

**GOVT. NAGARJUNA PG COLLEGE OF SCIENCE,
RAIPUR**

DEPARTMENT OF PHYSICS

SYLLABUS AND MARKING SCHEME

**M.Sc.
(1st and IInd Semester System)**

2026-2027

M. Sc. (PHYSICS)
SEMESTER - I (JUL. -DEC. 2026)
Paper I (COURSE CODE- PHY-101)
MATHEMATICAL PHYSICS

Unit	Topics
I	1.1 Vector Spaces and Matrices linear independence Bases;
	1.2 Dimensionality; Inner product; linear transformations;
	1.3 Matrices; Inverse; Orthogonal and unitary matrices;
	1.4 Independent elements of a matrix; Eigen values and eigenvectors; Diagonalization; Complete orthonormal set of functions.
II	2.1 Special Functions; Solution by series expansion; Legendre Polynomial Generating function, recursion relations; Rodrique formula, orthogonal properties, Associated Legendre polynomials; Recurrence formulae and orthogonal properties,
	2.2 Laguerre Polynomial Generating function, recursion relations; Rodrique formula, orthogonal properties, Associated Laguerre differential equation and polynomial.
	2.3 Bessel's Differential equations, First and Second kind, Recurrence formulae and generating function for $J_n(x)$, Jacobi series Bessel's Integrals, orthonormality of Bessel's functions, spherical Bessel's function : Recurrence relation and orthogonality.
	2.4 Hermite Differential equation and polynomials, generating function, Recurrence relation, Rodrique formula, orthogonality.
III	3.1 Function of complex variables, limit ,continuity and differentiability, Analytic function, the necessary and sufficient condition for a function to be analytic,
	3.2 Cauchy-Riemann condition, Cauchy integral theorem, evaluation of line integral by indefinite integration, Cauchy integral formula,
	3.3 Derivative of an analytic function. Singularities of an analytic function
	3.4 Residues and their evaluation, Cauchy residue theorem, contour integration
IV	4.1 Integral Transforms, Laplace transform; First and second shifting theorems;
	4.2 Inverse LT by partial fractions; LT of derivative and integral of a function.
	4.3 Fourier series; FS or arbitrary period; Half-wave expansions; Partial sums; Fourier integral and transforms;
	4.4 Dirac delta function, three dimension delta function.

Signature of Members Board of Studies:

HOD : _____

External subject Experts:

1- _____ 2- _____ 3- sdh

Departmental Members :

1- sdh 2- Bansal 3- sdh 4- sdh 5- _____

6- sdh 7- sdh 8- sdh 9- _____

Student Members:

1- sdh 2- sdh 3- Palak

M. Sc. (PHYSICS)
SEMESTER - I (JUL. -DEC. 2026)
PAPER - II (Code- PHY-102)
CLASSICAL MECHANICS

Unit	Topics
I	1.1 Conservation Principles, Mechanics of a particle, conservation Principles for system of particles.
	1.2 Constrained motion, constraints and degrees of freedom, principle of virtual work, generalised coordinates, Generalised Notations (i) Generalised Displacement , velocity , Acceleration, momentum, force and potential , limitations of Newton's laws.
	1.3 D'Alembert's Principle, Lagrange's equation from D'Alembert's 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,
	1.4 conservation of linear momentum, angular momentum and energy in Lagrangian formulation, Lagrange's equation for nonholonomic system, procedure to eliminate consideration of Ignorable co ordinates the Routhian function.
II	2.1 Variational Principle, calculus of variation, some techniques of calculus of variables ,
	2.2 Euler Lagrange differential equation. Hamilton variational principle, Deduction of Hamilton's Principle from D'Alembert's 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 conservation and for non conservative systems,
	2.3 Non conservative forces, Dissipative system, Rayleigh's Dissipation function
	2.4 Lagrangian for a charged particle in an electromagnetic field.
III	3.1 Hamiltonian formulation of mechanics: Phase space and the motion of the system, Hamiltonian function, Hamilton's canonical equation of motion.
	3.2 Physical significance of H, Deduction of Canonical equation from variational principle, Hamilton's canonical equations of motion in different coordinate systems,
	3.3 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.
	3.4 Hamiltonian for a charged particle in an electromagnetic field . Principle of least action statement and its proof.
IV	4.1 Canonical or constant transformation, its advantage example of canonical transformation, necessary and sufficient condition for a transformation to be canonical, Infinitesimal contact transformations,
	4.2 Hamilton-Jacobi partial differential equation for Hamilton's Principle function. Solution of Harmonic oscillator problem by Hamilton-Jacobi method. Hamilton- Jacoby theory.
	4.3 Poisson Bracket: Definition and properties. Invariance of Poisson-Brackets with respect to canonical transformation , Equations of motion in Poisson bracket form Jacoby identity. Infinitesimal contact transformations, interpretation in terms of Poisson Brackets.
	4.4 The angular momentum and Poisson Bracket, Lagrange's Brackets: definition & Properties , Relation with Poisson Brackets .

