Lok Jagruti Kendra University
University with a Difference

Diploma in Architectural Assistantship

LJ Polytechnic

Course Code: 025080105

Basic Mathematics

Programme / Branch Name			Diploma in Architectural Assistantship			
Course Name	Basic Mathematics				**Course Code**	025080105
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week / Credits				**Evaluation Scheme**			
L	**T**	**P**	**Total Credit**	**CCE**	**SEE (Th)**	**SEE (Pr)**	**TOTAL**
4	0	0	4	50	50	-	100

Legends:
L: Lectures T: Tutorial P: Practical
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisites

- ✓ Decimal Fraction (Addition, Subtraction, Multiplication, Division)
- ✓ L.C.M, H.C.F
- ✓ Factorization
- ✓ Indices and Surds
- ✓ Relation and Functions
- ✓ Integers and Rational Arithmetic
- ✓ Standard Units of Measure and Related Concepts such as Length, Area, Volume, and Capacity
- ✓ Graphical Representation of Lines and Cartesian Co-ordinate Plane
- ✓ Distance and Section Formulae
- ✓ Quadratic Equations and its Roots
- ✓ Set Operations and Number System ($\boldsymbol{N}, \boldsymbol{Z}, \boldsymbol{Q}, \boldsymbol{R}$)

3. Rationale

- ✓ The study of mathematics is the fundamental tool in the design process. It is useful for architects, builders, and construction experts right from drawing or making plans, execution, till finalization of building projects.
- ✓ Geometry, algebra, and trigonometry all play a crucial role in architectural design. Architects apply these to plan their blueprints or initial sketch designs.
- ✓ The curriculum focuses on developing mathematical understanding, reasoning, and problem-solving skills. This will enable students for employing mathematical strategies to make precise decisions and solve familiar and unfamiliar problems efficiently.
- ✓ It helps students to become self-motivated, confident learners through active participation in challenging and engaging experiences in their day-to-day affairs.

- ✓ To develop versatility to work effectively and efficiently in a broad range of analytic, scientific, government, financial, health, technical, and other positions.

4. Objectives

- ✓ Apply the concept of surface area and volume with the help of trigonometry in the application of integration.
- ✓ Analyze characteristics and properties of two and three-dimensional geometric shapes and develop mathematical arguments about geometric relationships.
- ✓ Know to convert logarithmic equations to exponential equations and vice versa.
- ✓ Distinguish between matrices and determinants and are used as mathematical tools in solving simultaneous linear equations.
- ✓ Find the exact trigonometric function values for standard angles for sine, cosine, tangent, cotangent, cosecant, and secant using the unit circle.
- ✓ Understand inverse trigonometric functions.
- ✓ Analyze the equation of a sine or cosine and will able to plot the graphs.
- ✓ Calculate the probability of events for more complex outcomes and solve applications involving probabilities.
- ✓ Demonstrate the ability to perform complex statistical data management and analysis.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	**Surface Area & Volume and Co-ordinate Geometry**	1.1. Perimeter and Area of Basic Plain Figures 1.2. Surface Area and Volume of Solid Figures **Point:** 1.3. Distance Formula 1.4. Mid–Point 1.5. Circumcentre of the Triangle 1.6. Area of Triangle 1.7. Locus of a Point **Straight Line:** 1.8. Cartesian Equation of Line 1.9. Intercepts of a Line on the Axes 1.10. Forms of Equation of Line (Slope Point Form, Two Point Form, Intercept Form) 1.11. Parallel and Perpendicular Lines **Circle:** 1.12. Equation of a Circle 1.13. Standard Equation of a Circle 1.14. General Equation of Circle	• Distinguish the Formula for Perimeter, Area, and Volume by Considering Dimensions • Calculate the Volume of given Geometric Figures of Two and Three-Dimension Figures • Obtain the Equation of Locus Using the Distance Formula • Find the Equation of a Line Using the Different Forms • Calculate the Gradients of Two Lines and Identify the Conditions for them to be Parallel or Perpendicular • Find the Equation of Circle with the help	30	16

