

GOVERNMENT POLYTECHNIC, KANDHAMAL

Department of Mathematics & Science

AICTE OUTCOME-BASED LESSON PLAN (SESSION 2026–2027)

1. COURSE OVERVIEW

Course Title	Mathematics	Course Code	TH4
Branch/Program	Civil, Electrical, Mechanical Engg.	Semester/Year	First Year
Total Credits	4 Credits	Contact Hours	4 Periods/Wk (128 Total Periods)
Internal Assessment	30 Marks (Progressive Assessment)	End-Sem Exam	70 Marks (3 Hours Duration)
Academic Session	17.08.2026 to 17.04.2027	Faculty Member	Sri Nirakara Bag, Lecturer Stage-1

2. COURSE OUTCOMES (COS) & BLOOM'S TAXONOMY MAPPING

CO ID	Course Outcome Statement	Bloom's Level
CO1	Apply trigonometric concepts and inverse trigonometric identities to solve trigonometric equations and practical engineering problems.	L3: Apply
CO2	Analyze geometric entities using coordinate geometry techniques for straight lines and circles in engineering modeling.	L4: Analyze
CO3	Execute algebraic solutions for complex numbers, partial fractions, binomial series, determinants, and matrix equations.	L3: Apply
CO4	Utilize vector algebra to model and calculate physical quantities including force, torque, work, and spatial projections.	L3: Apply
CO5	Evaluate limits, continuity, and derivatives of algebraic and transcendental functions using core calculus principles.	L5: Evaluate
CO6	Formulate and solve integral calculus problems and first-order differential equations relevant to engineering dynamics.	L4: Analyze

3. DETAILED INSTRUCTIONAL DELIVERY & ACTIVITY PLAN (128 PERIODS)

Unit 1: Trigonometry (16 Periods | Mapped to CO1)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W1/P1	Concept of angles	Explains dynamic concept of angle rotation, initial and terminal sides, positive/negative directions.	Takes notes, identifies sense of rotation, and solves basic sign conventions.
W1/P2	Measurement of angles in degrees, grades, and radians	Defines sexagesimal, centesimal, and circular systems. Demonstrates radian measure on board.	Draws unit circle, notes definitions, and asks clarifying questions on circular system.
W1/P3	Conversions	Derives conversion relation: $\pi \text{ radians} = 180^\circ = 200^g$. Demonstrates standard conversion examples.	Solves degree-to-radian and radian-to-degree practice problems in exercise notebooks.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W1/P4	T-Ratios of Allied angles (without proof)	Illustrates ASTC rule and quadrant rules for allied angles ($90^\circ \pm \theta$, $180^\circ \pm \theta$, etc.).	Maps trigonometric function signs per quadrant and practices quick evaluations.
W2/P5	Sum and Difference Formulae	Introduces identity expansions for $\sin(A+B)$, $\cos(A+B)$, $\tan(A+B)$ with standard numericals.	Applies formulae to compute non-standard angles (e.g., 15° , 75° , 105°) in class.
W2/P6	Product Formulae	Demonstrates products of sine and cosine functions ($2 \sin A \cos B$, $2 \cos A \sin B$, etc.).	Works out assigned product problems and checks identity validity with peers.
W2/P7	Transformation of product to sum, difference, and vice versa	Teaches transformation rules ($\sin C + \sin D$, $\cos C - \cos D$, etc.).	Converts given trigonometric sums into product forms and simplifies expressions.
W2/P8	Their applications	Models real-world application problems involving trigonometric identity simplification.	Solves advanced identity simplification questions individually at their desks.
W3/P9	T-Ratios of multiple angles (2A)	Derives expressions for $\sin 2A$, $\cos 2A$, and $\tan 2A$ in terms of single angle A.	Notes multiple angle identities and solves direct substitution problems.
W3/P10	T-Ratios of multiple angles (3A)	Explains formulas for $\sin 3A$, $\cos 3A$, and $\tan 3A$ with numerical examples.	Evaluates trigonometric values of 18° and 36° using 3A identities.
W3/P11	T-Ratios of sub-multiple angles (A/2)	Demonstrates half-angle formulas derived from 2A relations.	Converts double-angle formulas into sub-multiple angle forms and solves exercises.
W3/P12	Problems on multiple & sub-multiple angles	Facilitates a problem-solving session focusing on exam-oriented multiple/sub-multiple problems.	Solves set problems on the board and in notebooks with peer consultation.
W4/P13	Introduction to Inverse Trigonometric Functions	Defines inverse trigonometric relations, principal value branches, domain, and ranges.	Records principal value tables and sketches basic inverse function graphs.
W4/P14	Inverse Trigonometric Functions	Demonstrates step-by-step methods to evaluate principal values of inverse trigonometric expressions.	Solves principal value evaluation exercises and presents solutions.
W4/P15	Properties of Inverse Trigonometric Functions	Lists core properties ($\tan^{-1}x + \tan^{-1}y$, $\sin^{-1}x + \cos^{-1}x = \pi/2$, etc.).	Validates inverse properties using numerical values and records key formulas.
W4/P16	Problems on Inverse Trigonometric Functions	Conducts problem session on proving identities and solving equations involving inverse T-ratios.	Works out multi-step proof problems and submits written responses for assessment.

