(Bachelor of Science) (Mathematics)
(B.Sc.) (Mathematics) Semester (II)

Course Code	US02CMTH51	Title of the Course	Elementary Algebra
Total Credits of the Course	4	Hours per Week	4 hours

Course Objectives:	1. Students will learn basics of Complex analysis. 2. They will also get the primary knowledge of Mathematical Functions and Number theory. 3. They will also able to get detailed knowledge of Matrix Algebra.

Course Content		
Unit	Description	Weightage* (%)
1.	**Algebra of Complex Numbers** Complex Numbers, Polar representation of complex number, De Moivre's Theorem of rational indices and its applications, n^{th} roots of a complex number, Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ in powers of $\sin\theta$, $\cos\theta$, $\tan\theta$ respectively, Addition formula for any number of angles, Expansion of $\sin^m\theta$, $\cos^m\theta$, $\sin^m\theta\cos^n\theta$ in a series of sines or cosines of multiples of θ. Complex functions: Exponential function, Trigonometric functions, Hyperbolic functions, Inverse Hyperbolic functions, Real and Imaginary part of circular and hyperbolic functions, Logarithmic function.	25%
2.	**Elementary Theory of Numbers** Equivalence Relations, Functions, Composition of functions, Invertible functions, one to one correspondence and cardinality of a set, Countable, Uncountable and Countably infinite sets and its examples. Well-ordering property of positive Integers, Division Algorithm, Divisibility and Euclidean Algorithm, Congruence relation between Integers, Fundamental theorem of Arithmetic.	25%
3.	**Algebra of Matrices-I** Different types of Matrices, Associative and Distributive Laws of Matrices, Determinants and Minors of Matrices, Adjoint and Inverse of a square matrix, Rank of a matrix, Elementary transformation on a matrix, Invariance of Rank under elementary transformation, Reduction to normal form, Elementary matrices, Rank of product, Method for computing the inverse of a non-singular matrix by elementary operations, Equivalence matrices.	25%
4.	**Algebra of Matrices-II** System of Linear homogeneous and Nonhomogeneous equations,	25%

	Eigen value (Characteristic Roots) and Eigen vectors of a square matrix, Nature of the characteristic roots and some special types of matrices, Construction of orthogonal and unitary matrices, Characteristic matrix and Characteristic equation of a matrix and Cayley-Hamilton theorem.	

Teaching-Learning Methodology	Classroom teaching, Presentation by students, Use of ICT whenever required.

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	Internal Written / Practical Examination (As per CBCS R.6.8.3)	15%
2.	Internal Continuous Assessment in the form of Practical, Viva-voce, Quizzes, Seminars, Assignments, Attendance (As per CBCS R.6.8.3)	15%
3.	University Examination	70%

Course Outcomes: Having completed this course,	
1.	Students can use the basic knowledge of Complex numbers in Complex Analysis in future.
2.	Basic understanding of functions will help them in Mathematical Analysis, Abstract Algebra, Linear Algebra, Topology, Differential equations and many other branches of Mathematics.
3.	Students will be able to use this knowledge of Matrices in initiating the study of Advanced linear algebra.

Suggested References:	
Sr. No.	References
1.	Narayan S., Mittal P. K. (2005), A textbook of Matrices, 11th revised edition, S. Chand and Co. Ltd., New Delhi.
2.	Grewal B. S., Higher Engineering Mathematics, 36th edition, Khanna Publ.
3.	Lipschutz S., Lipson M. L, Discrete Mathematics,McGraw-Hill

	International Ed. (Schaum's Series)
4.	Hsiung C. Y. (1992), Elementary Theory of numbers, Allied publishers Ltd.
5.	Burton D., elementary Number Theory, 6th Ed, Tata McGraw-Hill Edition, Indian reprint.
6.	Andreescu T., Andrica D. (2006), Complex Numbers from A to Z, Birkhauser,
7.	Brown, J. W., & Churchill, R. V. (2009), Complex variables and applications, McGraw-Hill Book Company.

On-line resources to be used if available as reference material
On-line Resources

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