Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 1st Semester)
Name of Subject: Classical Mechanics and Theory of Relativity (PH 101)

1st Sept 2022 to 24th Dec 2022	
	Month (November)
Week 1	**Unit 1: Basic concepts of Classical mechanics** Mechanics of single and system of particles, Conversion law of linear momentum,
	Month (December)
Week 2	Angular momentum and mechanical energy for a particle and a system of particles, Centre of Mass and equation of motion, Constrained Motion.
Week 3	**Unit2: Generalized Notations** Degrees of freedom and Generalized coordinates, Transformation equations, Generalized Displacement, Velocity, Acceleration,
Week 4	Momentum, Force and Potential, Hamilton's variational principle,
Week 5	Lagrange's equation of motion from Hamilton's principle, Linear Harmonic oscillator, Simple pendulum, Atwood's machine.
Week 6	**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, **Assignment**
	Month (January)
Week 7	Classical relativity- Galilean invariance, Transformation equation for a frame of reference- inclined to an inertial frame and Rotating frame of reference,
Week 8	Non-inertial frames-The accelerated frame of reference and rotating frame of reference , Effect of centrifugal and coriolis forces due to Earth's rotation, Fundamental frame of reference,
Week 9	Michelson- Morley's experiment, concept of Einstein's relativity. **Unit 4: Applications of theory of relativity** Special theory of relativity, Lorentz co-ordinate and physical significance of Lorentz invariance,
Week 10	Length Contraction, Time Dilation, Twin Paradox,
Week 11	Velocity addition theorem, Variation of mass with velocity,
	Month (February)
Week 12	Mass energy equivalence, Transformation of relativistic momentum and energy, relation between relativistic momentum and energy,
Week 13	Mass, velocity, momentum and energy of zero rest mass
Week 14	**Revision, Assignment and Test**

Text and Reference Books:

1. Classical Mechanics by H. Goldstien (2nd Edition).
2. Mechanics by D.S. Mathur

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 1st Semester)
Name of Subject: Electricity, Magnetism and Electromagnetic theory (PH 102)

1st Sept 2022 to 24th Dec 2022	
Week 1	**Unit I: 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,
Week 2	Divergence and curl of a vector and their physical significance, Gauss's divergence theorem, Stokes theorem. Derivation of electric field E from potential as gradient, Derivation of Laplace and Poisson equations,
Week 3	Electric flux, Gauss's Law, Mechanical force of charged surface, Energy per unit volume.
Week 4	**Unit 2: Magnetism** Magnetic induction, Magnetic flux, Solenoidal nature of vector field of induction,
Week 5	properties of B, Electronic theory of dia and paramagnetism, Domain theory of ferromagnetism (Langevin's theory), Cycle of magnetization- hystresis loop (Energy dissipation, Hystresis loss and importance of Hystresis Curve)
Week 6	**Unit 3: Electromagnetism** Maxwell equations and their derivations, Displacement current, Vector and Scalar potentials, **Assignment**
Week 7	Boundary conditions at interface between two different media, Propagation Of electromagnetic wave (Basic idea, no derivation),
Week 8	Poynting vector and Poynting theorem.
Week 9	**Unit 4: A. C. Analysis** A.C. circuit analysis using complex variable with (a) Capacitance and Resistance (CR)
Week 10	(b) Resistance and Inductance (LR) (c) Capacitance and Inductance (LC) and (d) Capacitance, Inductance and Resistance (LCR),
Week 11	Series and parallel resonance circuit,
Week 12	Quality factor (sharpness of resonance).
Week 13	Revision
Week 14	**Revision, Assignment and Test**

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 1st Semester)
Name of Subject: Electricity, Magnetism and Electromagnetic theory (PH 102)

Text and Reference Books:

1. Electricity and Magnetism by Reitz and Milford (Prentice Hall of India).
2. Electricity and Magnetism by A.S. Mahajan and A.A. Rangwala

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 3rd Semester)
Name of Subject: Computer Programming and Thermodynamics (PH 301)

20th Aug 2022 to 24th Dec 2022	
Week 1	**UNIT-1: Computer Programming** Computer organization, Binary representation, Algorithm development, Flow charts and their interpretation.
Week 2	FORTRAN Preliminaries: Integer and floating point arithmetic expression, built in functions, executable and non-executable statements, input and output statements,
Week 3	Formats, IF, DO and GO TO statements, Dimension arrays, statement function and function subprogram.
Week 4	**UNIT –2: Applications of FORTRAN programming** Algorithm, Flow Chart and Programming for Print out of natural numbers, Range of the set of given numbers,
Week 5	Ascending and descending order, Mean and standard deviation, Least square fitting of curve, Roots of quadratic equation,
Week 6	Product of two matrices, Numerical integration (Trapezoidal rule and Simpson 1/3 rule). **Assignment**
Week 7	**UNIT-3: Thermodynamics-I** Thermodynamic system and Zeroth law of thermodynamics. First law of thermodynamics and its limitations, reversible and irreversible process.
Week 8	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, Joule-Thomson (Porous plug) experiment, conclusions and explanation,
Week 9	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.
Week 10	**UNIT-4: Thermodynamics-II** Derivation of Clausius-Clapeyron and Clausius latent heat equation and their significance,specific heat of saturated vapours,phase diagrame and triple point of a substance, development of Maxwell thermodynamical relations.

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 3rd Semester)
Name of Subject: Computer Programming and Thermodynamics (PH 301)

Week 11	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,
Week 12	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 ,
Week 13	derivation of Stefans law, adiabatic compression and expention of gas & deduction of theory of Joule Thomson effect.
Week 14	**Revision, Assignment and Test**

Text and Reference Books:

1.Rajaraman V, Computer Programming in FORTRAN 77, Prentice-Hall of India Pvt Ltd, New Delhi.
2 Roy S K, Thermal Physics and Statistical Mechanics, New Age International Publishers, New Delhi
3. Sharma J K and Sarkar K K, Thermodynamics and Statistical Physics, Himalaya Publishing House.

