M. Blundell, Oxford University Press
4. Heat and Thermodynamics: An Intermediate Textbook by M. W. ZemanskyandR. Dittman, McGraw-Hill.
5. Thermal Physics and Statistical Mechanics, S.K. Roy, New Age International Publishers, New Delhi
6. Thermodynamics and Statistical Physics, J.K.Sharma and K.K. Sarkar, Himalaya Publishing House, Bombay
7. Introduction to Thermodynamics and itsApplications, Stowe Keith,University Press (India) Pvt.Ltd,Hyderabad
8. Introductory Thermodynamics, PierreInfelta, BrownWalkerPress, Boca Ratan, Florida
9. Fundamentalsof Thermodynamics, J. K.Johnson, Universityof Pittsburgh2009
10. Thermodynamics andItsApplications, Jefferson Tester, Michael Modell, 3rd Edition
11. Thermodynamics, Statistical Thermodynamics & Kinetics, Thomas Engel, PhilipReid, 2nd Edition

BSc/Phy/SM/2/DSC/106–Physics Lab-III

Credits: 1 (Practical) **Max. Marks: 25**
Teaching per week: 2 Hrs. **Duration of Exam: 2 Hrs.**

Objective: The objective of this course is to impart practical knowledge through design and performance of experiments.

Course outcomes: After successfully completing the course, student will be able to:
CO1: Hands on experience with different instruments and measurements of related physical quantities.
CO2: Verify some fundamental principles, effects and concepts of physics through experimentation.
CO3: Perform basic experiments in thermal Physics, viz., determinations of Stefan's constant, coefficient of thermal conductivity, temperature coefficient of resistant, variation of thermo-emf of a thermocouple with temperature difference at its two junctions and calibration of a thermocouple.
CO4: Learn to present observations, results and analysis in suitable and presentable form.

List of Experiments

1. Measurement of Planck constant using black body radiation.
2. To determine Stefan's Constant.
3. To determine the coefficient of thermal conductivity of copper by Searle's Apparatus.
4. To determine the thermal conductivity of bad conductor by Lee and Charlton's disc method.
5. To determine the temperature co-efficient of resistance by platinum resistance thermometer.
6. To study the variation of thermoe.m.f. across two junctions of a thermocouple with temperature.
7. To calibrate Resistance Temperature Device (RTD) using Null Method/Off-Balance Bridge.
8. To determine Mechanical Equivalent of Heat by Callender and Barne'scontant flow method.
9. To draw a calibration curve for a thermocouple.
10. To find the specific heat of a solid by a method of mixture
11. To find the specific heat of a liquid (Turpentine oil) by law of cooling.
12. To find coefficient of apparent expansion of glycerine

References:

1. B.Sc. Practical Physics, C.L. Arora, 2005-2006, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M.Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi.
4. Practical Physics, S.L. Gupta and V. Kumar, PragatiPrakashan Meerut.
5. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar.
6. Advanced Practical Physics for students, B.L. Flint and H.T.Worsnop, Asia Publishing House.

BSc/Phy/SM/2/DSC/107– Waves & Optics

Credits: 3 **Max. Marks: 75**
Lectures: 45 **Final Term Exam.: 50**
Duration of Exam.: 3 Hrs. **Internal Assessment: 25**

Objective: The objective of this course is to introduce the basics of Waves & Optics and their applications.

Course Outcomes: After successfully completing the course, student will be able to:
CO1: Have understanding of Interference - by Division of Wave front, by Division of Amplitude and Interference due to transmitted light & reflected light.
CO2: Learn about Huygens-Fresnel's theory, diffraction at a straight edge and at a circular aperture, diffraction due to a narrow slit and due to a narrow wire.
CO3: Understand and explain the Fraunhoffer diffraction, dispersive power of grating, Rayleigh's criterion and resolving power of telescope & a grating.
CO4: Understand the theories and laws of polarization along with understanding of the production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light.

Note for the Paper Setter: *The question paper will consist of seven questions in all. The first question will be compulsory and will consist of four short questions of 2 marks each covering the whole syllabus. In addition, six more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt three more questions selecting at least one question from each unit.*

UNIT-I

Interference: Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference, Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, phase change on reflection. Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films, classification of fringes in films, nterference due to transmitted light and reflected light, wedge shaped film, Newton's rings.

