

Modules of Classes and Examinations, 2021-22

B.Sc. (General) in Physics

Semester-I

➤ Total 75 Marks

➤ **Hiralal Bhakat College, Nalhati**

➤

➤ **Core Course CC2A** Mechanics

➤ 40 Marks for Semester-end-Examination# (will be organized by University)

➤ 20 Marks for practical (will be organized by College in general and Department in Particular)

➤ 10+5=15 Marks for Internal Assessment (will be organized by College in general and Department in Particular)

➤ 10 Marks for Class Test/ Assignment/ Seminar

➤ 5 Marks for Attendance

Attendance: 50% & above but below 60% - 2 Marks

Attendance: 60% & above but below 75% - 3 Marks

Attendance: 75% & above but below 90% - 4 Marks

Attendance: 90% & Above - 5 Marks

Internal Assessment	Component 1 (C₁)	Component 2 (C₂)
Weightage	5 Marks	1.Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant). Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS). 2. Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations. 3. Elasticity: Hooke's law - Stress-strain diagram - Elastic moduli-Relation between elastic constants - Poisson's Ratio-Expression for Poisson's ratio in terms of elastic constants-Work done in stretching and work done in twisting a wire-Twisting couple on a cylinder - Determination of Rigidity modulus by static torsion -Torsional pendulum- Determination of Rigidity modulus and moment of inertia . 4. Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation.
Number of Questions	5	
Date	15-09-2021	
Time	2PM-3PM	
Syllabus	1.Vectors: Vector algebra, Scalar and vector products, Derivatives of a vector with respect to a parameter. 2. Ordinary Differential Equations: 1st order homogeneous differential equations. 2 nd order homogeneous differential equations with constant coefficients. 3.Laws of Motion: Frames of reference. Newton's Laws of motion. Dynamics of a system of particles. Centre of Mass. 4. Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets. 5.Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum.	

Name of Teacher(s)	Md Ashik	Md Ashik
Number of Classes	62 (Tentative)	125 (Tentative)
Component 2(C₃) <ul style="list-style-type: none"> ➤ 40Marks for Semester-end-Examination (will be organized by University) ➤ Answer 5 questions out of 8 carrying 02 marks each = 5 x 02 = 10 marks ➤ Answer 5 questions out of 7 carrying 03 marks each = 5 x 03 = 15 marks ➤ Answer 03 questions out of 05 carrying 5 marks each = 03x 5 = 15 marks ➤ Whole Syllabus of CC 2A ➤ Practical (Mechanics) = 20 Marks Laboratory Note Book: 05 Marks Viva- voce: 05 Marks Experiment: 40 Marks (This 40 marks will be transformed into 10 Marks) ➤ A project File (Laboratory Note Book), comprising one exercise each is to be submitted. 		

Modules of Classes and Examinations, 2021-22

B.Sc. (GENERAL) IN PHYSICS

Semester-III

Hiralal Bhakat College, Nalhati

Core Course 2C : Thermal physics and Statistical physics

- Total 75 Marks
- 40 Marks for Semester-end-Examination[#] (will be organized by University)
- 20 Marks for practical (will be organized by College in general and Department in Particular)
- 10+5=15 Marks for Internal Assessment (will be organized by College in general and Department in Particular)
- 10 Marks for Class Test/ Assignment/ Seminar
- 5 Marks for Attendance
 - Attendance: 50% & above but below 60% - 2 Marks
 - Attendance: 60% & above but below 75% - 3 Marks
 - Attendance: 75% & above but below 90% - 4 Marks
 - Attendance: 90% & Above - 5 Marks

Internal Assessment	Component 1 (C ₁)	Component 2 (C ₂)
Weightage	5 Marks	1.Kinetic Theory of Gases:

Number of Questions	5	Derivation of Maxwell's law of distribution of velocities and its experimental verification, Mean free path (Zeroth Order), Transport Phenomena: Viscosity, Conduction and Diffusion (for vertical case), Law of equipartition of energy (no derivation) and its applications to specific heat of gases; mono-atomic and diatomic gases. 2. Theory of Radiation: Blackbody radiation, Spectral distribution, Concept of Energy Density, Derivation of Planck's law, Deduction of Wien's distribution law, Rayleigh-Jeans Law, Stefan Boltzmann Law and Wien's displacement law from Planck's law. 3. Statistical Mechanics: Phase space, Macro state and Micro state, Entropy and Thermodynamic probability, Maxwell-Boltzmann law - distribution of velocity - Quantum statistics - Fermi-Dirac distribution law - electron gas - Bose-Einstein Distribution law - photon gas - comparison of three statistics.
Date	15-09-21	
Time	2PM-3PM	
Syllabus	1.Laws of Thermodynamics: Thermodynamic Description of system: Zeroth Law of thermodynamics and temperature. First law and internal energy, conversion of heat into work, Various Thermodynamical Processes, Applications of First Law: General Relation between CP & CV, Work Done during Isothermal and Adiabatic Processes, Compressibility & Expansion Coefficient, Reversible & irreversible processes, Second law & Entropy, Carnot's cycle & theorem, Entropy changes in reversible & irreversible processes, Entropy-temperature diagrams, Third law of thermodynamics, Unattainability of absolute zero. 2. Thermodynamic Potentials: Enthalpy, Gibbs, Helmholtz and Internal Energy functions, Maxwell's relations & applications - Joule-Thompson Effect, Clausius-Clapeyron Equation, Expression for (CP - CV), CP/CV, TdS equations.	

Name of Teacher(s)	Md Ashik	Md Ashik
Number of Classes	62 (Tentative)	125 (Tentative)
<p>Component 2:</p> <ul style="list-style-type: none"> ➤ 40Marks for Semester-end-Examination (will be organized by University) ➤ Answer 5 questions out of 8 carrying 02 marks each = 5 x 02 = 10 marks ➤ Answer 5 questions out of 7 carrying 03 marks each = 5 x 03 = 15 marks ➤ Answer 03 questions out of 05 carrying 5 marks each = 03x 5 = 15 marks ➤ Whole Syllabus of CC 2C ➤ Practical (Statistical Methods in Geography) = 20 Marks Laboratory Note Book: 05 Marks Viva- voce: 05 Marks Experiment: 40 Marks (This 40 marks will be transformed into 10 Marks) 		

- A project File (Laboratory Note Book), comprising one exercise each is to be submitted.

Modules of Classes and Examinations, 2021-22

B.Sc. (General) in Physics

Semester-V

Hiralal Bhakat College, Nalhati

DSE 2A

ELEMENT OF MORDERN PHYSICS

- Total 75 Marks
- 40 Marks for Semester-end-Examination[#] (will be organized by University)
- 20 Marks for practical (will be organized by College in general and Department in Particular)
- 10+5=15 Marks for Internal Assessment (will be organized by College in general and Department in Particular)
- 10 Marks for Class Test/ Assignment/ Seminar
- 5 Marks for Attendance
 - Attendance: 50% & above but below 60% - 2 Marks
 - Attendance: 60% & above but below 75% - 3 Marks
 - Attendance: 75% & above but below 90% - 4 Marks
 - Attendance: 90% & Above - 5 Marks

Internal Assessment	Component 1 (C ₁)	Component 2 (C ₂)
Number of Questions	5	1. Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson – Germer experiment. (8Lectures) Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra. 2. Position measurement- gamma ray microscope thought experiment; Wave-particle duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle. 4. Two slit interference experiment with photons, atoms and particles; linear super position principle as a consequence; Matter waves and wave amplitude; Schrodinger
Date	15-09-2021	
Time	2PM-3PM	
Syllabus Time	1. Planck's quantum, Planck's constant and light as a collection of photons; Photo-electric effect and Compton scattering. De Broglie wavelength and matter waves; Davisson – Germer experiment. (8Lectures) Problems with Rutherford model- instability of atoms and observation of discrete atomic spectra; Bohr's quantization rule and atomic stability; calculation of energy levels for hydrogen like atoms and their spectra. 2. Position measurement- gamma ray microscope thought experiment; Wave-particle	

	<p>duality, Heisenberg uncertainty principle- impossibility of a particle following a trajectory; Estimating minimum energy of a confined particle using uncertainty principle; Energy-time uncertainty principle.</p> <p>3. 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 wavefunction, probabilities and normalization; Probability and probability current densities in one dimension.</p> <p>To be announced</p>	<p>equation for non- relativistic particles; Momentum and Energy operators; stationary states; physical interpretation of wavefunction, probabilities and normalization; Probability and probability current densities in one dimension.</p> <p>5. One dimensional infinitely rigid box- energy eigenvalues and eigenfunctions, normalization; Quantum dot as an example; Quantum mechanical scattering and tunnelling in one dimension - across a step potential and across a rectangular potential barrier.</p> <p>6. Size and structure of atomic nucleus and its relation with atomic weight; Impossibility of an electron being in the nucleus as a consequence of the uncertainty principle. Nature of nuclear force, NZ graph, semi-empirical mass formula and binding energy.</p> <p>7.. Radioactivity: stability of nucleus; Law of radioactive decay; Mean life & decay β decay; α half-life; γ -ray emission. energy released, spectrum and Pauli's prediction of neutrino; Fission and fusion-mass deficit, relativity and generation of energy; Fission-nature of fragments and emission of neutrons.</p> <p>8. Nuclear reactor: slow neutrons interacting with Uranium-235; Fusion and thermonuclear reactions</p>
Name of Teachers	Md Ashik Mondal	Md Ashik Mondal