Unit 2: Coordinate Geometry (14 Periods | Mapped to CO2)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W5/P1	Introduction to Coordinate Geometry	Explains Cartesian coordinate system, quadrant axes, and point representations.	Plots coordinates, identifies quadrants, and asks clarification on axis orientation.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W5/P2	Distance formula	Derives distance formula between two points (x_1, y_1) and (x_2, y_2) .	Calculates distances between geometric points and verifies collinearity of points.
W5/P3	Section formula	Demonstrates internal/external division formulas, midpoint, and centroid of a triangle.	Solves section formula exercises to find division ratios and centroid coordinates.
W5/P4	Slope of a line & Parallel / Perpendicular conditions	Explains inclination, slope $m = \tan \theta$, parallel ($m_1 = m_2$), perpendicular ($m_1 m_2 = -1$).	Determines slopes of given lines and tests geometric parallelism/perpendicularity.
W6/P5	Straight line forms (Slope-Intercept, Point-Slope)	Derives Slope-Intercept form ($y = mx + c$) and Point-Slope form ($y - y_1 = m(x - x_1)$).	Converts geometric line conditions into standard algebraic equations.
W6/P6	Straight line forms (Two-Point, Intercept, Normal)	Teaches Two-Point form, Intercept form ($x/a + y/b = 1$), Normal form ($x \cos \alpha + y \sin \alpha = p$).	Transforms general line equation $Ax + By + C = 0$ into intercept and normal forms.
W6/P7	Intersection of two straight lines	Illustrates simultaneous solution method to find point of intersection of two straight lines.	Solves linear simultaneous equations to compute intersection coordinates.
W6/P8	Angle between two lines	Derives formula $\tan \theta = \pm (m_1 - m_2) / (1 + m_1 m_2)$ for angle between lines.	Calculates acute and obtuse angles between given line equations.
W7/P9	Perpendicular distance to a line from a point	Explains perpendicular distance formula $d = Ax_1 + By_1 + C / \sqrt{A^2 + B^2}$ and parallel distance.	Computes length of perpendiculars and distance between parallel lines.
W7/P10	Centre and radius of a Circle	Introduces circle definition, standard equation $(x - h)^2 + (y - k)^2 = r^2$.	Identifies center and radius from standard circle equations.
W7/P11	General equation of a circle	Analyzes general form $x^2 + y^2 + 2gx + 2fy + c = 0$, center $(-g, -f)$, radius $\sqrt{g^2 + f^2 - c}$.	Converts general circle equations to center-radius form and evaluates constants.
W7/P12	Circle passing through three given points	Demonstrates system of linear equations generated by substituting three non-collinear points.	Sets up three simultaneous linear equations in g, f, c and solves for circle parameters.
W8/P13	Circle with given diameter endpoints (Part 1)	Derives diameter form $(x - x_1)(x - x_2) + (y - y_1)(y - y_2) = 0$.	Constructs circle equations directly using end-points of diameter.
W8/P14	Circle with given diameter endpoints (Part 2)	Solves multi-concept problems combining circle diameter form with tangent/line intersections.	Works out comprehensive coordinate geometry numericals for unit assessment.