UNIT-II

Diffraction-I: Huygens-Fresnel's theory, Fresnel's assumptions, rectilinear propagation of light, Fresnel's half period zones, zone plate, diffraction at a straight edge, rectangular slit and diffraction at a circular aperature. Diffraction due to a narrow slit, diffraction due to a narrow wire. Fraunhoffer diffraction: one slit diffraction, two slit diffractions, N-slit diffraction, plane transmission grating spectrum, dispersive power of grating, limit of resolution.

Unit-III

Polarization: Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygens's wave theory of double refraction (Normal and oblique incidence), Analysis of polarized Light. Nicol prism, Quarter wave plate and half wave plate, production and detection of (i) Plane polarized light (ii) Circularly polarized light and (iii) Elliptically polarized light. Optical activity, Fresnel's theory of optical rotation, Specific rotation, Polarimeters (half shade and Biquartz).

Text/Reference Books:

1. Principles of Optics, M. Born and E. Wolf, PergamamanPress.
2. Fundamentals of Optics, Jenkinsand White, McGraw HillBook Co.Ltd., New Delhi.
3. Optics, K.D. Muller, UniversityScienceBooks, MillallyCalifornia.
4. AnIntroduction toInterferometery,Tolansky, John Wiley&Sons, NewDelhi.
5. PolarizedLight Production and Use, Shurcliff, Harward UniversityPress,Cambridge, M A (USA)
6. Refresher Course in Physics Vol.II, C.L. Arora, 2005-2006, S Chand and Co, New Delhi.

BSc/Phy/SM/2/DSC/108–Physics Lab-IV

Credits: 1 (Practical) **Max. Marks: 25**
Teaching per week: 2 Hrs. **Duration of Exam: 2 Hrs.**

Objective: The objective of this course is to impart practical knowledge through design and performance of experiments.

Course outcomes: After successfully completing the course, student will be able to:
CO1: Hands-on experience of using various optical instruments and making finer measurements of wavelength of light using Newton Rings experiment, Fresnel Biprism etc. and resolving power of optical equipment.
CO2: Understand various optical phenomena, principles, workings and applications of optical instruments through experiments.
CO3: Learn to present observations, results and analysis in suitable and presentable form.

List of Experiments

1 To measure the(a)area of a window (b) height of an inaccessible object using a sextant.
2 To determine Refractive index of the material of a prism using sodium source.
3 To determine the dispersive power and Cauchy constants of the material of a prism using Mercury discharge source.
4 To draw a graph between wavelength and minimum deviation for various lines from a Mercury discharge source.
5 Determination of wave length of sodium light and the number of lines per centimetre using a diffraction grating.
6 Determination of wave length of sodium light using Newton's Rings.
7 Resolving power of a telescope.
8 Comparison of Illuminating Powers by a Photometer.
9 Measurement of (a) Specific rotation (b) concentration of sugar solution using polarimeter.
10 Ordinary and extra ordinary refractive indices for calcite or quartz.
11 To find the equivalent focal length of a lens system by nodal slide assembly.

References:

1. B.Sc. Practical Physics, C.L. Arora, 2005-2006, S. Chand Publisher, New Delhi
2. Advanced Level Practical Physics, M.Nelkon and Ogborn, Henemann Education Books Ltd., New Delhi
3. Practical Physics, S.S. Srivastava and M.K. Gupta, Atma Ram & Sons, Delhi
4. Practical Physics, S.L. Gupta and V. Kumar, PragatiPrakashan Meerut
5. Modern Approach to Practical Physics, R.K. Singla, Modern Publishers, Jalandhar
6. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, Asia Publishing House

BSc/Phy/SM/2/MIC/102: Electromagnetic Theory

Credits: 4 **Max. Marks: 100**
Lectures: 60 **Final Term Exam.: 70**
Duration of Exam. 3 Hrs. **Internal Assessment: 30**

Objectives: The course enables student to develop in depth understanding about the electromagnetic induction, Maxwell's equations, electromagnetic wave propagation, Poynting's vector, electromagnetic field transformation.

Course Outcomes: The student will be able to understand;
CO1: electromagnetic induction and it's applications.
CO2: Maxwell's equations and generation of electromagnetic fields.
CO3: wave propagation through vacuum and isotropic dielectric medium as well as wave guide.
CO4: electromagnetic potential and dipole radiation.

Note for the Paper Setter: *The question paper will consists of nine questions in all. The first question will be compulsory and will consist of seven short questions of 2 marks each covering the whole syllabus. In addition, eight more questions will be set unit-wise comprising of two questions from each of the four units. The candidates are required to attempt four more questions selecting at least one question from each unit.*

UNIT-I

Motional EMF, Faraday's Law of induction, Induced electric field, Lenz's law, Inductance, Self-induction of a single coil, Mutual induction of two coils, Transformers, Energy stored in magnetic field.
Maxwell`s equations: Maxwell's fixing of Ampere's law, Displacement current, Maxwell's equations In vacuum.

