Lesson plan for the odd semester November to February 2020-21

Subject-CLASSICAL MECHANICS

Class-B.Sc.-First Year (1st Semester)

Teacher Name: Vandana

November,2020 **3rd Week**	**Unit 1: Basic concepts of Classical mechanics** Mechanics of single and system of particles, Conversion law of linear momentum,
4th Week	Conversion law of Angular momentum and mechanical energy for a particle and a system of particles,
December,2020 **1st Week**	Centre of Mass and equation of motion Constrained Motion, Numerical problems and Revision
2nd Week	**Unit2: Generalized Notations** Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement
3rd Week	Generalized Velocity, Acceleration, Momentum, Force and Potential, Hamilton's variational principle
4th Week	Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.
5th Week	Numerical problems and Revision.
January ,2021 **1st Week**	**Unit 3: Theory of relativity** Frame of reference, limitation of Newton's law of motion, Inertial frame of reference, Galilean transformation, Frame of reference with linear acceleration
2nd Week	Classical relativity-Galilean invariance, Transformation equation for a frame of reference- inclined to an inertial frame and Rotating frame of reference,
3rd Week	Non-inertial frames-The accelerated frame of reference and Rotating frame of reference,
4th Week	Numerical and short Answers **Sessionals**
February ,2021 **1st Week**	Effect of centrifugal and coriolis forces due to Earth's rotation, Fundamental frame of reference, Michelson- Morley's experiment, concept of Einstein's relativity.
2nd Week	**Unit 4: Applications of theory of relativity** Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance
3rd Week	Length Contraction, Time Dilation, Twin Paradox, Velocity addition theorem, Variation of mass with velocity, Mass energy equivalence
4th Week	Transformation of relativistic momentum and energy, relation between relativistic momentum and energy, Mass, velocity, momentum and energy of zero rest mass.

Subject-Electricity
Class-B.Sc- First Year (1st Semester)
Teacher Name: Vandana

November, 2020 **3rd Week**	**Unit I: Vector background and Electric field** Introduction of vector and scalar fields Gradient of a scalar and its physical significance
4th Week	Line, Surface and Volume integrals of a vector and their physical significance, Flux of a vector field,
December,2020 **1st Week**	Divergence and curl of a vector and their physical significance, Gauss's divergence theorem,
2nd Week	Stokes theorem, Derivation of electric field E from potential as gradient
3rd Week	Derivation of Laplace and Poisson equations, Electric flux Gauss's Law
4th Week	Mechanical force of charged surface, Energy per unit volume. **Revision**
5th Week	Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction, properties of B (i) Div (B)=0 (ii) Curl (B)=μJ
January,2021 **1st Week**	Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory)
2nd Week	Cycle of magnetization- hysteresis loop (Energy dissipation, Hysteresis loss and importance of Hysteresis Curve)
3rd Week	**Unit 3: Electromagnetism** Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials
4th Week	Boundary conditions at interface between two different media, Propagation of electromagnetic wave (Basic idea, no derivation), Poynting vector and Poynting theorem.
February ,2021 **1st Week**	**Unit 4: A. C. Analysis** A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR) (b) Resistance and Inductance (LR)
2nd Week	(c) Capacitance and Inductance (LC) and (d) Capacitance, Inductance and Resistance (LCR),
3rd Week	Series and parallel resonance circuit, **Sessional**
4th Week	Quality factor (sharpness of resonance). Revision

Subject-Computer Programming and Thermodynamics
Class-B.Sc-second Year (3rd Semester)
Teacher Name: Meenu Sharma