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 3rd Semester)
Name of Subject: Wave and optics I (PH 302)

20th Aug 2022 to 24th Dec 2022	
Week 1	**Unit-1: Interference I** Interference by Division of Wave front: Young's double slit experiment, Coherence, Conditions of interference
Week 2	Fresnel's biprism and its applications to determine the wavelength of sodium light and thickness of a mica sheet, Lloyd's mirror
Week 3	Difference between Bi-prism and Llyod mirror fringes
Week 4	**Unit 2: Interference II** Interference by Division of Amplitude: Plane parallel thin film, production of colors in thin films
Week 5	classification of fringes in films, Interference due to transmitted light and reflected light, wedge shaped film, Newton's rings,
Week 6	Interferometer: Michelson's interferometer and its applications to (i) Standardization of a meter (ii) determination of wavelength. **Assignment**
Week 7	**Unit- 3: Diffraction I** Fresnel's diffraction: Fresnel's assumptions and half period zones
Week 8	rectilinear propagation of light, zone plate, diffraction at a straight edge
Week 9	rectangular slit and circular aperture, diffraction due to a narrow slit and wire.
Week 10	**Unit -4: Diffraction II** Fraunhoffer diffraction: single-slit diffraction,
Week 11	double-slit diffraction, N-slit diffraction,
Week 12	plane transmission granting spectrum, dispersive power of grating,.
Week 13	limit of resolution, Rayleigh's criterion, resolving power of telescope and a grating
Week 14	Differences between prism and grating spectra **Revision, Assignment and Test**

Text and Reference Books:

1.Optics by Ajay Ghatak, Tata McGraw Hill 1977.
2 Subrahmanyam N, Lal B, Avadhanulu M N, A Text Book of Optics, S Chand & Co, New Delhi

.

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 5th Semester)
Name of Subject: Quantum and Laser Physics (PH 501)

20th Aug 2022 to 24th Dec 2022	
Week 1	**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.
Week 2	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.
Week 3	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.
Week 4	Orthogonality and Normalization of function, concept of observer and operator. Expectation values of dynamical quantities, probability current density
Week 5	**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)
Week 6	(iii) One dimensional step potential E < Vo (penetration depth calculation). (iv) One dimensional potential barrier, E > Vo (Reflection and Transmission coefficient) **Assignment**
Week 7	(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).
Week 8	**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,
Week 9	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,

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 5th Semester)
Name of Subject: Quantum and Laser Physics (PH 501)

Week 10	Threshold condition for laser emission, line broadening mechanism, homogeneous and inhomogeneous line broadening (natural, collision and Doppler broadening).
Week 11	**Unit IV: Laser Physics – II** He-Ne laser and RUBY laser (Principle, Construction and working),
Week 12	Optical properties of semiconductor, Semiconductor laser (Principle, Construction and working),
Week 13	Applications of lasers in the field of medicine and industry.
Week 14	**Revision, Assignment and Test**

Text and Reference Books:

1. Bransden B H and Joachain C J, Quantum Mechanics (2000), Pearson Education
2.Laud B B, Laser Physics

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 5th Semester)
Name of Subject: Nuclear Physics (PH 502)

20th Aug 2022 to 24th Dec 2022	
Week 1	**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).
Week 2	Determination of mass by Bain-Bridge, Bain-Bridge and Jordan mass spectrograph. Determination of charge by Mosley Law.
Week 3	Determination of size of nuclei by Rutherford Back Scattering. mass and binding energy, systematic of nuclear binding energy, nuclear stability
Week 4	**Unit II: Nuclear Radiation decay Processes** Alpha-disintegration and its theory. Energetics of alpha-decay, Origin of continuous beta spectrum (neutrino hypothesis),
Week 5	types of beta-decay and energetics of beta-decay. Nature of gamma rays, Energetics of gamma rays.
Week 6	**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. **Assignment**
Week 7	Geiger-Nuttal law. Interaction of light charged particle (Beta-particle), Energy loss of beta-particles (ionization), Range of electrons, absorption of beta-particles.
Week 8	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..
Week 9	**Unit III: Nuclear Accelerators** Linear accelerator, Tendem accelerator, Cyclotron and Betatron accelerators.
Week 10	**Nuclear Radiation Detectors.** Gas filled counters; Ionization chamber, proportional counter, G.M. Counter (detailed study), Scintillation counter and semiconductor detector.
Week 11	**Unit IV:** **Nuclear reactions.** Nuclear reactions, Elastic scattering, Inelastic scattering, Nuclear disintegration, Photonuclear reaction, Radiative capture, Direct reaction, Heavy ion reactions and spallation Reactions.
Week 12	Conservation laws, Q-value and reaction threshold**.**

Summary of Lesson Plan of College Faculty

Name of College: Govt. College for Women, Bastara, Karnal **Academic Session 2022-23** **Semester: Odd**
Name of Asstt./Ass. Prof : Dr. Hitender Kumar
Class: B.Sc. Physics (Pass Course 5th Semester)
Name of Subject: Nuclear Physics (PH 502)

Week 13	**Nuclear Reactors.** Nuclear Reactors, General aspects of Reactor Design. Nuclear fission and fusion reactors, (Principle, construction, working and use).
Week 14	**Revision, Assignment and Test**

Text and Reference Books:

1.Tayal D C, Nuclear Physics (1994), HPH, Bombay
2.Ghoshal S N, Atomic and Nuclear Physics Vol II (1994), S Chand & Co New