

DEPARTMENT OF HUMANITIES & SCIENCES

GOVERNMENT POLYTECHNIC, GAJAPATI

LESSON PLAN 1ST YEAR 2026-27

Name of Teaching Faculty: Manas Kumar Mahalik ,Lecturer Stage II (Mathematics)

Sub: Mathematics TH- 4(Common to	No. of Classes per week:04	Class from 17.08.2026 to 17.04.2027
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Total Periods:128

Week	Class Day	Theory Topics
1st	1st	Concept of angles & rotational directions.
	2nd	Measurement of angles in degrees, grades, and radians.
	3rd	Conversions between degrees, grades, and radians.
	4th	T-Ratios of Allied angles (without proof).
2nd	1st	Practice problems on Allied angles ratios.
	2nd	Sum and difference formulae of T-ratios.
	3rd	Product formulae of T-ratios.
	4th	Transformation of product to sum and difference.
3rd	1st	Transformation of sum/difference to product.
	2nd	T-Ratios of multiple angles (2A).
	3rd	T-Ratios of multiple angles (3A).
	4th	T-Ratios of sub-multiple angles (A/2).
4th	1st	Advanced identity proofs using multiple/sub-multiple formulae.
	2nd	Introduction to Inverse Trigonometric functions.
	3rd	Properties of Inverse Trigonometric functions.
	4th	Problem-solving on Inverse Trigonometric equations.
5th	1st	Introduction to Cartesian Co-ordinate Geometry.
	2nd	Distance formula derivation and application.
	3rd	Section formula (Internal and External division).
	4th	Slope of a line and inclination angle.
6th	1st	Relationship between slopes of parallel lines.
	2nd	Relationship between slopes of perpendicular lines.
	3rd	Straight line equation: Slope-Intercept & Point-Slope forms.
	4th	Straight line equation: Two-Point & Intercept forms.
7th	1st	Intersection of two straight lines.
	2nd	Determining the angle between two straight lines.
	3rd	Perpendicular distance from a given point to a line.
	4th	Definition, centre, and radius of a Circle.
8th	1st	General equation of a circle and its features.
	2nd	Equation of circle when end points of diameter are given.

	4th	Cartesian representation & Argand diagram.
9th	1st	Polar representation of complex numbers.
	2nd	Conversion from Cartesian to Polar form and vice versa.
	3rd	Conjugate and Modulus of a complex number.
	4th	Amplitude/Argument of a complex number across quadrants.
10th	1st	Addition and Subtraction of complex numbers.
	2nd	Multiplication and Division of complex numbers.
	3rd	Finding the Square root of a complex number.
	4th	Properties and concepts of Cube roots of unity.
11th	1st	De-Moivre's theorem statement.
	2nd	Simple applications of De-Moivre's theorem.
	3rd	Definition of Polynomial, Proper & Improper fractions.
	4th	Resolving fractions with non-repeated linear factors.
12th	1st	Resolving fractions with repeated linear factors.
	2nd	Resolving fractions with non-repeated irreducible quadratic factors.
	3rd	Factorial of a non-negative integer & fundamental counting principle.
	4th	Permutations: Determination of $P(n, r)$ with problems.
13th	1st	Combinations: Determination of $C(n, r)$ with problems.
	2nd	Binomial theorem statement for positive integral index.
	3rd	Determination of general term in binomial expansion.
	4th	Determination of Middle term in binomial expansion.
14th	1st	Introduction to matrices and Order of a matrix.
	2nd	Types of matrices (Row, Column, Square, Diagonal, Identity).
	3rd	Addition and Subtraction operations of matrices.
	4th	Scalar multiplication of matrices.
15th	1st	Multiplication of matrices (Condition and operation).
	2nd	Numerical practice on matrix multiplication.
	3rd	Introduction to determinants and 2nd order expansion.
	4th	Expansion of determinant up to 3rd order.
16th	1st	Structural properties of determinants (Part 1).
	2nd	Structural properties of determinants (Part 2).
	3rd	Evaluation of Minors and Co-factors.
	4th	Finding the Adjoint and Inverse of a matrix.
17th	1st	Cramer's rule concept and 2-variable solutions.
	2nd	Solution of system of linear equations by Cramer's rule (3 variables).
	3rd	Matrix inversion method setup for linear equations.
	4th	Solution of linear equations by matrix method (3 variables).