UNIT-II

Maxwell's equations in matter, Boundary Conditions, Continuity equation, Poynting Theorem and Poynting vector, Maxwell Stress tensor, Conservation of Momentum and angular momentum in electromagnetic field, Energy density in electromagnetic field.

UNIT-III

The wave equation, Sinusoidal waves, Wave equations for **E** and **B** fields, Electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves, Energy and momentum in EM waves, Propagation in linear media, Reflection and transmission at Normal and Oblique incidence, Brewster's angle, Wave guides, TEM waves.

UNIT-IV

Scalar and vector potential for electromagnetic fields, Gauge Transformation, Coulomb Gauge, Lorentz Gauge, Electric and magnetic dipole radiation (no derivation needed, discussion of results only), Magnetism as relativistic phenomenon, Transformation of electric and magnetic fields between two inertial frames.

Reference Books:

1. Introduction to Electrodynamics, D.J. Griffiths, 3rd Edn, 1998, Benjamin Cummings.
2. ElectricityandMagnetism,EdwardM.Purcell,1986,McGraw-HillEducation.
3. Electricity and Magnetism, J.H. Fewkes& J. Yarwood. Vol. I, 1991, Oxford Univ. Press.
4. University Physics, Ronald Lane Reese, 2003, ThomsonBrooks/Cole.
5. Electromagnetics, S.L. Kakani& C. Hemrajani, 2016, CBS Publication.

BSC/PHY/SM/2/MDC/102
Statistics-I

Marks (Theory):50 **Marks (Total):75**
Marks (Internal Assessment):25 **Time:3Hrs**
Credits: 03

Note for the Paper Setter: The question paper will consist of **seven** questions in all. The first question will be compulsory and will consist of **four** short questions of **2** marks each covering the whole syllabus. In addition, **six more** questions of **14 marks each** will be set unit-wise comprising of **two** questions from each of the **three** units. The candidates are required to attempt **one compulsory question** and **three more questions** selecting atleast one question from each unit.

Course Outcomes: This course enables the students:

1. To understand the basic knowledge of data and their classification, tabulation.
2. To represent the data in different type of graphs like Histogram, ogives, frequency polygons and curves.
3. To know how to calculate the mean, median, Mode, range, quartile deviation, standard deviation, coefficient deviation.
4. Be familiar with moments, Skewness, Kurtosis and the theory of attributes, order of class frequencies,Yule coefficients.

Unit-I

Introduction of Statistics, Basic knowledge of various types of data, Collection, classification and tabulation of data. Presentation of data: histograms, frequency polygon, frequency curveandogives. Stem-and-LeafandBoxplots.

Unit-II

Measures of Central Tendency and Location: Mean, median, mode, geometric mean, harmonic mean, partition values.
Measures of Dispersion: Absolute and relative measures of range, quartile deviation, mean deviation, standard deviation (σ), coefficient of variation.

Unit-III

Moments, Skewness and Kurtosis: Moments about mean and about any point and derivation of their relationships, effect of change of origin and scale on moments, Sheppard's correct ion for moments (without derivation) ,Charlier's checks, Concepts of Skewness and Kurtosis.

BooksRecommended:

1. A.M.Goon,M.K.Gupta,andB.DasGupta:FundamentalsofStatistics,Vol-I.
2. S.BernsteinandR.Bernstein,ElementsofStatistics,Schaum'soutlineseries,McGraw-Hill.
3. S.C.GuptaandV.K.Kapoor,FundamentalsofMathematicalStatistics,SultanChand&Sons, 200

ENGLISH-I

Communicative English-1

Course Code: **ENG/AEC/101**

Credits: 2 **Internal Assessment: 15**
Duration of Examination:-2 hrs **Semester End Examination: 35**
Total Marks: 50

Course Objective: The course aims to introduce students to the theory, fundamentals and tools of communication and to develop effective communication skills for personal, social and professional interactions. Besides, the students shall learn the basics of English grammar and language.

Course Learning Outcomes:

i) They will learn the importance and basics of communication
ii) They will learn to receive, comment and respond to correspondences in English language.
iii) They will learn to use English in their life practically.