October,2020 **2nd Week**	**UNIT-1: Computer Programming** Computer organization, binary representation, algorithm development
3rd Week	Flow-chart and their interpretation. FORTRAN preliminaries: integer and floating points arithmetic expression
4th Week	built-in-function, executable and non-executable statement , input and output statements
5th Week	Formats, IF, Do and Go To statements, dimension arrays, statements function and function subprogram
November,2020 **1st Week**	**UNIT –2: Applications of FORTRAN programming** Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the set of given numbers
2nd Week	Ascending and descending order, Mean and standard deviation,
3rd Week	Least square fitting of curve, Roots of quadratic equation
4th Week	Product of two matrices, Numerical integration (Trapezoidal rule and Simpson 1/3 rule) .
December,2020 **1st Week**	Revision class problems and class test
2nd Week	**UNIT-3: Thermodynamics-I** Thermodynamic system and Zeroth law of thermodynamics .first law of thermodynamics and its limitations, reversible and irreversible process.
3rd Week	second law of thermodynamics and its significance ,Carnot theorem , Absolute scale of temperature ,Absolute scale and magnitude of each division on work scale and perfect gas scale ,
4th Week	Joule free expansion, joule Thomson effect, joule Thomson experiment , conclusions and explanation, analytical treatment of Joule Thomson effect.
5th Week	Entropy ,calculations of entropy of reversible and irreversible process, T-S diagram, entropy of perfect gas, Nernst heat law
January,2021 **1st Week**	Liquefaction of gases (oxygen , air, hydrogen and helium) , solidification of He below 4K ,cooling by adiabatic demagnetization
2nd Week	**Sessionals Revision** **Class Test**
3rd Week	UNIT-4: Thermodynamics-II Derivation of Clausius-Clapeyron and Clausius latent heat equation and their significance, specific heat of saturated vapours,
4th Week	Phase diagram and triple point of a substance, development of Maxwell thermodynamical relations.
Feb,2021 **1st Week**	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,
2nd Week	Derivation of Clausius-Clapeyron and Clausius equation, variation of intrinsic energy with volume for (i) perfect gas (ii)Vander wall gas (iii)solids and liquids
3rd Week	Derivation of Stefan's law, adiabatic compression and expansion of gas & deduction of theory of Joule Thomson effect.
4th Week	**Revision**

Subject-Wave and Optics
Class-B.Sc (semester 3rd)
Teacher Name: Meenu Sharma

October,2020 **2nd Week**	**Unit 1: Interference I** Interference by Division of wave front, Young's double slit experiment,
3rd Week	Coherence, conditions of Interference.
4th Week	Fresnel's biprism and its applications to determination of wavelength of sodium light and thickness of a mica sheet
5th Week	Lloyd's mirror **Class Test**
November,2020 **1st Week**	Difference between Bi-prism and Lloyd's mirror fringes, phase change on reflection
2nd Week	**Unit 2: Interference II** Interference by division of Amplitude, thin films, plane parallel film
3rd Week	Revision of Unit 1
4th Week	Interference due to transmitted light, wedge shaped film
December,2020 **1st Week**	Newton's rings
2nd Week	Interferometers; Michelson interferometer and its applications to 1)standardization of a meter 2)determination of wavelength
3rd Week	Revision of unit 2
4th Week	**Unit- 3: Diffraction I** Huygens's Fresnel's diffraction: Fresnel's assumptions and half period zones, rectilinear propagation of light
5th Week	zone plate, diffraction at a straight edge, rectangular slit and circular aperture,
January ,2021 **1st Week**	diffraction due to a narrow slit and wire
2nd Week	Revision of Unit 3 **Sessionals**
3rd Week	**Unit -4: Diffraction II** Fraunhoffer diffraction: single-slit diffraction
4th Week	Fraunhoffer diffraction :double-slit diffraction
Feb,2021 **1st Week**	N-slit diffraction, plane transmission granting spectrum,
2nd Week	dispersive power of grating, limit of resolution, Rayleigh's criterion
3rd Week	resolving power of telescope and a grating. Differences between Prism and grating spectra.
4th Week	Revision of unit 4

Subject-Quantum and Laser Physics
Class-B.Sc- Third Year (5th Semester)
Teacher Name: Vandana

