CISKMV Dhand- Dadwana (Kaithal)

lesson plan

Session-2023-24

Class-B.sc I (Non- medical)

Course- CC-1/MCC-1 (**Mechanics)**

Paper-B23-PHY-101

Date- 24 July ,2023 to 23 November , 2023

Faulty name -Ms Rachna

July	**unit-1** ***Fundamental of dynamics*** : Rigid body, Moment of Inertia, Radius of Gyration, Theorems of perpendicular and parallel axis (with proof),Moment of Inertia of ring, Disc, Angular Disc, Solid cylinder, Solid sphere.
August	Moment of inertia of Hollow sphere, Rectangular plate, Square plate, Solid cone,Triangular plate, Torque, Rotational Kinetic Energy, Angular momentum,Law of conservation of angular momentum, Rolling motion, condition for pure rolling, acceleration of body rolling down an inclined plane, Flywheel, Moment of Inertia of an irregular body. **unit-2** ***Elasticity*** Deforming force, Elastic limit, stress, strain and their types,Hooke's law, Modulus of rigidity, Relation between shear angle and angle of twist.and revision
September	Elastic energy stored/volume in an elastic body, Elongation produced in heavy rod due to its own weight and elastic potential energy stored in it, Tension in rotating rod, Poisson's ratio and its limiting value,Elastic Constants and their relations. Torque required for twisting cylinder,Hollow shaft is stiffer than solid one. Bending of beam, bending moment and its magnitude, Flexural rigidity, Geometrical moment of inertia for beam of rectangular cross-section and circular cross-section. Bending of cantilever (loaded by a weight W at its free end), weight of cantilever uniformly distributed over its entire length. Dispersion of a centrally loaded beam supported at its ends, determination of elastic constants for the material of wire using Searle's method.
October	**Unit-3** ***Special theory of Relativity*** : Michelson's Morley experiment and its outcomes, Postulates of special theory of relativity, Lorentz Transformations, Simultaneity and order of events, Lorentz contraction, Time dilation, Relativistic transformation of velocity, relativistic addition of velocities, variation of mass-energy equivalence, relativistic Doppler effect, relativistic kinematics, transformation of energy and momentum,transformation of force, Problems of relativistic dynamics.
November	**unit-4.** ***Gravitation and central force motion*** : Law of gravitation, Potential and field due to spherical shell and solid sphere. Motion of a particle under central force field, Two body problem and its reduction to one body problem and its solution, compound pendulum or physical pendulum in form of elliptical lamina and expression of time period, determination of g

	by means of bar pendulum, Normal coordinates and normal modes, Normal modes of vibration for given spring mass system, possible angular frequencies of oscillation of two identical simple pendulums of length (l) and small bob of mass (m0 joined together with spring of spring constant(k) and revision.

Practicum	1. Measurement of length (or diameter) using Vernier Caliper, screw gauge and travelling microscope. 2. Moment of Inertia of a Fly Wheel. 3. Moment of Inertia of irregular body using a Torsion Pendulum. 4. Modulus of rigidity of material of wire by Maxwell's Needle. 5. Elastic constants by Searle's method. 6. To determine the value of 'g' by using Bar pendulum.

CISKMV Dhand- Dadwana (Kaithal)

lesson plan

Session-2023-24

Class-B.sc I (Non- medical)