Unit 3: Advanced Algebra (38 Periods | Mapped to CO3)

3.1 Complex Numbers (12 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W8/P1	Definition & Real/Imaginary parts	Introduces imaginary unit $i = \sqrt{-1}$, complex format $z = a + ib$, $\text{Re}(z)$, $\text{Im}(z)$.	Identifies real and imaginary components and solves powers of i .
W8/P2	Polar and Cartesian representation	Explains Argand plane, Cartesian form (x, y) , and Polar form $r(\cos \theta + i \sin \theta)$.	Plots complex numbers on Argand plane and notes conversion formulas.
W9/P3	Conversion from one form to other	Guides conversion procedures between Cartesian and Polar representations.	Converts complex numbers from Cartesian to Polar forms and vice versa.
W9/P4	Conjugate, Modulus, and Amplitude	Defines conjugate $\bar{z}$, modulus $ z = \sqrt{x^2 + y^2}$, principal amplitude $\arg(z)$.	Computes modulus and principal argument across all four quadrants.
W9/P5	Addition & Subtraction of complex numbers	Demonstrates algebraic rules for adding and subtracting complex numbers.	Performs vector-like addition and subtraction of complex numbers in exercise books.
W9/P6	Multiplication & Division of complex numbers	Teaches multiplication and rationalization method for division of complex numbers.	Simplifies complex fractions into standard $a + ib$ form.
W10/P7	Square root of a complex number	Derives method to find square root of $a + ib$ using algebraic equations.	Solves square root problems of given complex numbers step by step.
W10/P8	Cube roots of unity	Solves $x^3 = 1$, introduces roots $1, \omega, \omega^2$, proves $1 + \omega + \omega^2 = 0, \omega^3 = 1$.	Evaluates powers of ω and simplifies algebraic expressions containing ω .
W10/P9	De-Moivre's theorem (statement only)	States De-Moivre's theorem for integer and rational indices.	Notes theorem statement and observes application to powers of complex numbers.
W10/P10	Simple applications of De-Moivre's theorem	Demonstrates expansions using De-Moivre's theorem for $(\cos \theta + i \sin \theta)^n$.	Simplifies trigonometric exponential powers using De-Moivre's statement.
W11/P11	Problems on Complex Numbers	Conducts problem session on algebraic operations and proofs on complex numbers.	Solves complex number exercise problems individually and on the board.
W11/P12	Problems on De-Moivre's theorem	Leads problem-solving on De-Moivre's applications and complex roots.	Completes advanced numerical sheet on De-Moivre's theorem.

3.2 Partial Fractions (4 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W11/P1	Polynomials, Proper & Improper fractions	Defines polynomials, degree, proper fraction $P(x)/Q(x)$ where $\deg(P) < \deg(Q)$, improper conversion.	Classifies rational fractions as proper or improper and converts improper forms.
W11/P2	Non-repeated linear factors denominator	Explains resolution method for $P(x)/[(x-a)(x-b)] = A/(x-a) + B/(x-b)$ using substitution.	Solves non-repeated linear factor partial fraction problems.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W12/P3	Repeated linear factors denominator	Demonstrates resolution for $P(x)/[(x-a)^2(x-b)] = A/(x-a) + B/(x-a)^2 + C/(x-b)$.	Determines undetermined coefficients for repeated linear factors.
W12/P4	Irreducible quadratic factors denominator	Teaches form $P(x)/[ax^2+bx+c](x-d) = (Ax+B)/(ax^2+bx+c) + C/(x-d)$.	Equates coefficients to solve for constants with quadratic denominators.

3.3 Permutations, Combinations & Binomial Theorem (6 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W12/P1	Factorial of non-negative integer	Defines factorial $n!$, fundamental rules of counting (addition & multiplication principles).	Computes factorial values and solves basic counting puzzles.
W12/P2	Determine $P(n,r)$ and $C(n,r)$	Derives $P(n,r) = n!/(n-r)!$, $C(n,r) = n!/[r!(n-r)!]$, and $P(n,r) = r! \cdot C(n,r)$.	Computes permutations and combinations for given n and r values.
W13/P3	Binomial theorem for positive integral index	States Binomial Theorem $(x+a)^n = \sum C(n,r) x^{n-r} a^r$ and Pascal's triangle.	Expands binomial expressions for small positive integer powers.
W13/P4	General term in binomial expansion	Derives general term formula $T_{r+1} = C(n,r) x^{n-r} a^r$.	Calculates specific terms (e.g., 4th term, term independent of x).
W13/P5	Middle term in binomial expansion	Teaches rules to determine middle term(s) when n is even vs. n is odd.	Identifies and computes middle term(s) for positive integral expansions.
W13/P6	Problems on Permutations, Combinations & Binomial	Facilitates problem session covering combined Permutation, Combination, and Binomial questions.	Works out multi-concept numericals and submits exercise book.

