

GUJARAT TECHNOLOGICAL UNIVERSITY, AHMEDABAD.

MATHEMATICS-I

1. RATIONALE :

The entrance qualifications for a Diploma technician is 10th pass. They have gained sufficient knowledge of the course Mathematics in the standard 10th to qualify for further studies in diploma programmes. A technician engineer needs to study relevant theories and principles of Mathematics to enable them to understand & grasp the concepts of the advance courses of diploma programme and their various engg. applications.

With this view, the necessary content for the course Mathematics is designed and developed in consultations with the senior technical teachers to make students capable to understand the technology related courses at higher levels. It is presumed that this course-content will provide a suitable foundation for all the engineering applications which technician is supposed to come across in his field and will be able to use it in understanding them during his diploma study.

2. SCHEME OF TEACHING :

SN.	Topics	Theory Hours
	Part-I Algebra	
1.	Indices & Surds	5
2.	Logarithm	3
3.	Arithmetic & Geometrical Progression	5
4.	Binomial Theorem	5
5.	Matrices	7
6.	Vector Algebra	7
	TOTAL	32
	Part-II Trigonometry	
1.	Measurement of angles	1
2.	Trigonometric Ratios	3
3.	Standard & Allied angles	3
4.	Periodic Functions & Graphs	4
5.	Compound angles	3
6.	Multiple & Sub-multiple angles	4
7.	Inverse Trigonometric Functions	2
8.	Properties & Solutions of triangle	3
9.	Height & Distances	1
	TOTAL	24

Grand Total 56 hrs.

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3. TOPICS AND SUB TOPICS

Part-I Algebra

Topic 1. Indices & Surds 5 hrs.

- 1.1 Indices
 - 1.1.1 Concept and rules
 - 1.1.2 Examples on indices
- 1.2 Surds
 - 1.2.1 Definition & concept
 - 1.2.2 Simple examples on surds
 - 1.2.3 Square root of surds
 - 1.2.4 Examples on square root of surds

Topic 2. Logarithm 3 hrs.

- 2.1 Definition & concept
- 2.2 Logarithm rules
- 2.3 Examples based on rules and calculations

Topic 3. Arithmetic & Geometrical Progression (A.P & G.P) 5 hrs.

- 3.1 Sequence, series and progression.
 - 3.1.1 Difference between the terms.
 - 3.1.2 Problem based on the terms .
- 3.2 Arithmetic progression
 - 3.2.1 Definition
 - 3.2.2 Formula for nth term of an A.P
 - 3.2.3 Sum of n terms of an A.P.
 - 3.2.4 Definition of Arithmetic mean.
 - 3.2.5 Examples.
- 3.3 Geometrical progression.
 - 3.3.1 Definition
 - 3.3.2 Computation of nth term of a G.P.
 - 3.3.3 Sum of n terms of G.P.
 - 3.3.4 Definition of geometrical mean.
 - 3.3.5 Examples.

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Topic 4. Binomial Theorem

5 hrs.

- 4.1 Meaning of the terms $n!$ (Factorial n), nCr .
 - 4.1.1 Examples.
- 4.2 Expansion of $(x+a)^n$ for positive integral values of n .
 - 4.2.1 Formula for $(r+1)$ st term of $(x+a)^n$.
 - 4.2.2 Examples of finding any term of middle term/terms of $(x+a)^n$.
 - 4.2.3 Finding constant term & coefficient of x^r .
 - 4.2.4 Examples of $(1+x)^n$, $n \in \mathbb{Q}$
- 4.3 Approximate value by Binomial theorem.
 - 4.3.1 Rules
 - 4.3.2 Examples.

Topic 5. Matrices

7 hrs.

- 5.1 A brief idea of determinant of order three.
 - 5.1.1 Definition.
 - 5.1.2 Examples of expansion.
- 5.2 Matrix of order $m \times n$.
 - 5.2.1 Definition.
 - 5.2.2 Examples.
- 5.3 Types of matrix.
 - (1) Null matrix.
 - (2) Square matrix.
 - (3) Unit matrix.
 - (4) Diagonal matrix.
 - (5) Skew symmetric matrix.
 - 5.3.1 Examples based on types of matrix.
- 5.4 Addition and subtraction of matrices.
 - 5.4.1 Rules and explanation
 - 5.4.2 Problems based on subtraction and addition.
- 5.5 Product of a matrix with scalar.
 - 5.5.1 Definition and examples.
- 5.6 Product of two matrices.
 - 5.6.1 Definition and examples.
- 5.7 Transpose of a matrix.
- 5.8 Adjoint of a matrix,
 - 5.8.1 Definition & Examples.
- 5.9 Inverse of a matrix for order 3.
 - 5.9.1 Definition & Examples.
- 6.0 Examples to solve linear simultaneous equations of three variables.