Signature of Members Board of Studies:

HOD : _____

External subject Experts

1- _____ 2- _____ 3- Kah

Departmental Members

1- [Signature] 2- [Signature] 3- [Signature] 4- [Signature] 5- [Signature]

Student Members

1- Deliti 2- Isakrit 3- Palak

M. Sc. (PHYSICS)
SEMESTER - I (JUL. -DEC. 2026)
PAPER - III (Code- PHY-103)
(BASIC QUANTUM MECHANICS)

Unit	Topics
I	1.1 Hertz experiment for particle nature of radiation, photoelectric effect and its explanation by plank's theory, Compton effect for particle nature of radiation, Davison - Germer experiment for wave nature of matter, interference experiment and uncertainty principle,
	1.2 Probabilistic interpretation of matter waves, exact proof of uncertainty principle, Schrodinger equation physical interpretation of wave function and probability current density, Continuity equation,
	1.3 Wave packet, time evolution of 1 D wave packet, group and phase velocities of a wave packet, Operators and their commutation relation, Ehrenfest theorem,
	1.4 Stationary state solution of Schrodinger equation, boundary and continuity condition, degeneracy, orthogonality of eigen function, parity Dirac delta function and completeness of eigen function, Gaussian wave packet.
II	2.1 Some exact solutions for schrodinger equation like: 1D infinite potential well, particle in a 3 D box, density of states and application to free electrons in a metal, rectangular potential barrier, periodic potential wells and barriers, Schrodinger picture,
	2.2 Bracket notation properties and some applications, Hilbert space, and representation of states, matrix representation of operators;
	2.3 Heisenberg picture, Interaction picture, Unitary transformation
	2.4 Linear harmonic oscillator problem using Bracket notation, Density Operators.
III	3.1 Angular momentum as infinitesimal rotation operator, Commutation relationship, Angular Momentum Operator and Spherical Harmonics,
	3.2 Eigen values and eigen functions of Angular Momentum using bracket notation,
	3.3 Concept of spin and Stern Gerlach experiment, Pauli's spin Matrices, Pauli's wave function and Pauli equation,
	3.4 Angular momentum matrices for $J=1$, Addition of Angular Momentum and Clebsch-Gordon coefficients, calculation of Clebsch-Gordon coefficients for $J_1=J_2=1/2$
IV	4.1 Central force problem: Solution of Schrodinger equation for spherically symmetric potentials; Hydrogen atom, center of mass frame, reduced mass, 3D
	4.2 Square well potential problem and eigen values and eigen function for hydrogen atom.
	4.3 Time-independent perturbation theory; Non-degenerate cases; First order Perturbation with the example of an Oscillator Degenerate cases,
	4.4 Applications of time independent perturbation theory such as Stark effect. Zeeman effect without electron spin, First order Stark Effect in Hydrogen

Signature of Members Board of Studies:

HOD : _____

External subject Experts

1- _____ 2- _____ 3- _____

Departmental Members

1- _____ 2- _____ 3- _____ 4- _____ 5- _____

Student Members

1- Aditi 2- Prachi 3- Palak

M. Sc. (PHYSICS)
SEMESTER - I (JUL. -DEC. 2026)
PAPER - IV (Code- PHY-104)
(Basic Electronic Devices)

Unit	Topics
I	1.1 Transistors : Bipolar Junction transistor (BJT) – basics working principle of NPN and PNP transistor, characteristic curve and different modes of transistor, current gain in different modes and relation between them.
	1.2 Junction Field Effect Transistor (FET) – N channel and P channel FET, Working principle, static and dynamic characteristic curves, pinched off voltage, Coefficient of FET, and relation between different coefficient.
	1.3 Metal Oxide Field Effect Transistor (MOSFET) – DE MOSFET and E-MOSFET-construction and working principle, static and dynamic characteristics.
	1.4 Uni-junction transistor (UJT) – basics structure, working principle, Voltage – Current characteristics and important parameters
II	2.1 MIS Diode : Introduction , Energy band diagram, accumulation, depletion and inversion condition concept of surface space charge, surface potential, surface capacitance, Ideal MIS curves
	2.2 Charged Couple Device (CCD) : Basic structure, working principle, charge transfer with clock voltage.
	2.3 IMPATT Diode : Introduction, Structure, Principle of operation, Static and Dynamic Characteristics.
	2.4 Microwave devices: Tunnel Diode Transfer Electron Devices: Transfer Electron Effect, Gun Diode, Backward Diode
III	3.1 Electro-Optic, Magneto-Optic and Acousto-Optic Effects. Material Properties related to get these effect.
	3.2 Important Ferro electric, Liquid Crystal and Ploymeric materials for these devices,
	3.3 Important materials exhibiting Electro-Optic, Magneto-Optic and Acousto-Optic properties, and their applications in sensors and actuator devices.
	3.4 Piezoelectric, Electrostrictive and magneto strictive Effects, Acoustic Delay lines, piezoelectiric resonators and filters.
IV	4.1 Modulation : Definition , Types of Modulation, Mathematical expression of modulation, Percentage of modulation, Amplitude modulation, Generation of Amplitude modulation,
	4.2 Demodulation, Demodulation of Amplitude modulated wave, side bands, band width, DSBSC modulation, Generation of DSBSC waves.
	4.3 SSB modulation, Generation and Detection of SSB waves,
	4.4 Multiplexing: Frequency division multiplexing (FDM)

Signature of Members Board of Studies:

HOD : _____

External subject Experts

Departmental Members

Student Members

1 _____ 2 _____ 3 _____

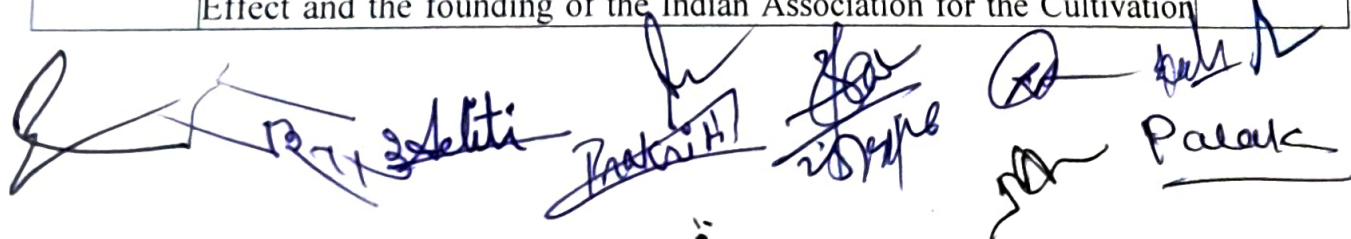
1 _____ 2 _____ 3 _____ 4 _____ 5 _____

6 _____ 7 _____ 8 _____ 9 _____

1 _____ 2 _____ 3 _____ Palak

M.Sc. (PHYSICS)
SEMESTER – M.Sc. I Sem. (JUL - DEC 2026)
PAPER – V (COURSE CODE - 107)
INDIAN KNOWLEDGE SYSTEM (IKS)