3.4 Determinants and Matrices (16 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W14/P1	Introduction to matrices	Introduces rectangular arrays, rows, columns, and matrix representation $A = [a_{ij}]$.	Identifies row and column positions of elements in given matrices.
W14/P2	Order & Types of matrices	Classifies order $m \times n$, row, column, square, diagonal, scalar, identity, zero, symmetric, skew-symmetric.	Categorizes given matrices into respective matrix types.
W14/P3	Addition & Subtraction of matrices	Defines conformability for addition/subtraction and entry-wise operations.	Performs matrix addition and subtraction operations in class.
W14/P4	Scalar & Matrix multiplication	Explains scalar multiplication kA and row-by-column rule for matrix product AB .	Verifies matrix product conformability and calculates matrix products.
W15/P5	Introduction to determinant	Defines determinant of order 1, 2, and 3 associated with square matrices.	Evaluates 2×2 determinants and notes sign expansion rules.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W15/P6	Expansion of determinant up to 3rd order	Demonstrates expansion of 3×3 determinant along any row or column.	Expands 3×3 determinants along different rows to verify invariance.
W15/P7	Properties of determinants	Lists properties (row-column interchange, identical rows, scalar multiplication, column addition).	Applies properties to simplify determinants without direct expansion.
W15/P8	Minors and Cofactors	Defines Minor M_{ij} and Cofactor $C_{ij} = (-1)^{i+j} M_{ij}$.	Calculates minors and cofactors for all elements of a 3×3 matrix.
W16/P9	Inverse of a matrix	Explains Adjoint matrix $\text{adj}(A)$ and inverse formula $A^{-1} = \text{adj}(A)/ A $ for non-singular matrices.	Computes cofactor matrix, adjoint, and inverse of 2×2 and 3×3 matrices.
W16/P10	Cramer's rule (2 variables)	Explains Cramer's rule derivation for 2 variables ($x = D_x/D$, $y = D_y/D$).	Solves system of 2 linear equations using Cramer's determinant rule.
W16/P11	Cramer's rule (3 variables)	Extends Cramer's rule to 3 variables using D , D_x , D_y , D_z determinants.	Evaluates 3-variable system consistency and computes solutions using Cramer's rule.
W17/P12	Matrix Method for linear system (Part 1)	Formulates matrix equation $AX = B \Rightarrow X = A^{-1}B$ for system of equations.	Sets up matrix equations $AX = B$ for 2 and 3 variable linear systems.
W17/P13	Matrix Method for linear system (Part 2)	Demonstrates complete solution procedure of 3-variable linear system via Matrix Inverse.	Calculates A^{-1} and multiplies by B to determine variable values X .
W17/P14	Problems on Determinants	Guides problem session on proving matrix determinant identities using properties.	Solves determinant proof problems and presents board solutions.
W17/P15	Problems on Matrices	Leads problem session on matrix polynomial equations (e.g., $A^2 - 5A + 7I = 0$).	Evaluates matrix polynomials and computes higher matrix powers.
W17/P16	Problems on Cramer's Rule & Matrix Method	Conducts comparative evaluation session solving identical linear systems by both methods.	Solves examination-pattern questions and verifies results across both methods.