Course -CC-2/MCC-3 **(Electricity,Magnetism and electromagnetic theory)**

Paper- B23-PHY-201

Date- 01 January ,2024 to 27 April, 2024

Faulty name - Ms. Rachna

January	**unit-1 vector background and Electric Field** : Gradient of a scalar and its physical significance, Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field, Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stoke's theorem. Conservative nature of Electrostatic Field, Electrostatic Potential, Potential as line integral of field, potential difference Derivation of electric field E from potential as gradient. Derivation of Laplace and Poisson equations. Electric flux, Gauss's Law, Differential form of Gauss's law and applications of Gauss's law. Mechanical force of charged surface, Energy per unit volume.
February	**unit-2. Magnetic Field :** Biot-Savart law and its simple applications: straight wire and circular loop, Current Loop as a Magnetic Dipole and its Dipole Moment, Ampere's Circuital Law and its applications to (1) Solenoid and (2) Toroid, properties of B: curl and divergence, Magnetic Properties of Matter: Force on a dipole in an external field, Electric currents in Atoms, Electron spin and Magnetic moment, types of magnetic materials, Magnetization vector (M), Magnetic Intensity (H), Magnetic Susceptibility and permeability, Relation between B, H and M, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of Magnetization- B-H curve and hysteresis loop: Energy dissipation, Hysteresis loss and importance of Hysteresis Curve,assignment.
March	**unit-3. Time varying electromagnetic fields:** Electromagnetic inductioFaraday's laws of induction and Lenz's Law, Self-inductance, Mutual inductance, Energy stored in a Magnetic field, Derivation of Maxwell's equations, Displacement current, Maxwell's equations in differential and integral form and their physical significance. **Electromagnetic Waves**: Electromagnetic waves, Transverse nature of electromagnetic wave, energy transported by electromagnetic waves, Poynting vector, Poynting's theorem. Propagation of Plane electromagnetic waves in free space & Dielectrics.
April	**unit-4. DC current Circuits**: Electric current and current density, Electrical conductivity and Ohm's law (Review), Kirchhoff's laws for D.C. networks, Network theorems: Thevenin's theorem, Norton theorem, Superposition theorem. **Alternating Current Circuits:** A resonance circuit, Phasor, Complex Reactance and Impedance, Analysis for RL, RC and LC Circuits, Series LCR Circuit: (1) Resonance, (2) Power Dissipation (3) Quality Factor and (4) Band Width, Parallel LCR Circuit.

Practicum	1. Determination of Impedance of an A.C. circuit and its verification.

	2. Frequency of A.C. mains using an electromagnet. 3. Frequency of A.C. mains Electrical vibrator. 4. To study a series LCR circuit and determine its (a) Resonant frequency, (b) Quality factor. 5. To study a parallel LCR circuit and determine its (a) Anti-resonant frequency and (b) Quality factor. 6. Study of B-H curves of various materials using C.R.O, and determination of various parameters

CISKMV Dhand- Dadwana (Kaithal)

lesson plan

Session-2023-24

Class-B.sc II (non- medical)

Subject -Physics

Paper- PH - 301 (computer programming and thermodynamic)

Date- 24 July ,2023 to 23 November , 2023

Faulty name -Ms Rachna

July	***UNIT-1: Computer Programming*** Computer organization, Binary representation, Algorithm development, Flow charts and their interpretation. FORTRAN Preliminaries: Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements, Formats, . IF, DO and GO TO statements.
August	Dimension arrays, statement function and function subprogram. ***UNIT –2: Applications of FORTRAN programming*** Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the set of given numbers, Ascending and descending order, Mean and standard deviation, Least square fitting of curve, Roots of quadratic equation, Product of two matrices, Numerical integration (Trapezoidal rule and Simpson 1/3 rule)
September	***UNIT-3: Thermodynamics***-I Thermodynamic system and Zeroth law of thermodynamics. First law of thermodynamics and its limitations, reversible and irreversible process. Second law of thermodynamics and its significance.Carnot theorem, Absolute scale of temperature, Absolute Zero and magnitude of each division on work scale and perfect gas scale, Joule's free expansion , Joule Thomson effect.
October	Joule-Thomson (Porous plug) experiment, conclusions and explanation, analytical treatment of Joule Thomson effect. Entropy, calculations of entropy of reversible and irreversible process , T-S diagram, entropy of a perfect gas, Nernst heat law(third law of thermodynamics), Liquefaction of gases, (oxygen, air, hydrogen and helium), Solidification of He below 4K, Cooling by adiabatic demagnetization. ***UNIT-4: Thermodynamics-II*** Derivation of Clausius-Clapeyron and Clausius latent heat equation and their significance
November	specific heat of saturated vapours,phase diagrame and triple point of a substance, development of Maxwell thermodynamical relations. Thermodynamical functions: Internal energy (U), Helmholtz function (F), Enthalpy (H), Gibbs function (G) and the relations between them, derivation of Maxwell thermodynamical relations from thermodynamical functions,Application of Maxwell relations: relations between two specific heats of gas, Derivation of Clausius-Clapeyron and Clausius equation,variation of intrinsic energy with volume for (i) perfect gas (ii)Vanderwall gas (iii)solids and liquids , derivation of Stefans law, adiabatic compression and expention of gas & deduction of theory of Joule Thomson effect. And revision.

