



बिलासपुर विश्वविद्यालय, बिलासपुर (छत्तीसगढ़)

SEMESTER SYLLABUS

M.Sc. PHYSICS

SCHEME OF EXAMINATION & DISTRIBUTION OF MARKS

SEMESTER I

Paper No.	Title of the Paper	Internal Assessment	Term End Exam	Total Marks
1.	Mathematical Methods-I	20	80	100
2.	Classical Mechanics	20	80	100
3.	Numerical Methods and C Programming	20	80	100
4.	Electronics-I	20	80	100
LAB I	General	-	-	100
LAB II	Computer Programming	-	-	100
TOTAL				600

SEMESTER II

Paper No.	Title of the Paper	Internal Assessment	Term End Exam	Total Marks
1.	Mathematical Methods-II	20	80	100
2.	Quantum Mechanics-I	20	80	100
3.	Electrodynamics	20	80	100
4.	Electronics-II	20	80	100
LAB I	Electronics (Devices)	-	-	100
LAB II	Electronics (Circuits) Power supply, Amplifier, Oscillators, Modulation, Detection etc.	-	-	100
TOTAL				600

SEMESTER III

Paper No.	Title of the Paper	Internal Assessment	Term End Exam	Total Marks
1.	Quantum Mechanics II	20	80	100
2.	Statistical Mechanics	20	80	100
3.	Condensed Matter Physics I	20	80	100
4.	Electronics III	20	80	100
LAB I	Condensed Matter Physics	-	-	100
LAB II	Digital Electronics	-	-	100
TOTAL				600

SEMESTER IV

Paper No.	Title of the Paper	Internal Assessment	Term End Exam	Total Marks
1.	Condensed Matter Physics II	20	80	100
2.	Nuclear Physics	20	80	100
3.	Atomic and Molecular physics	20	80	100
4.	Electronics IV	20	80	100
5.	Project	-	-	200
TOTAL				600
GRAND TOTAL				2400



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M.Sc. PHYSICS

SEMESTER-I

PAPER - I

MATHEMATICAL METHODS-I

UNIT - I

Vector Spaces and Matrices linear independence Bases; Dimensionality; Inner product; linear transformations; Matrices; Inverse; Orthogonal and unitary matrices; Independent elements of a matrix; Eigen values and eigenvectors; Diagonalization; Complete orthonormal set of functions.

UNIT - II

Special Functions; Solution by series expansion; Legendre Polynomial Generating function, recursion relations; Rodrigue formula, orthogonal properties, Associated Legendre polynomials; Recurrence formulae and orthogonal properties; Laguerre Polynomial Generating function, recursion relations; Rodrigue formula, orthogonal properties, Associated Laguerre differential equation and polynomial.

UNIT - III

Bessel's Differential equations, First and Second kind, Recurrence formulae and generating function for $J_n(x)$, Jacob's Series Bessel's Integrals, orthonormality of Bessel's functions, spherical Bessel's function: Recurrence relation and orthogonality. Hermite Differential equation and polynomials, generating function, Recurrence relation, Rodrigue formula, orthogonality.

UNIT-IV

Integral Transforms, Laplace transform; first and second shifting theorems; Inverse LT by partial fractions; LT of derivative and integral of a function. Fourier series; FS of arbitrary period; Half-wave expansions; Partial sums; Fourier integral and transforms; Dirac delta function, three dimension delta function.

Text and Reference Books:

1. Mathematical Methods of Physics, by G Arfken
2. Matrices and Tensors for Physicists, by AW Joshi
3. Advanced Engineering Mathematics, by E Kreyszig
4. Special Functions, by ED Rainville
5. Special Functions, by W W Bell
6. Mathematical Method for Physicists and Engineers. By KF Reilly, M P Hobson and S J Bence
7. Mathematics for Physicists, by Mary L Boas



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M.Sc. PHYSICS

SEMESTER I

PAPER II

CLASSICAL MECHANICS

UNIT-I

Conservation Principles, Mechanics of particle conservation Principles for system of particles. Constrained motion: constraints and degrees of freedom generalised coordinates, Generalised Notations (i) Generalised Displacement, velocity, Acceleration, momentum force and potential, limitations of Newton's laws.

D'Alemberts Principle, Lagrange's equations from D'Alemberts principle. Application of Lagrange's equation of motion (i) Linear Harmonic oscillator (ii) Simple pendulum (iii) spherical pendulum (iv) Isotropic oscillator (v) Atwood's Machine, conservation of linear momentum angular momentum and energy in Lagrangian formulation Lagrange's equation for nonholonomic system procedure to eliminate consideration of Ignorable coordinates the Routhian function.

UNIT -II

Variational Principle, calculus of variation, some techniques of calculus of variables, Euler-Lagrange differential equation. Hamilton variational principle Deduction of Hamilton's Principle from D'Alemberts principle. Deduction of Newton's second law of motion from Hamilton's Principle. Deduction of Lagrange's equations of motion from Hamilton's Principle for conservative and for non conservative systems Non conservative forces. Dissipative system, Rayleigh's Dissipation function, Lagrangian for a charged particle in an electromagnetic field.

UNIT - III

Hamiltonian formulation of mechanics: Phase space and the motion of the system, Hamiltonian function, Hamilton's canonical equation of motion. Physical significance of H Deduction of Canonical equation from variational principle. Hamilton's canonical equations of motion in different coordinate systems. Application of Hamilton equation of motion (i) Simple pendulum (ii) compound pendulum (iii) Two dimensional Isotropic Harmonic oscillator (iv) Linear Harmonic oscillator (v) Particle in central field of force. Hamiltonian for a charged particle in an electromagnetic field. Principle of least action statement and its proof.

UNIT - IV

Canonical or constant transformation, its advantage example of canonical transformation, necessary and sufficient condition for a transformation to be canonical, Infinitesimal contact transformations. Hamilton-Jacobi partial differential equation for Hamilton's Principle function. Solution of Harmonic oscillator problem by Hamilton-Jacobi method. Hamilton- Jacoby theory. Poisson Bracket: Definition and properties. Invariance of Poisson-Brackets with respect to canonical transformation, Equations of motion in Poisson bracket form Jacobi identity. Infinitesimal contact transformations interpretation in terms of Poisson Brackets. The angular momentum and Poisson Bracket Lagrange's Brackets: definition & Properties, Relation with Poisson-Brackets.

Text and Reference Books:

1. Classical mechanics. H. Goldstein
2. Principle of mechanics - Synge and Griffith
3. Classical mechanics - Gupta Kumar, Sharma
4. Classical mechanics of particles and rigid body- Kiran C. Gupta