UNIT -1	Mathematics : Ritual Geometry, Numerals and the Infinite Series	No. of Lectures
1.1	Vedic Geometry :- Introduction to the Śulba Sūtras, specifically the work of Baudhāyana; analysis of the Pythagorean theorem, geometric algebra, and algorithmic construction of complex sacrificial altars. [c. 800 BCE – 500 BCE]	7
1.2	The Numeral System and Śūnya :- Development of the decimal place-value system from Brahmi numerals; Brahmagupta's formalization of zero as a mathematical entity and the definition of rules for negative numbers. [c. 3rd Century BCE – 7th Century CE]	
1.3	Classical Algebra and Trigonometry :- Āryabhaṭa I's introduction of sine tables (jyā) and the approximation of π ; Bhāskara II's advancements in indeterminate equations and early concepts of instantaneous motion. [c. 5th Century CE – 12th Century CE]	
1.4	The Kerala School :- Mādhava of Saṅgamagrāma's discovery of infinite power series for trigonometric functions; analysis of the Yuktibhāṣā by Jyeṣṭhadeva as a foundational text for pre-modern calculus. [c. 14th Century CE – 16th Century CE]	
UNIT -2	Physical Sciences : Matter, Metallurgy and Siddhāntic Astronomy	
2.1	Atomic Theory and Mechanics :- Study of the Vaiśeṣika school and Acārya Kaṇāda's theory of atoms (paramāṇu); conceptual frameworks for force, momentum, and the laws of motion (vega). [c. 6th Century BCE – 2nd Century BCE]	8
2.2	Applied Chemistry and Metallurgy :- History of high-carbon Wootz Steel production; the chemical engineering of the rust-resistant Iron Pillar of Delhi; and the world's first industrial-scale zinc distillation at Zawar, Rajasthan. [c. 4th Century BCE – 16th Century CE]	
2.3	Siddhāntic Astronomy :- Āryabhaṭa's rotation models and scientific explanations for eclipses; Nīlakaṇṭha Somayāji's revised planetary models and his semi-heliocentric theories. [c. 5th Century CE – 15th Century CE]	
2.4	Cosmology and Time-Measurement :- Mathematical scales of time ranging from the microscopic <i>ṛuṭi</i> to the macro-cosmic kalpa; dimensions and structure of the universe in Siddhāntic texts. [Ancient – Medieval]	
UNIT -3	Modern Physics : Radio Waves, Light Scattering and Quantum Statistics	
3.1	Microwave Optics and Radio :- Jagadish Chandra Bose's pioneering experiments with millimeter-waves and the development of the "Mercury Coherer" and crystal detectors. [c. 1895 – 1920]	7
3.2	Light Scattering and Spectroscopy :- Sir C. V. Raman's investigation into molecular diffraction; the physics of the Raman Effect and the founding of the Indian Association for the Cultivation	



	of Science (IACS). [c. 1921 – 1930]	
3.3	Quantum Statistics and Matter :- Satyendra Nath Bose's derivation of Planck's Law; the collaboration with Einstein leading to Bose-Einstein Statistics and the definition of Bosons. [c. 1924 – 1930]	
3.4	Thermodynamics and Astrophysics :- Meghnad Saha's development of the Saha Ionization Equation and its role in classifying stellar spectra and temperatures. [c. 1920 – 1940]	
UNIT -4	Post-1947 Physics : Nuclear Energy, Space, Biophysics and Computing	
4.1	Nuclear Physics and Energy :- Homi J. Bhabha's theoretical work on electron-positron scattering; the "Three-Stage Nuclear Program" and the strategic focus on Thorium-based cycles. [c. 1948 – 1966]	8
4.2	Space Physics and Satellite Technology :- Vikram Sarabhai's role in establishing ISRO; evolution of indigenous launch vehicle physics (PSLV/GSLV) and cosmic ray studies. [c. 1962 – Present]	
4.3	Structural Physics and Biophysics :- G. N. Ramachandran's discovery of the triple-helical structure of collagen and the development of the Ramachandran Plot as a standard in structural biology. [c. 1950 – 1970]	
4.4	Advanced Computing and Fiber Optics :- Narinder Singh Kapany's foundational contributions to the physics of fiber optics; development of the PARAM supercomputers by C-DAC. [c. 1980 – Present]	