CISKMV Dhand- Dadwana (Kaithal)

lesson plan

Session-2023-24

Class-B.sc II (non- medical)

Subject -Physics

Paper- PH - 302 (Wave and optics I)

Date- 24 July ,2023 to 23 November , 2023

Faulty name -Ms. Rachna

July	***Unit-1: Interference I*** 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.
August	Lloyd's mirror, Difference between Bi-prism and Llyod mirror fringes, phase change on reflection. ***Unit 2: Interference II*** Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films, classification of fringes in films and assignments
September	Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings, Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength.
October	***Unit- 3: Diffraction I*** Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light, zone plate, diffraction at a straight edge, rectangular slit and circular aperture, diffraction due to a narrow slit and wire.
November	***Unit -4: Diffraction II*** Fraunhoffer diffraction: single-slit diffraction, double-slit diffraction, N-slit diffraction, plane transmission granting spectrum, dispersive power of grating, limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating. Differences between prism and grating spectra and revision.

CISKMV Dhand- Dadwana (Kaithal)
lesson plan

Session-2023-24
Class-B.sc II (non- medical)
Subject -Physics
Paper- PH - 401 (Statistical Physics)
Date- 01 January ,2024 to 27 April , 2024
Faulty name -Ms. Rachna

January	***Unit –I: Statistical Physics I*** Microscopic and Macroscopic systems, events-mutually exclusive, dependent and independent. Probability, statistical probability, A- priori Probability and relation between them, probability theorems, some probability considerations, combinations possessing maximum probability, combination possessing minimum probability, Tossing of 2,3 and any number of Coins, Permutations and combinations, distributions of N (for N= 2,3,4) distinguishable and indistinguishable particles in two boxes of equal size, Micro and Macro states, Thermodynamical probability, Constraints and Accessible states, Statistical fluctuations, general distribution of distinguishable particles in compartments of different sizes, Condition of equilibrium between two systems in thermal contact-- β parameter, Entropy and Probability (Boltzman's relation).
February	***Unit –II: Statistical Physics II*** Postulates of statistical physics, Phase space, Division of Phase space into cells, three kinds of statistics, basic approach in three statistics. M. B. statistics applied to an ideal gas in equilibrium- energy distribution law (including evaluation of σ and β) , speed distribution law & velocity distribution law. Expression for average speed, r.m.s. speed, average velocity, r. m. s. velocity, most probable energy & mean energy for Maxwellian distribution.
March	***Unit-III: Quantum Statistics*** Need for Quantum Statistics: Bose-Einstein energy distribution law, Application of B.E. statistics to Planck's radiation law B.E. gas, Degeneracy and B.E. Condensation, FermiDirac energy distribution law, F.D. gas and Degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law, Fermi Dirac gas and degeneracy, Fermi energy and Fermi temperature, Fermi Dirac energy distribution law for electron gas in metals, Zero point energy, Zero point pressure and average speed (at 0 K) of electron gas, Specific heat anomaly of metals and its solution. M.B. distribution as a limiting case of B.E. and F.D. distributions, Comparison of three statistics. And seminars.
April	***Unit-IV: Theory of Specific Heat of Solids*** Dulong and Petit law. Derivation of Dulong and Petit law from classical physics. Specific heat at low temperature, Einstein theory of specific heat, Criticism of Einstein theory, Debye model of specific heat of solids, success and shortcomings of Debye theory, comparison of Einstein and Debye theories. & revision.

CISKMV Dhand- Dadwana (Kaithal)
lesson plan

Session-2023-24
Class-B.sc II (non- medical)
Subject -Physics
Paper- PH - 402 (Wave and optics II)
Date- 01 January ,2024 to 27 April , 2024
Faulty name -Ms Rachna

January	***Unit-1: Polarization:*** Polarisation by reflection, refraction and scattering, Malus Law, Phenomenon of double refraction, Huygen'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).
February	***Unit-II: Fourier analysis*** Fourier theorem and Fourier series, evaluation of Fourier coefficient, importance and limitations of Fourier theorem, even and odd functions, Fourier series of functions f(x) between (i) 0 to 2pi, (ii) –pi to pi, (iii) 0 to pi, (iv) –L to L, complex form of Fourier series, Application of Fourier theorem for analysis of complex waves: solution of triangular and rectangular waves , half and full wave rectifier outputs, Parseval identity for Fourier Series, Fourier integrals.
March	***Unit III: Fourier transforms*** Fourier transforms and its properties, Application of Fourier transform (i) for evaluation of integrals, (ii) for solution of ordinary differential equations, (iii) to the following functions: 1. f(x)= e- x2/2 for 1 |X|<a 2 . f(x) = 0 |X |>a Geometrical Optics I Matrix methods in paraxial optics, effects of translation and refraction, derivation of thin lens and thick lens formulae, unit plane, nodal planes, system of thin lenses.
April	***Unit-IV: Geometrical Optics II*** Chromatic, spherical, coma, astigmatism and distortion aberrations and their remedies. **Optical fiber:** Critical angle of propagation, Mode of Propagation, Acceptance angle, Fractional refractive index change, Numerical aperture, Types of optics fiber, Normalized frequency, Pulse dispersion, Attenuation, Applications, Fiber optic Communication, Advantages. and revision.

