



Semester-I											
Paper Description	Classical and Linear Algebra		Paper Code				UMATMAJI1001				
Paper (Type)	Major Course (Theory)		Credit				Marks				
Paper Level	Class Hours	Sem. End Exam.	L	T	P	Total	TH	PRC	CE	ATT	Total
100	4 Hours/week	2 Hr. 30 Min	3	1	--	4	60	---	10	5	75

CLASSICAL AND LINEAR ALGEBRA

Classical Algebra

Unit 1: **10 classes**

Complex numbers: Polar representation, De Moivre's theorem for rational indices and its applications. Trigonometric, logarithm, exponential and hyperbolic functions of complex variable.

Unit 2: **15 classes**

Theory of equations: Fundamental theorem of Classical Algebra (statement only), relation between roots and coefficients, symmetric functions of roots, transformation of equation, Descartes' rule of signs, Sturm's theorem, cubic equation (Cardan's method), biquadratic equation (Ferrari's method).

Unit 3: **5 classes**

Inequality: $AM \geq GM \geq HM$, theorem of weighted means and m -th power theorem (statement only), Cauchy-Schwartz inequality (statements only) and its application.

Linear Algebra

Unit 4: **15 classes**

Matrices: Inverse of a matrix, characterizations of invertible matrices, elementary operations and matrices, echelon matrix, row/column reduced echelon matrix, rank of matrix, normal forms, equivalency and congruency of matrices.

Unit 5: **10 classes**

Systems of linear equations: Consistency in equivalence system, Solution of homogeneous system $AX=O$, Solution of nonhomogeneous system $AX=B$ using row reduced echelon form.

Unit 6: **5 classes**

Eigen values and eigen vectors of a square matrix, characteristic equation of a matrix, Cayley-Hamilton theorem, and its use in finding the inverse of a matrix.

Suggested Reading Books:

- S. Lang, Introduction to Linear Algebra, *Springer*.
- S.K. Mapa, Higher Algebra: Classical, *Levant*.
- S.K. Mapa, Higher Algebra: Abstract & Linear, *Levant*.
- W.S. Burnstine and A.W. Panton, Theory of equations, *Creative Media*.
- S.H. Friedberg, A.J. Insel and L.E. Spence, Linear Algebra, *Pearson Edu. Pub. (Indian)*.
- K. Hoffman and R. Kunze, Linear algebra, *Prentice Hall India*.
- T. Andreescu and D. Andrica, Complex Numbers from A to Z, *Birkhauser*.
- V. Sahai and V. Bist, Linear Algebra, *Narosa Pub. House*.
- D.C. Lay, Linear Algebra and its Applications, *Pearson Edu. Pub. (Indian)*.