Seminar and Assignment Topics :-

1. Baudhāyana's Altar : To reconstruct one Śulba construction step by step and prove the theorem it encodes.
2. Brahmagupta on Zero : To set out his rules for zero and negative quantities and identify the one rule modern mathematics rejects.
3. Truṭi to Kalpa : To tabulate the Siddhāntic scale of time against SI seconds and years.
4. Mādhava and Leibniz : To compare the arctangent series of the Yuktibhāṣā with Leibniz's and assess the transmission argument.
5. Paramāṇu and Dalton : To identify the first prediction Dalton's atomic theory makes that Vaiśeṣika cannot.
6. Eclipse Prediction : To compare Siddhāntic and Ptolemaic predictions of one recorded eclipse against the modern computed value.
7. The Saha Equation : To derive the ionization equation and apply it to one stellar spectral class.
8. Bose's Derivation : To reconstruct Planck's Law from the counting of indistinguishable quanta.

Text Book and Reference :

1. Introduction to Indian Knowledge System : Concepts and Applications – B. Mahadevan, Vinayak Rajat Bhat and Nagendra Pavana R. N.
2. Mathematics in India – Kim Plofker.
3. A Concise History of Science in India – D. M. Bose, S. N. Sen and B. V. Subbarayappa.
4. The Crest of the Peacock : Non-European Roots of Mathematics – George Gheverghese Joseph.

The bottom of the page features several handwritten signatures and dates. From left to right, there is a large signature, a signature with the date '25/9/26', a signature with the date '25/9/26', and a signature with the name 'Palak' and the date '25/9/26'. There are also some other smaller signatures and marks.

M. Sc. (PHYSICS)
SEMESTER - II (Jan –June 2027)
Paper I (COURSE CODE- PIHY-201)
(ELECTRODYNAMICS)

Unit	Topics
I	1.1 Equation of continuity, Maxwell's equations (SI unit) and its derivation, Integral form of equation, Maxwell's equations in some particular cases: a) In Free space (b) In linear isotropic medium (c) for harmonically varying fields, Electromagnetic energy: Poynting Theorem, The wave equation..
	1.2 . Plane electromagnetic waves in free space. Plane electromagnetic waves in a non-conducting isotropic medium (i.e. Isotropic dielectrics)
	1.3 Plane electromagnetic waves in Anisotropic Non-conducting medium (Anisotropic dielectric), Plane electromagnetic waves in conducting medium 1) skin depth 2) Poynting vector.
	1.4 A simple model for dynamic conductivity. Propagation of electromagnetic waves in ionized gases.
II	2.1 Boundary conditions at the interface of two media, Reflection and Refraction of electromagnetic waves at the interface of Non-conducting media,
	2.2 Fresnel's equations :case- 1 E-vector is perpendicular to the plane of incidence,case-2 E-vector is parallel to the plane of incidence, experimental verification of Fresnel's equations.
	2.3 Reflection and transmission coefficients at the interface between two non conducting media, Brewster's law and degree of polarisation , Total internal reflection , Group velocity
	2.4 Propagation of Electromagnetic waves between parallel conducting planes. Wave guides: TM modes and TE modes, Rectangular wave guides
III	3.1 Postulates of Einstein's special theory of relativity, Galilean transformations. Lorentz's transformations and it's consequences: Length Contraction, Time Dilation, Velocity addition, Variation in mass. .
	3.2 Transformation of differential operator, Invariance of D'Alembertian operator, Invariance of charge, Transformation of charge density, Electric field measured in different frames of reference, Minkowski space,
	3.3 Concept of four vector, Lorentz transformation of space and time in four vector form, Transformation for charge and current density: Equation of continuity in covariant form, special case, Invariance of charge.
	3.4 Transformation of electromagnetic potential A and . Lorentz condition in covariant form, Covariance or invariance of Maxwell field equation in terms of four vectors
IV	4.1 Electromagnetic vector and scalar potential , Lorentz Gauge, Lienard Wiechart potentials,
	4.2 The electromagnetic field of a uniformly moving point charge, Radiation from an accelerated charge at low velocity – Larmer's formula
	4.3 Relativistic generalization of Larmer's formula, Angular distribution of radiation emitted by an accelerated charge, Radiation damping, The Abraham Lorentz formula, Cherenkov radiation
	4.4 Radiation due to an oscillating electric dipole, electric quadra pole radiation, Radiation due to small current element, Radiation from linear antenna, Half wave antenna, Antenna array: Work, Radiation, Pattern.