Unit 4: Vector Algebra (12 Periods | Mapped to CO4)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W18/P1	Vector and Scalar Quantities	Defines scalar vs vector quantities with physical examples (mass, velocity, force, displacement).	Differentiates scalars and vectors; gives engineering examples.
W18/P2	Notation and rectangular resolution of a vector	Introduces vector notation $\vec{a}$, unit vectors $\hat{i}, \hat{j}, \hat{k}$, magnitude $ \vec{a} = \sqrt{a_x^2 + a_y^2 + a_z^2}$.	Resolves vectors into rectangular components and calculates vector magnitudes.
W18/P3	Types of vectors	Explains zero vector, unit vector, co-initial vector, collinear, parallel, and coplanar vectors.	Identifies vector types and computes unit vector $\hat{a} = \vec{a}/ \vec{a} $.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W18/P4	Addition, subtraction & scalar multiplication	Demonstrates Triangle Law, Parallelogram Law, vector addition, subtraction, scalar product.	Solves vector addition, subtraction, and linear combination exercises.
W19/P5	Scalar and vector products of two vectors	Defines Dot Product $\vec{a} \cdot \vec{b} = \vec{a} \vec{b} \cos \theta$ and Cross Product $\vec{a} \times \vec{b} = \vec{a} \vec{b} \sin \theta \hat{n}$.	Computes dot and cross products using component determinant forms.
W19/P6	Angle between two vectors	Derives $\cos \theta = (\vec{a} \cdot \vec{b}) / (\vec{a} \vec{b})$ and orthogonality condition ($\vec{a} \cdot \vec{b} = 0$).	Calculates angle between vectors and tests orthogonality/parallelism.
W19/P7	Scalar projection of a vector on another vector	Derives scalar projection formula $\text{Proj}_{\vec{b}} \vec{a} = (\vec{a} \cdot \vec{b})/ \vec{b} $.	Computes scalar projections of vectors onto given directional vectors.
W19/P8	Vector projection of a vector on another vector	Explains vector projection formula $[(\vec{a} \cdot \vec{b})/ \vec{b} ^2] \vec{b}$.	Evaluates vector projection components along specified direction vectors.
W20/P9	Area of a triangle	Derives area of triangle with adjacent vector sides $\frac{1}{2} \vec{a} \times \vec{b} $.	Calculates triangular area given adjacent side vectors or vertex position vectors.
W20/P10	Area of a parallelogram	Explains area of parallelogram with side vectors $ \vec{a} \times \vec{b} $ or diagonals $\frac{1}{2} \vec{d}_1 \times \vec{d}_2 $.	Calculates area of parallelogram from adjacent side or diagonal vectors.
W20/P11	Simple problems related to work	Applies scalar product to mechanical work done $W = \vec{F} \cdot \vec{d}$.	Solves engineering problems calculating work done by constant forces.
W20/P12	Simple problems related to moment of a force	Applies vector product to moment/torque $\vec{M} = \vec{r} \times \vec{F}$ about a point.	Computes torque/moment vectors and magnitudes about specified pivot points.

Unit 5: Differential Calculus (18 Periods | Mapped to CO5)

5.1 Limits and Continuity (8 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W21/P1	Function definition and types	Defines relation, function $y = f(x)$, domain, range, and introduces basic function graphs.	Sketches function graphs and determines domain and range of basic functions.
W21/P2	Limit definition & Existence condition	Defines limit $\lim_{x \rightarrow a} f(x)$, LHL, RHL, and existence condition LHL = RHL.	Evaluates LHL and RHL to verify limit existence for piecewise functions.
W21/P3	Algebra of limits	Explains sum, difference, product, quotient, and scalar multiplication rules for limits.	Applies algebra of limits to simplify composite rational expressions.
W21/P4	Limit of standard functions	Presents standard limits: $\lim (x^n - a^n)/(x - a)$, $\lim (\sin x)/x$, $\lim (e^x - 1)/x$.	Records standard formulas and solves direct substitution limits.
W22/P5	Limit of $ x $ and $[x]$	Demonstrates limit evaluations involving absolute value $ x $ and greatest integer function $[x]$.	Evaluates non-existence of limits for step/discontinuous functions using LHL/RHL.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W22/P6	Evaluation of limits using standard formulas (Part 1)	Demonstrates factorization, rationalization, and standard trigonometric limit techniques.	Solves algebraic and trigonometric limit problems using standard formulas.
W22/P7	Evaluation of limits using standard formulas (Part 2)	Guides student practice on logarithmic and exponential standard limits.	Evaluates exponential and logarithmic limits in class workbook.
W22/P8	Test of Continuity of a function at a point	Defines continuity at $x = a$ ($\lim_{x \rightarrow a} f(x) = f(a)$), types of discontinuity.	Tests continuity of given functions at specific points and finds unknown constants.

