Semester*	: I
Course Type	: DSC
Course Code**	: MAT-DSC-101
Name of the Course	: Higher Algebra and Trigonometry
Learning level***	: 150
Credits	: 3
Contact Hours	: 45
Total Marks	: 100
End Semester Marks	: 70
Internal Marks	: 30
Course Objectives	:

★ To provide a comprehensive understanding of trigonometry, formal logic, polynomial equations, inequalities, and systems of linear equations.
★ To enable the learners to gain the necessary skills and knowledge to apply mathematical concepts in a variety of real-world contexts.

Unit-I

Polar representation of complex numbers. De Moivre's theorem for rational indices and related problems. Expansions of sin nθ, cos nθ, sin θ, cos θ. Expansions for sinn θ, cosn θ for even and odd n.

Unit-II

Exponential and logarithmic functions of complex arguments, Gregory's series, hyperbolic functions, summation of trigonometric series.

Unit-III

Relations: Reflexive, symmetric, transitive, and equivalence. Equivalence classes and partitions. Introduction to Logic: propositions, truth table, negation, conjunction and disjunction. Implications, biconditional propositions. Converse, contrapositive and inverse propositions and precedence of logical operators. Quantifiers: Universal and Existential quantifiers.

Unit-IV

Relation between roots and coefficients of a polynomial equations of nth degree, symmetric functions of roots. Transformation of equations, reciprocal and binomial equations. Cardan's method of solution of cubic equations. Descartes' rule of signs. Inequalities involving arithmetic and geometric means, Cauchy-Schwarz's inequality, Minkowski inequality.

Unit-V

Elementary transformation of matrices, echelon and canonical forms, rank of a matrix, linear dependence and independence of n-tuples; Inverse of a matrix by elementary operations. Systems of linear equations and their solutions by Gaussian elimination method.

Textbooks:

1. B.C. Das and B.N. Mukherjee, Higher Trigonometry, 34th ed., U.N. Dhur and Sons, 1933 **(Units-I, II)**
2. A. Kumar, S. Kumaresan, and B.K. Sarma, A Foundation Course in Mathematics, 1st ed., Narosa Publishing House, 2018 **(Unit-III)**
3. J.G. Chakraborty and P.R. Ghosh, Higher Algebra: Classical and Modern, 23rd ed., U.N. Dhur and Sons, 1972 **(Unit-IV)**
4. S. Lipschutz and M. Lipson, Schaum's Outlines: Linear Algebra, 3rd ed., McGraw Hill Education, 2017 **(Unit-V)**

Reference books:

1. S.K. Mapa, Higher Algebra: Classical, 9th ed., Sarat Book House, 2021.

2. D.C. Lay, Linear Algebra and its Applications, 3rd ed., Pearson Education India, 2002.

Course Learning Outcome

After completion of the course, learners will be able to

1. Demonstrate understanding of complex numbers in polar form and apply De Moivre's theorem effectively.
2. Analyse and solve problems involving exponential and logarithmic functions with complex arguments and series expansions.
3. Apply formal logic principles to construct logical statements and understand the relationship between roots and coefficients of polynomial equations.
4. Solve polynomial equations and inequalities involving means using appropriate techniques.
5. Solve systems of linear equations using Gaussian elimination and understand concepts related to matrices, rank, and linear dependence/independence.