Signature of Members Board of Studies:

HOD : _____

External subject Experts

Departmental Members

Student Members

1- _____ 2- _____ 3- _____
 1- _____ 2- _____ 3- _____ 4- _____ 5- _____
 6- _____ 7- _____ 8- _____ 9- _____
 1- _____ 2- _____ 3- _____ 4- _____ 5- _____

M. Sc. (PHYSICS)
SEMESTER - II (Jan –June 2027)
Paper II (COURSE CODE- PHY 202)
(Computational Methods)

Unit	Topics
I	1.1 Problem analysis and solving scheme. Computational procedure, programming outline, flow chart. Branching and looping writing.
	1.2 Character set, constants, (numeric string) variables(numeric string) rules for arithmetic expressions and hierarchy of operators, rational expressions, logical expressions, and operators, library functions.
	1.3 Identifiers, qualifiers, define statements, value Initialized variables, operators, and expressions. Operator precedence and associativity.
	1.4 Scanf with specifier, search set arrangements and suppression Character, format specifier for scanf.
II	2.1 Control structure, If statement, if else statement, multiway decision, compound statement.
	2.2 Loops: for loop, while loop, do while loop, break statement , compound statement continue statement , go to statement
	2.3 Function: function main , function accepting more than one parameter, user defined and library function concept associatively with functions, function parameter, return value, recursion comparison.
	2.4 Arrays , strings, multidimensional array, array of strings function in string
III	3.1 Solution of algebraic and transcendental equations – Basic properties of equation, transformation of equation and rate of convergence.
	3.2 Methods –Bisection Method, Regula falsi method, Secant method, iteration method, Newton Raphson method, Muller's method.
	3.3 Solution of simultaneous linear equations Gaussian elimination pivoting, iterative method matrix inversion method, cramer's rule, Gauss-Jordan method.
	3.4 Eigen values and Eigen vectors of matrices. Power and Jacobi method , curve fitting polynomial least squares
IV	4.1 Finite deference interpolation with equally spaced and unequally spaced points,
	4.2 Numerical differentiation and Integration, Newton cote's quadrature formula
	4.3 Trapezoidal rule, simpson 1/3 rule, simpson 3/8 rule, Boole's rule, Weddle's rule
	4.4 Numerical solution of ordinary differential equation. Euler and Runge Kutta methods. Predictor corrector method

Signature of Members Board of Studies:

HOD : _____

External subject Experts

1- _____ 2- _____ 3- _____

Departmental Members

1- _____ 2- _____ 3- _____ 4- _____ 5- _____

6- _____ 7- _____ 8- _____ 9- _____

Student Members

1- Aliti 2- Prakriti 3- Palak

M. Sc. (PHYSICS)
SEMESTER - II (Jan –June 2027)
Paper III (COURSE CODE- PHY-203)
(ADVANCED QUANTUM MECHANICS)

Unit	Topics
I	1.1 Variational method, Ground state energy of H atom, Ground state energy of He atom, Ground state energy of 1D harmonic oscillator
	1.2 WKB method, Classically accessible & inaccessible region ,Turning points, condition of validity of semi classical approximation, connection formula to join two WKB solutions at turning points,
	1.3 Sommerfield quantization condition, Energy levels of potential well, quantization rule,
	1.4 Probability of penetration through potential barrier, tunneling through potential barrier, Theory of α decay.
II	2.1 Time dependent perturbation theory:-Basic Concept, Transition probability, harmonic perturbation, constant perturbation, Fermi's Golden rule,
	2.2 adiabatic approximation ,sudden approximation, Semi classical theory of radiation:-The interaction of radiation with atomic system,
	2.3 Applications of time dependent perturbation theory, Transition probability for absorption and induced emission, Electric dipole transition,
	2.4 transition Probability, Einstein's A & B coefficients, selection rule, forbidden transition
III	3.1 Scattering, scattering amplitude scattering cross section, Laboratory & centre of mass frame, Techniques for calculating the scattering amplitude,
	3.2 Born approximation, Integral form of Schrodinger equation, First Born approximation, Born approximation for spherically symmetric potential, condition for validity of Born approximation,
	3.3 Applications of Born approximation:- screened coulomb potential, square well potential, Partial wave analysis:-Formalism & strategy,
	3.4 Optical theorem, phase shift, Applications of partial wave analysis, scattering by Perfectly rigid sphere and square well potential
IV	4.1 Identical particles : Physical meaning of identity, Symmetric & Anti symmetric wave function,
	4.2 Construction from unsymmetrized function, the Exclusion principle, spin angular momentum.
	4.3 Relativistic quantum mechanics:- Klein Gorden equation for free particle and for particle in electromagnetic field, continuity equation,
	4.4 Dirac equation for free particle, α and β matrices, charge and current densities, free particle solution, existence of spin and magnetic moment, theory of positron.