Number of Classes	60 (Tentative)	120 (Tentative)
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#Component 2:

- 40Marks for Semester-end-Examination (will be organized by University)
- Answer 5 questions out of 8 carrying 02 marks each = 5 x 02 = 10 marks
- Answer 5 questions out of 7 carrying 03 marks each = 5 x 03 = 15 marks
- Answer 03 questions out of 05 carrying 5 marks each = 03x 5 = 15 marks
- Whole Syllabus of DSE 2A

- Practical (: ELEMENTS OF MODERN PHYSICS) = 20 Marks
 - Laboratory Note Book: 05 Marks
 - Viva- voce: 05 Marks
 - Experiment: 40 Marks (This 40 marks will be transformed into 10 Marks)

- A project File (Laboratory Note Book), comprising one exercise each is to be submitted.

Skill Enhancement Course – SEC 3

- Total 50 Marks
- 40 Marks(written exam) for Semester-end-Examination[#] (will be organized by University)
- 10 Marks for Class Test/ Assignment (will be organized by College in general and Department in Particular)


Internal Assessment	Component 1 (C ₁)	Component 2 (C ₂)
Weightage	5 Marks	
Number of Questions	5	
Date	15-09-2021	
Time	11AM-12PM	
Syllabus	<p>1. Introduction: Importance of computers in Physics, paradigm for solving physics problems for solution. Usage of linux as an Editor.</p> <p>2. Algorithms and Flowcharts: Algorithm: Definition, properties and development. Flowchart: Concept of flowchart, symbols, guidelines, types. Examples: Cartesian to Spherical Polar Coordinates, Roots of Quadratic Equation, Sum of two matrices, Sum and Product of a finite series, calculation of $\sin(x)$ as a series, algorithm for plotting (1) lissajous figures and (2) trajectory of a projectile thrown at an angle with the horizontal</p>	<p>1. Scientific Programming: Some fundamental Linux Commands (Internal and External commands). Development of FORTRAN, Basic elements of FORTRAN:CharacterSet, Constants and their types, Variables and their types, Keywords, Variable Declaration and concept of instruction and program.</p> <p>2. Operators: Arithmetic, Relational, Logical and Assignment Operators. Expressions: Arithmetic, Relational, Logical, Character and Assignment Expressions. Fortran Statements: I/O Statements (unformatted/formatted), Executable and Non-Executable Statements, Layout of Fortran Program, Format of writing Program and concept of coding, Initialization and Replacement Logic. Examples from physics problems.</p> <p>3. Control Statements: Types of Logic (Sequential, Selection, Repetition), Branching Statements (Logical IF, Arithmetic IF, Block IF, Nested Block IF, SELECT CASE and ELSE IF Ladder statements), Looping Statements (DO-CONTINUE, DO-ENDDO, DO-WHILE, Implied and Nested DO Loops), Jumping Statements (Unconditional GOTO, Computed GOTO, Assigned GOTO) Subscripted Variables (Arrays: Types of Arrays, DIMENSION Statement, Reading and Writing Arrays), Functions and Subroutines (Arithmetic Statement Function, Function Subprogram and Subroutine), RETURN, CALL, COMMON and EQUIVALENCE Statements), Structure, Disk I/O Statements, openfile, writing in a file, reading from a file. Examples from physics problems</p>
Name of Teacher(s)	Md Ashik Mondal	Md Ashik Mondal
Number of	60 (Tentative)	120 (Tentative)

Classes

#Component 2:

- 40Marks for Semester-end-Examination (will be organized by University)
- Answer 5 questions out of 8 carrying 02 marks each = $5 \times 02 = 10$ marks
- Answer 5 questions out of 7 carrying 03 marks each = $5 \times 03 = 15$ marks
- Answer 03 questions out of 05 carrying 5 marks each = $03 \times 5 = 15$ marks
- Internal assessment 10


Coordinator
Science Wing
Hiralal Bhakat College


Head
Department of.....Physics
Hiralal Bhakat College
Nalhati, Birbhum


Principal
Hiralal Bhakat College
Nalhati, Birbhum