Note for the Paper Setter: The question paper will consist of **five** questions in all. The **first** question will be compulsory and will consist of **seven** short questions of **1** mark each covering the whole syllabus. In addition, **four** more questions of **14** marks each will be set unit-wise comprising of **two** questions from each of the **two** units. The candidates are required to attempt **one** compulsory question and **two** more questions selecting at least **one** question from each unit.

Unit - I: Listening, Reading and Speaking Skills

Definition, The Listening Process; Importance of Listening; Basic Types of Listening; Barriers to Effective Listening, Reading Comprehension, Intonation, Group Discussion, Interview

Unit II: Writing Skills:

- Report Writing
- Paragraph Writing
- Letter Writing
- E-Mail
- Resume
- Blogs and Comments on Social Media

Suggested Reading:

I) Kumar, Sanjay and Pushp Lata. 2015. *Communication Skills*. Second Edition, New Delhi: Oxford University Press (OUP).
II) Sethi, J. and P.V. Dhamija. 2006. *A Course in Phonetics and Spoken English.* Second Edition. New Delhi: Prentice-Hall of India.
III) Balasubramanian. T. *A Text Book of English Phonetics for Indian Students*. Chennai: Macmillan Publishers India Ltd., 1981.
IV) *On Track: English Skills For Success* by Orient Blackswan (Board of Editors, Solapur University).

BSC/PHY/SM/2/SEC/102

Electrical Circuits & Networks (Practical)

Credits: 3 (Practical) **Max. Marks: 75**
Teaching per week: 6 Hrs. **Duration of Exam: 4 Hrs.**

List of Experiments:

1. Use of an oscilloscope, Voltemeter, Ammeter, Multimeter for measuring electrical paramteres.
2. CRO as a versatile measuring device.
3. Circuit tracing of Laboratory electronic equipment,
4. Use of Digital multimeter/VTVM for measuring voltages
5. Circuit tracing of Laboratory electronic equipment,
6. Winding a coil/transformer.
7. Study the layout of receiver circuit.
8. Trouble shooting a circuit
9. Balancing of bridges

Reference Books:

1. A text book in Electrical Technology - B L Theraja - S Chand & Co.
2. A text book of Electrical Technology - A K Theraja.
3. Performance and design of AC machines - M G Say ELBS Edn.

CDLU/VAC/105

Vedic Mathematics

Marks (Theory): 35 **Marks(Total): 50**
Marks (Internal Assessment):15 **Time:2Hrs**
Credits:02

Note for the Paper Setter: The question paper will consist of **five** questions in all. The first question will be compulsory and will consist of **seven** short questions of **1** marks each covering the whole syllabus. In addition, **four** more questions of **14 marks each** will be set unit-wise comprising of **two** questions from each of the **two** units. The candidates are required to attempt **one compulsory question** and **two more questions** selecting at least one question from each unit.

Course Outcomes (COs): At the end of the course, the students will be able

CO1: Discuss the rich heritage of mathematical temper of Ancient India Learning Outcomes: Overcome the fear of maths, Improved critical thinking

CO2: Familiarity with the mathematical under pinnings and techniques ,Ability to do basic maths faster and with ease.

UNIT-I

Vedic Math's- High Speed Addition and Subtraction Sessions/Lectures, Vedic Maths: History of Vedic Maths and its Features, Vedic Maths formulae: Sutras and Upsutras, Addition in Vedic Maths: Without carrying, Dot Method, Subtraction in Vedic Maths:NikhilamNavatashcaramamDashatah,Fraction–AdditionandSubtraction.

UNITII

Vedic Math-Miracle Multiplication and Excellent Division, Multiplication in Vedic Maths: Base Method (any two numbers upto three digits), Multiplication by Urdhva Tiryak Sutra, Miracle multiplication: Any three-digit number by series of 1's and 9's,DivisionbyUrdhvaTiryakSutra(Vinculum method).

Books suggested:

1. TheEssentialofVedicMathematics,RajeshKumarThakur,RupaPublications,NewDelhi2019.
2. VedicMathematicsMadeEasy,DahavalBathia,JaicoPublishing,NewDelhi2011
3. VedicMathematics:SixteenSimpleMathematicalformulaefromtheVedas,Jagadguru SwamiSriBharatiKrishnaTrithaji,MotilalBanarasidas,NewDelhi2015.
4. LearnVedicSpeedMathematicsSystematically,ChaitnayaA.Patil2018.17SuggestedReadings
5. AModernIntroductiontoAncientIndianMathematics,TSBhanumurthy,WileyEastern Limited,NewDelhi.