Signature of Members Board of Studies:

HOD : _____

External subject Experts

Departmental Members

Student Members

1 _____ 2 _____ 3 _____

1 _____ 2 _____ 3 _____ 4 _____ 5 _____

6 _____ 7 _____ 8 _____ 9 _____

1 _____ 2 _____ 3 _____ Palak

M. Sc. (PHYSICS)
SEMESTER - II (Jan - June 2027)
Paper IV (COURSE CODE- PHY-204)
(Digital Electronics)

		Topics
I	1.1	Number system : Decimal, Binary, Octal and Hexadecimal Number System with mutual conversion.
	1.2	BCD addition and subtraction, 1's and 2's compliments, multiplication & division BCD code (8421), Excess -3 code, gray code, binary to gray code and gray code to binary code conversion.
	1.3	Logic gates: Positive and negative logic , Basic gates, Universal building block. Basic laws of Boolean Algebra, De-Morgan's Theorem, two, three and four variable
	1.4	K-Map, mapping and minimization of SOP and POS expressions, pairs, quads, octet, overlapping, Rolling, concepts of Don't care condition.
II	2.1	Ex-OR gate, Ex-NOR gate circuitry, Half adder, Full adder, binary parallel adder, Serial adder, Half Subtractor, Full Subtractor, 1's complements Subtractor circuit and 2's complements Subtractor circuit.
	2.2	Digital logic Families : Introduction, Basic concepts of RTL, DTL, TTL, ECL and CMOS logic.
	2.3	Decoder : 2 line to 4 line decoder, 1 of 16 decoder, BCD to decimal decoder, BCD to seven segment decoder, Encoder : decimal to BCD encoder.
	2.4	Multiplexer : 2-input, 4-input, 16 input Multiplexer, DeMultiplexer : 1 line to 2 line , 1 line to 4 line and 1 line to 16 line DeMultiplexer.
III	3.1	Flip-flop and timing diagram, RS flip-flop using NOR gate, RS flip-flop using NAND gate, Clocked RS flip-flop, D- latch flip-flop, Preset and Clear,
	3.2	JK flip-flop, Positive and negative edge triggered flop-flops., JK Master Slave flip-flop
	3.3	Counters: Binary ripple counter , up counter , down counter, decade counter and Ring counter and time diagram
	3.4	Registers: Parallel and shift Register, Scaling, PIPO, SIPO, PISO, SOSI Bi-directional shift Register, Application of shift register.
IV	4.1	Digital to analog converter and Analog to Digital converters : D/A converters using binary weighted resistor network and R-2R ladder Network
	4.2	Counter type A/D converter, Successive approximation A/D converter and dual slope converters , applications of DACs and ADCs.
	4.3	Integrated Circuit Introduction, Technology, Advantages and disadvantages, Basic technology of monolithic IC, Basic processes used in monolithic technology
	4.4	Fabrication of components on monolithic IC, IC packing, symbol and scale of Integration.

Signature of Members Board of Studies:

HOD : _____

External subject Experts

1 _____ 2 _____ 3 _____

Departmental Members

1 _____ 2 _____ 3 _____ 4 _____ 5 _____

6 _____ 7 _____ 8 _____ 9 _____

Student Members

1 Shruti 2 Pratik 3 Palat