		1.15. Centre and Radius for General Equation of a Circle 1.16. Equation of Tangent and Normal to a Circle	of its Centre and Radius • Calculate Tangent and Normal to the Circle		
2.	**Logarithm**	2.1. Concept and Relation between Exponential and Logarithmic Function 2.2. Types of Logarithm, 2.3. Fundamental Laws and Properties	• Solve the Given Simple Problem based on the Laws of the Logarithm	10	6
3.	**Determinants and Matrices**	3.1. Second-Order Determinants 3.2. Minor and Cofactor 3.3. Third-Order Determinants 3.4. Matrix 3.5. Different Types of Matrices 3.6. Properties of Matrices 3.7. Adjoint of a Matrix 3.8. Inverse of a Matrix 3.9. Solution of Simultaneous Linear Equations	• Solve the Given System of Linear Equations Using the Method of Inverse of Matrix which can also be Useful in Various Fields of Technology	20	12
4.	**Trigonometry**	4.1. Unit Circle and Trigonometric Point 4.2. Trigonometric Identities and Relation between Cartesian and Polar Coordinate System 4.3. Measurement of an Angle (In Degree and Radian) 4.4. Trigonometric Ratios of $(-\theta)$ in Teams of those of θ 4.5. Allied Angles 4.6. Periodic Functions and Graphs 4.7. Graph of Sine and Cosine Function 4.8. Compound Angles	• Apply the Concept of Compound Angle, Allied Angle, and Multiple Angles to Solve the Given Simple Engineering Related-Problems • Investigate Given Simple Problems Utilizing Inverse Trigonometric Ratios	25	14

		4.9. Product into Sums or Differences 4.10. Multiple and Submultiple Angles and Trigonometric Function of 18° and $22\frac{1}{2}^{\circ}$ 4.11. Inverse Trigonometric Functions 4.12. Inverse Trigonometric Functions of Negative Numbers and Reciprocal 4.13. Inverse Functions of Complementary Functions			
5.	**Probability and Statistics**	5.1. Basic Concept of Probability and Some Useful Terms 5.2. Types of Event 5.3. Probability - Definitions and Formulae 5.4. Measure of Central Tendency-Mean, Median, Mode 5.5. Measure of Dispersion-Mean Deviation from Mean and Median 5.6. Standard Deviation 5.7. Variance	• Be Familiar with Commonly Named Discrete and Continuous Random Variables • Solve Simple Problems Using Basic Probability Axioms and Rules • Calculate Measures of Central Tendency and Dispersion for Grouped and Ungrouped Data	15	8
				Total Hours	**56**

6. List of Exercises /Tutorials

Tutorial is an important teaching-learning tool in mathematics. Small-group tutorials are an effective method to enhance student's confidence. It can help to improve their scores on tests and boost their academic performance in a class by One-on-one attention.

Sr. No	Exercises/Tutorial	Key Competency
1.	Surface Area & Volume and Co-ordinate Geometry	. • Know Perimeter and Area of Basic Plain Figures • Evaluate Area and Volume of Solid Figures • Understand the Locus of a Point Using Distance Formula • Distinguish Different Forms of Equation of Line and its Slop • Formation of Parallel and Perpendicular Lines by Applying its Condition • Evaluate Angle between Two Lines • Evaluate Equation of Circle • Calculate Centre and Radius from the Given Equation of Circle • Obtain the Equation of Tangent and Normal to the Given Circle
2.	Logarithm	• Solve the Given Simple Problem Based on the Laws of the Logarithm • Know to Draw the Graph of Logarithmic and Exponential Functions
3.	Determinants and Matrices	• Solve the Given System of Linear Equations Using the Method of Inverse of Matrix which can also be Useful in Various Fields of Technology
4.	Trigonometry	• Apply the Concept of Compound Angle, Allied Angle, and Multiple Angles to Solve the Given Simple Engineering-Related Problems • Investigate Given Simple Problems Utilizing Inverse Trigonometric Ratios
5.	Probability and Statistics	• Express the Concept of Factorial and the Basic Principle of Counting • Solve the Simple Problems about Permutation and Combination • Calculate Mean and Standard Deviation of Discrete and Grouped Data Related to the Given Simple Engineering Problems • Determine the Variance and Coefficient of Variance of Given Grouped and Ungrouped Data • Develop an Analytical and Systematic Approach towards Solving the Problem

7. Suggested Specification Table for Evaluation Scheme

Unit No.	Unit Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1	Surface Area & Volume and Co-ordinate Geometry	20	20	20	10	20	10
2	Logarithm	20	30	10	10	20	10
3	Determinants and Matrices	10	30	20	10	20	10
4	Trigonometry	20	30	10	10	20	10
5	Probability and Statistics	10	20	20	00	30	20

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

8. Reference Books

1) Mathematics for Engineering Applications, Kuldip S. Rattan, Nathan W. Klingbeil, Wiley Publication
2) Engineering Mathematics, H. K. Das, S. Chand Publication
3) Engineering Mathematics-1, Reena Garg, Khanna Publication
4) Mathematics for Polytechnic Students, S. P. Deshpande, Pune Vidyarthi Gruh Prakashan
5) Plane Trigonometry, S. L. LONEY, Cambridge University Press

9. Open Sources (Website, Video, Movie)

1) https://tinyurl.com/ykddvzwu
2) https://tinyurl.com/238e2ep9