5.2 Differentiation (10 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W23/P1	Differentiation of algebraic functions	Defines derivative dy/dx as rate of change, demonstrates $d/dx(x^n) = nx^{n-1}$.	Computes derivatives of polynomial and power functions.
W23/P2	Differentiation of exponential & log functions	Introduces rules $d/dx(e^x) = e^x$, $d/dx(a^x) = a^x \ln a$, $d/dx(\ln x) = 1/x$.	Evaluates derivatives of exponential and logarithmic functions.
W23/P3	Differentiation of trigonometric & inverse T-ratios	Presents standard formulas for derivatives of 6 trigonometric and 6 inverse T-ratios.	Memorizes standard derivatives and solves direct standard form problems.
W23/P4	Differentiation of sum and product of functions	Teaches Sum Rule $d/dx(u \pm v)$ and Product Rule $d/dx(uv) = u v' + v u'$.	Applies product rule to evaluate derivatives of product functions.
W24/P5	Differentiation of quotient of functions	Teaches Quotient Rule $d/dx(u/v) = (v u' - u v') / v^2$ with standard examples.	Solves quotient rule differentiation problems step by step.
W24/P6	Differentiation of function of a function (Chain Rule)	Explains Chain Rule $dy/dx = (dy/du)(du/dx)$ for composite functions.	Applies chain rule to differentiate nested composite functions.
W24/P7	Differentiation using logarithm	Demonstrates logarithmic differentiation technique for $y = [f(x)]^{g(x)}$ and complex products.	Differentiates variable-exponent functions by taking natural log on both sides.
W24/P8	Differentiation of function w.r.t. another function	Explains parametric differentiation technique $df(x)/dg(x) = f'(x)/g'(x)$.	Evaluates derivatives of one function with respect to another function.
W25/P9	Problems on Differentiation	Facilitates a comprehensive problem-solving session covering all explicit differentiation rules.	Solves mixed differentiation practice set in small study groups.
W25/P10	Problems on Chain Rule & Logarithmic Differentiation	Leads problem-solving on advanced chain rule and implicit/logarithmic differentiation.	Completes advanced differentiation worksheet under timed conditions.

Unit 6: Integral Calculus & Differential Equations (30 Periods | Mapped to CO6)

6.1 Integral Calculus (18 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W25/P1	Integration as inverse of differentiation	Defines indefinite integral $\int f(x)dx = F(x) + c$, integration constant, standard table.	Notes fundamental integral table and solves direct integration problems.
W25/P2	Simple integration by substitution (Part 1)	Explains substitution method $\int f(g(x))g'(x)dx = \int f(u)du$ for linear algebraic forms.	Transforms algebraic integrals into standard forms using variable substitution.
W26/P3	Simple integration by substitution (Part 2)	Extends substitution technique to trigonometric integrands (e.g., $\int \tan x dx$, $\int \sec x dx$).	Solves trigonometric integrals using suitable substitution steps.
W26/P4	Integration by parts (Part 1)	Derives Integration by Parts formula $\int u v dx = u \int v dx - \int [u' \int v dx] dx$ and ILATE rule.	Selects first (u) and second (v) functions using ILATE rule and integrates.
W26/P5	Integration by parts (Part 2)	Demonstrates Integration by Parts for inverse trigonometric and logarithmic integrands.	Solves integrals like $\int \ln x dx$ and $\int \tan^{-1} x dx$ using integration by parts.
W26/P6	Integration using partial fractions (Part 1)	Combines partial fraction decomposition with integration rules for rational functions.	Resolves rational integrands into partial fractions and integrates term by term.
W27/P7	Integration using partial fractions (Part 2)	Guides practice on complex proper rational integrands with linear factors.	Integrates proper rational functions with non-repeated and repeated linear denominators.
W27/P8	Definite integrals of simple functions (Part 1)	Defines Fundamental Theorem of Calculus $\int_a^b f(x)dx = [F(x)]_a^b = F(b) - F(a)$.	Computes definite integrals by evaluating upper and lower limits.
W27/P9	Definite integrals of simple functions (Part 2)	Demonstrates definite integrals involving substitution and limit changes.	Adjusts lower and upper integration limits during substitution solving.
W27/P10	Properties of definite integrals (without proof)	Lists properties: $\int_a^b f(x)dx = -\int_b^a f(x)dx$, dummy variable, split interval.	Records properties and tests basic property identities.
W28/P11	Evaluation using properties of definite integrals	Demonstrates symmetry properties $\int_0^a f(x)dx = \int_0^a f(a-x)dx$ and even/odd properties.	Evaluates complex definite integrals efficiently using symmetry properties.
W28/P12	Area bounded by curve and axes (Part 1)	Explains geometric interpretation of definite integral as area $A = \int_a^b y dx$ under curve.	Sketches curve boundaries and sets up definite integral for area computation.
W28/P13	Area bounded by curve and axes (Part 2)	Computes bounded areas for parabolas, circles, and straight lines with coordinate axes.	Solves area evaluation problems for standard curves.
W28/P14	Problems on substitution & integration by parts	Facilitates problem session on advanced indefinite integration techniques.	Solves mixed substitution and integration by parts exercise questions.
W29/P15	Problems on integration using partial fractions	Conducts problem session on rational function integration.	Completes partial fraction integration problems in exercise book.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W29/P16	Problems on definite integrals	Leads problem solving on definite integrals and limit evaluation.	Computes numerical values for definite integrals.
W29/P17	Problems on properties of definite integrals	Guides problem solving using properties like $\int_0^{\pi/2} [\sin x / (\sin x + \cos x)] dx = \pi/4$.	Solves standard exam-type definite integral property proofs.
W29/P18	Problems on evaluation of area bounded by curve	Conducts practice session evaluating bounded areas between curves and axes.	Solves area determination problems and submits written work.