	1st	Vector and Scalar Quantities with real examples.
	2nd	Notation and rectangular resolution of a vector.
	3rd	Types of vectors (Zero, Unit, Co-initial, Parallel).
	4th	Addition and subtraction of vectors.
19th	1st	Scalar multiplication of vectors.
	2nd	Scalar (dot) product of two vectors.
	3rd	Vector (cross) product of two vectors.
	4th	Determining the angle between two vectors.
20th	1st	Scalar and Vector projection of a vector on another vector.
	2nd	Area of a triangle using vector product.
	3rd	Area of a parallelogram using vector product.
	4th	Simple engineering problems related to work and moment of a force.
21st	1st	Definition of a function and domain/range concepts.
	2nd	Types of functions: Constant, Identity, Absolute value.
	3rd	Types of functions: Greatest integer, Trigonometric, Exponential, Logarithmic.
	4th	Definition of limit of a function and left-hand/right-hand limits.
22nd	1st	Existence of limit of a function.
	2nd	Algebra of limits and fundamental theorems.
	3rd	Limit of standard algebraic & trigonometric functions.
	4th	Evaluation of limits using standard formulas; Testing point continuity.
23rd	1st	Introduction to derivatives and rate of change concept.
	2nd	Differentiation of algebraic functions.
	3rd	Differentiation of exponential functions.
	4th	Differentiation of logarithmic functions.
24th	1st	Differentiation of trigonometric functions.
	2nd	Differentiation of inverse trigonometric functions.
	3rd	Differentiation rule for sum and difference of functions.
	4th	Differentiation rule for product and quotient of functions.
25th	1st	Differentiation of function of a function (Chain Rule).
	2nd	Logarithmic differentiation and implicit variations.
	3rd	Differentiation of a function w.r.t another function.
	4th	Integration as inverse process of differentiation.
26th	1st	Standard elementary integration formulas.
	2nd	Integration of simple algebraic expressions.
	3rd	Simple integration by substitution method (Part 1).
	4th	Simple integration by substitution method (Part 2).
27th	1st	Advanced substitution techniques for trigonometric terms.
	2nd	Introduction to Integration by parts.

	3rd	Integration by parts using ILATE rule.
	4th	Complex problems solving using Integration by parts.
28th	1st	Integration using partial fractions (linear factors only).
	2nd	Problem-solving on partial fraction integration.
	3rd	Introduction to Definite integrals.
	4th	Evaluation of definite integrals of simple functions.
29th	1st	Properties of definite integrals (Part 1).
	2nd	Properties of definite integrals (Part 2).
	3rd	Area evaluation bounded by a curve and axes.
	4th	Practice problems on tracking plane area curves.
30th	1st	Introduction to Differential Equations.
	2nd	Finding the Order of a differential equation.
	3rd	Finding the Degree of a differential equation.
	4th	Formation of differential equations by eliminating arbitrary constants.
31st	1st	Concept of general and particular solutions.
	2nd	Solution of first-order, first-degree equations by variable separable method.
	3rd	Variable separable practice problems (Part 1).
	4th	Variable separable practice problems (Part 2).
32nd	1st	Introduction to linear differential equations form.
	2nd	Evaluating the Integrating Factor (I.F.).
	3rd	Finding general solutions for linear differential equations.
	4th	Cumulative course review, past question matching, and final mock test.

Prepared By

Manas Kumar Mahalik
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Lecturer S-II in Mathematics

Amrinder
21/7/26
Sign of HOD, H4S.