CISKMV Dhand- Dadwana (Kaithal)
lesson plan

Session-2023-24
Class-B.sc III (non- medical)
Subject -Physics
Paper- PH - 501 (Quantum and laser Physics)
Date- 24 July ,2023 to 23 November , 2023
Faulty name -Ms Rachna

July	***Unit I: Origin quantum physics (Experimental basis)*** Overview, scale of quantum physics, boundary between classical and quantum phenomena, Photon, Photoelectric effect, Compton effect (theory and result), FrankHertz experiment, de-Broglie hypothesis. Davisson and Germer experiment, G.P. Thomson experiment. Phase velocity, group velocity and their relation. Heisenberg's uncertainty principle. Time energy and angular momentum, position uncertainty. Uncertainty principle from de Broglie wave. (Wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit. Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle)
August	Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle). Time-independent Schrodinger wave equation, eigen values, eigen functions, wave functions and its significance. Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density ***Unit II: Application of Schrodinger wave equation:*** (i) Free particle in one-dimensional box (solution of Schrodinger wave equation, eigen functions, eigen values, quantization of energy and momentum, nodes and anti nodes, zero point energy). (ii) One dimensional step potential E > Vo (Reflection and Transmission coefficient)
September	iii) One dimensional step potential E < Vo (penetration depth calculation). (iv) One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient) (v) One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient). (vi) Solution of Schrodinger equation for harmonic oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states)
October	***Unit III: Laser Physics –I*** Absorption and emission of radiation, Main features of a laser: Directionality, high intensity, high degree of coherence, spatial and temporal coherence, Einstein's coefficients and possibility of amplification, momentum transfer,life time of a level, kinetics of optical absorption ((two and three level rate equation, Fuchbauer landerburg formula).population inversion: A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening).
November	***Unit IV: Laser Physics – II*** He-Ne laser and RUBY laser (Principle, Construction and working), Optical properties of semiconductor, Semiconductor laser (Principle, Construction

	and working), Applications of lasers in the field of medicine and industry. and revision.

CISKMV Dhand- Dadwana (Kaithal)
lesson plan

Session-2023-24
Class-B.sc III (non- medical)
Subject -Physics
Paper- PH - 502 (Nuclear Physics)
Date- 24 July ,2023 to 23 November , 2023
Faulty name -Ms Rachna

July	**Unit I:** *Nuclear Structure and Properties of Nuclei* Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear size, spin, parity, statistics, magnetic dipole moment, quadruple moment (shape concept).
August	Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law. Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability and revision.
September	**Unit II:** *Nuclear Radiation decay Processes* Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis), types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays. And assignment.
October	Radiation interaction Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation), Range and straggling of alpha particles. Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray; Passage of Gamma radiations through matter (Photoelectric, Compton and pair production effect) electron-positron annihilation. Absorption of Gamma rays (Mass attenuation coefficient) and its application **.Unit III:** Nuclear Accelerators Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators.
November	Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Scintillation counter and semiconductor detector. **Unit IV**:Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions. Conservation laws, Q-value and reaction threshold. Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors, (Principle, construction, working and use).