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Topic 6. Vector Algebra

7 hrs.

- 6.1 Vector and scalar quantities
 - 6.1.1 Definition of the terms
 - 6.1.2 Examples, non-examples
- 6.2 Types of vectors
 - (i) Position Vector
 - (ii) Equal Vector
 - (iii) Negative Vector
 - (iv) Coplanar Vector
 - (v) Unit Vector
 - (vi) Co-initial Vectors
 - 6.2.1 Definition of types of vectors
 - 6.2.2 Examples of types of Vectors
- 6.3 Geometrical representation of vectors
- 6.4 Addition and subtraction of vectors
 - 6.4.1 Principle and its explanation
 - 6.4.2 Problems based on addition and subtraction.
- 6.5 Unit Vectors i , j and k
 - 6.5.1 Use of unit vectors
 - 6.5.2 Position vectors of a vector in terms of i , j and k
- 6.6 Magnitude and direction of vectors
 - 6.6.1 Definition of magnitude and direction
 - 6.6.2 Examples based on magnitude and direction of vectors in terms of i , j and k
- 6.7 Product of a vector and a scalar
 - 6.7.1 Definition of product of a vector and a scalar.
 - 6.7.2 Examples.
- 6.8 Dot and cross product of two vectors
 - 6.8.1 Definition.
 - 6.8.2 Examples.
- 6.9 Applications
 - 6.9.1 Definition of work done by force and moment of force.
 - 6.9.2 Examples.

NB: This topic must be taught after completing all topics of Algebra & Trigonometry.

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Part 2 TRIGONOMETRY :

Topic 1. Measurement of angles	1 hr.
1.1 Degree and radians	
1.2 Area of sector and arc-length	
Topic 2. Trigonometric ratios	3 hrs.
2.1 Definition and identities	
2.2 Examples on T-ratios	
Topic 3. Standard & allied angles.	3 hrs.
3.1 Values of T-ratios for 30° , 45° , 60° & 90°	
3.2 Concept of allied angles	
3.3 Examples	
Topic 4. Periodic functions & Graphs	4 hrs.
4.1 Definition & concept of periodic function	
4.1.1 Examples on periodic functions	
4.2 Graphs of Sine & Cosine	
Topic 5. Compound angles	3 hrs.
5.1 Concept of addition & subtraction formula	
5.2 Sum & difference formula	
5.3 Examples	
Topic 6. Multiple & Sub-multiple angles	4 hrs.
6.1 Formulae for $2A$ & $3A$ and their multiples	
6.2 Product formulae	
6.3 $A/2$ formulae	
6.4 Examples	
Topic 7. Inverse T-functions	2 hr.
7.1 Definition and concept	
7.2 Simple examples.	
Topic 8. Properties and solutions of triangle	3 hrs.
8.1 Sine and cosine rules	
8.2 Projection formulae	
8.3 Napier's formula (Tangent rule)	
8.4 $\Delta = \frac{1}{2} ab \sin C$ etc. $= \sqrt{s(s-a)(s-b)(s-c)}$, $s = \frac{a+b+c}{2}$	
8.5 Solution of triangle using above given formula.	
Topic 9. Height & Distances	1 hr.
9.1 Simple examples	

Grand Total 56 hrs.

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4. REFERENCES :

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|--|----------------|
| (1) Engg. Mathematics | P.N. Wartikar |
| (2) Engg. Mathematics | B.S. Greal. |
| (3) Engg. Mathematics | I. B. Prasad |
| (4) Polytechnic Mathematics (Vol. I & II) | TTTI Bhopal |
| (5) College Algebra | Shah and Desai |
| (6) Mathematics for Polytechnic | S.P.Deshpande |
| (7) Co-Ordinate Geometry | Bansilal |
| (8) Technical Ganitshashtra(Part I,II in Gujarati) | R.D.Desai |

5. ASSESSMENT SCHEME :

Sr.No.	Name of Topics	% weightage
	Part - I Algebra	
1.	Indices & Surds	10
2.	Logarithm	06
3.	Arithmetic & Geometrical Progression	10
4.	Binomial Theorem	10
5.	Matrices	12
6.	Vector Algebra	12
	Total Marks	60
	Part-II Trigonometry	
1.	Measurement of angles	2
2.	Trigonometric Ratios	4
3.	Standard & Allied angles	5
4.	Periodic Functions & Graphs	7
5.	Compound angles	4
6.	Multiple & Sub-multiple angles	5
7.	Inverse Trigonometric Functions	2
8.	Properties & Solutions of triangles	8
9.	Height & Distances	3
	Total Marks	40
	Grand Total	100 Marks