6.2 Differential Equations (12 Periods)

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W30/P1	Order and degree of a differential equation	Defines differential equations, ordinary vs partial, order (highest derivative), degree (power).	Identifies order and degree for given ordinary differential equations.
W30/P2	Formation of differential equation	Demonstrates formation of DE by differentiating given family of curves and eliminating constants.	Eliminates constants to construct differential equations for given geometric curves.
W30/P3	Variable separable method (Part 1)	Explains variable separable technique $f(x)dx = g(y)dy$ and integrating both sides.	Separates variables x and y on opposite sides and integrates to find solution.
W30/P4	Variable separable method (Part 2)	Guides practice on initial value problems (IVP) using variable separable method.	Evaluates particular solution constant using given boundary conditions.
W31/P5	Variable separable method (Advanced)	Leads problem-solving on trigonometric and exponential variable separable DEs.	Applies trigonometric and algebraic identities to separate variables.
W31/P6	Variable separable method problems	Guides student group practice on advanced variable separable differential equations.	Works out assigned differential equation problems in peer groups.
W31/P7	Solution of linear differential equations	Defines First Order LDE $dy/dx + Py = Q$, $IF = e^{\int P dx}$, solution $y(IF) = \int Q(IF)dx + C$.	Calculates Integrating Factor IF and sets up general linear DE solution formula.
W31/P8	Examples on linear differential equations	Solves standard linear differential equations step by step on the board.	Differentiates P(x) and Q(x) components and executes integration to solve LDEs.
W32/P9	Problems on linear differential equations	Guides practice on LDEs requiring algebraic manipulation into standard form.	Converts non-standard DEs into linear form $dy/dx + Py = Q$ and solves.
W32/P10	Problems on variable separable method	Conducts problem session on variable separable differential equations.	Solves mixed variable separable DE problems.
W32/P11	Problems on linear differential equations	Conducts problem session on first order linear differential equations.	Solves mixed linear differential equation problems.

Wk/Per	Topic to be Covered	Teacher Activity	Student Activity
W32/P12	Mixed problems on Differential Equations	Facilitates a comprehensive revision and test prep session covering all DE topics.	Solves final model question paper exercises under exam conditions.

4. ASSESSMENT SCHEME & LEARNING RESOURCES

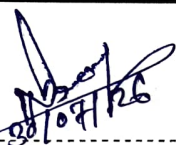
A. Continuous Internal Assessment Scheme (Progressive Assessment - 30 Marks)

- Class Attendance & Conduct: 5 Marks
- Assignments & Classroom Tutorials: 5 Marks
- Internal Assessment / Class Tests: 20 Marks

B. Recommended Textbooks & Reference Learning Resources

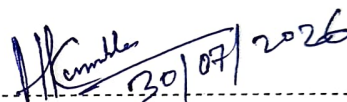
1. *Textbook of Engineering Mathematics (Vol-I & II)* – SCTE&VT, Odisha.
2. *Higher Engineering Mathematics* – Dr. B.S. Grewal, Khanna Publishers.
3. *Elements of Mathematics (Vol-I & II)* – Odisha State Bureau of Textbook Preparation & Production.
4. *Engineering Mathematics* – H.K. Dass, S.Chand Publishing.

5. TEACHING FACULTY & APPROVAL



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