CISKMV Dhand- Dadwana (Kaithal)
lesson plan

Session-2023-24
Class-B.sc III (non- medical)
Subject -Physics
Paper- PH - 601 (solid state and nano physics)
Date- 01 January ,2024 to 27 April, 2024
Faulty name -Ms Rachna

January	Unit-1:crystalline and glassy forms,liquid crystals,crystal structure,periodicity,lattice and basis,crystal translation vectors and axes,unit cell and primitive cell,Winger Switzerland primitive cell,symmetry operations for a two dimensional crystal,Bravia's lattices in 2D&3D ,crystal planes and Miller indices,interplaner spacing,crystal structure of ZnS,NaCl,Diamond and revision.
February	unit-2: X-ray diffraction,Bragg's law and experimental X-ray diffraction methods: Laue's method,rotating crystal method,powder method,K-space and reciprocal lattice and its physical significance,reciprocal lattice vectors,reciprocal lattice of SCC,BCC,FCC and assignment on crystal structure.
March	unit-3 (Superconductivity):Introduction and survey of superconductivity,HTS, isotopic effect ,critical magnetic field,Meissen effect ,London theory and Pippard's equation ,classification of superconductor,BCS theory of superconductivity,flux quantisation,Josephson effect (AC and DC),practical application of superconductivity and their limitations, And revision.
April	unit-4 : definition , length scale of nano physics,importance of nano scale and technology,benefits and challenges in molecular manufacturing,molecular assembler concept, understanding advanced capabilities: SEM,TEM,FIM,STEM,STM,AFM, carbon fullerenes and nanotubes ,revision and seminars.

CISKMV Dhand- Dadwana (Kaithal)
lesson plan

Session-2023-24
Class-B.sc III (non- medical)
Subject -Physics
Paper- PH - 602 (Atomic and Molecular physics)
Date- 01 January ,2024 to 27 April, 2024
Faulty name -Ms Rachna
B.Sc.-III (Physics)

January :Unit – I: *Historical background of atomic spectroscopy*
Introduction of early observations, emission and absorption spectra, atomic spectra, wave number, spectrum of Hydrogen atom in Balmer series, Bohr atomic model (Bohr's postulates) , spectra of Hydrogen rogen atom , explanation of spectral series in Hydrogen atom, un-quantized states and continuous spectra, spectral series in absorption spectra, effect of nuclear motion on line spectra (correction of finite nuclear mass), variation in Rydberg constant due to finite mass, short comings of Bohr's theory, Wilson sommerfeld quantization rule, de-Broglieinterpretation Bohr quantization law,and assignment.

February:Bohr's corresponding principle, Sommerfeld's extension of Bohr's model, Sommerfeld relativistic correction, Short comings of Bohr-Sommerfeld theory, Vector model; space quantization, electron spin, coupling of orbital and spin angular momentum, spectroscopic terms and their notation, quantum numbers associated with vector atom model, transition probability and selection rules.

Unit –II: *Vector Atom Model (single valance electron)*
Orbital magnetic dipole moment (Bohr megnaton), behavior of magnetic dipole in external magnetic filed; Larmor's precession and theorem. Penetrating and Non-penetrating orbits, Penetrating orbits on the classical model;Quantum defect, spin orbit interaction energy of the single valance electron, spin orbit interaction for penetrating and non-penetrating orbits. quantum mechanical relativity correction, Hydrogen fine spectra, Main features of Alkali Spectra and their theoretical interpretation, term series and limits, Rydeburg-Ritze combination principle, Absorption spectra of Alkali atoms. observed doublet fine structure in the spectra of alkali metals and its Interpretation, Intensity rules for doublets, comparison of Alkali spectra and Hydrogen spectrum .

March:UNIT-III: *Vector Atom model (two valance electrons)*
Essential features of spectra of Alkaline-earth elements, Vector model for two valance
electron atom: application of spectra.
Coupling Schemes:LS Coupling Scheme and JJ coupling scheme, Interaction energy in L-S coupling (sp, pd configuration), Lande interval rule, Pauli principal and periodic classification of the elements. Interaction energy in JJ Coupling (sp, pd configuration), equivalent and non-equivalent electrons, Two valance electron system-spectral terms of non-equivalent and equivalent electrons, comparison of spectral terms in L-S And J-J coupling. Hyperfine structure of spectral lines and its origin; isotope effect, nuclear spin and seminar.

April:Unit –IV: *Atom in External Field*

Zeeman Effect (normal and Anomalous),Experimental set-up for studying Zeeman effect, Explanation of normal Zeeman effect(classical and quantum mechanical), Explanation of anomalous Zeeman effect(Lande g-factor), Zeeman pattern of D1 and D2 lines of Naatom, Paschen-Back effect of a single valence electron system. Weak field Stark effect of Hydrogen atom.

Molecular Physics: General Considerations, Electronic States of Diatomic Molecules, Rotational Spectra (Far IR and Microwave Region), Vibrational Spectra (IR Region), Rotator Model of Diatomic Molecule, Raman Effect, Electronic Spectra. And revision .