October,2020 **2nd Week**	**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), Frank-Hertz experiment, de-Broglie hypothesis.
3rd Week	Davisson and Germer experiment, G.P.Thomson experiment. Phase velocity, group velocity and their relation. Heisenberg's uncertainty principle.
4th Week	Time energy and angular momentum, position uncertainty. Uncertainty principle from de Broglie wave. (Wave-particle duality). Gamma Ray Microscope, Electron diffraction from a slit.
5th Week	Derivation of 1-D time-dependent Schrodinger wave equation (subject to force, free particle).
November,2020 **1st Week**	Time-independent Schrodinger wave equation, Eigen values, Eigen functions, wave functions and its Significance.
2nd Week	Orthogonality and Normalization of function, concept of observer and Operator. Expectation values of dynamical quantities, probability current density.
3rd Week	**Revision and Class Test**
4th Week	**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).
December,2020 **1st Week**	ii) One dimensional step potential E > Vo (Reflection and Transmission coefficient) (iii) One dimensional step potential E < Vo (penetration depth calculation).
2nd Week	(iv) One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient) (v) One-dimensional potential barrier, E < Vo (penetration or tunneling coefficient).
3rd Week	(vi) Solution of Schrodinger equation for harmonic oscillator (quantization of energy, Zero-point energy, wave equation for ground state and excited states).
4th Week	**Revision and Class Test**
5th Week	**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,
January ,2021 **1st Week**	Einstein's coefficients and possibility of amplification, momentum transfer, life time of a level,
2nd Week	kinetics of optical absorption ((two and three level rate equation, Fuchbauer landerburg formula)
3rd Week	population inversion: A necessary condition for light amplification, resonance cavity, laser pumping, Threshold condition for laser emission, line broadening mechanism
4th Week	homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening). **Revision**
Feb,2021 **1st Week**	**Unit IV: Laser Physics – II** He-Ne laser and RUBY laser (Principle, Construction and working),

2nd Week	Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working),
3rd Week	Applications of lasers in the field of medicine and industry. **Sessional**
4th Week	**Revision**

Subject-Quantum and Laser Physics
Class-B.Sc- Third Year (5th Semester)
Teacher Name: Vandana

October,2020 **2nd Week**	**Unit I: Nuclear Structure and Properties of Nuclei** Nuclear composition (p-e and p-n hypotheses), Nuclear properties; Nuclear size, spin, parity
3rd Week	Statistics, magnetic dipole moment, quadruple moment (shape concept).
4th Week	Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law.
5th Week	Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability
November,2020 **1st Week**	**Revision and Class Test**
2nd Week	**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.
3rd Week	**Radiation interaction** Interaction of heavy charged particles (Alpha particles); Energy loss of heavy charged particle (idea of Bethe formula, no derivation),
4th Week	Range and straggling of alpha particles,Geiger-Nuttal law.
December,2020 **1st Week**	Interaction of light charged particle (Beta-particle), Energy loss of Beta-particles (ionization), Range of electrons, absorption of beta-particles. Interaction of Gamma Ray;
2nd Week	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.
3rd Week	**Revision and Class Test**
4th Week	**Unit III: Nuclear Accelerators** Linear accelerator, Tandem accelerator,
5th Week	Cyclotron and Betatron accelerators.
January ,2021 **1st Week**	**Nuclear Radiation Detectors.** Gas filled counters; Ionization chamber,
2nd Week	proportional counter, G.M. Counter (detailed study),
3rd Week	Scintillation counter and semiconductor detector
4th Week	**Revision and Class Test**
Feb,2021 **1st Week**	**Unit IV:** **Nuclear reactions.** Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and Spallation Reactions.
2nd Week	Conservation laws, Q-value and reaction threshold**.**
3rd Week	**Nuclear Reactors.** Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors,(Principle, construction, working and use).
4th Week	**Revision**