SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)
Syllabus with effect from the Academic Year 2021-2022

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

Course Code	US02CMTH52	Title of the Course	PROBLEMS AND EXERCISES IN ALGEBRA
Total Credits of the Course	2	Hours per Week	4 hours

Course Objectives:	1. Students will learn basics of Complex analysis. 2. They will 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.	Complex Numbers, Polar Form of Complex Number. De Moivre's Theorem, nth Roots of a Complex Number	10%
2.	Expansion of $\sin n\theta$, $\cos n\theta$, $\tan n\theta$ in powers of $\sin\theta$, $\cos\theta$, $\tan\theta$ respectively, Addition formulae 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.	10%
3.	Complex Function: Exponential function, Hyperbolic Functions, Inverse Hyperbolic Functions, Real and Imaginary part of Circular and Hyperbolic Functions, Logarithmic Function.	10%
4.	Equivalence Relations, Functions, Composition of Functions, Invertible Functions, One to One Correspondence and Cardinality of a set, Countable, Uncountable, Countably Infinite sets and its examples.	10%
5.	Well-ordering Property of Positive Integers, Division Algorithm, Divisibility and Euclidean Algorithm, Congruence Relation between Integers, Fundamental Theorem of Arithmetic.	10%
6.	Matrices, Some Special Types of Matrices, Sub-Matrices, Determinant and Minors of a Matrix, Algebra of Matrices, Reversal Law for Transpose of a Product, Associative La, Distributive Law, Zero Divisor, Adjoint and Inverse of a Square Matrix.	10%
7.	Rank of a Matrix, Elementary Transformation on a Matrix, Invariance of Rank Under Elementary Transformation, Reduction to Normal Form, Elementary Matrices.	10%
8.	Method for Computing the Inverse of a Non-singular Matrix by Elementary Operations, Equivalence Matrices. Solution of System of linear homogeneous algebraic equations, Solution of System of linear	10%

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)
Syllabus with effect from the Academic Year 2021-2022

	non-homogeneous algebraic equations.	
9.	Characteristic Roots and Vectors of a Square Matrix, Nature of the Characteristic Roots and Some Special Types of Matrices, Construction of Orthogonal and Unitary Matrices.	10%
10.	Characteristic Matrix and Characteristic equation of a matrix, Cayley-Hamilton Theorem.	10%

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

Evaluation Pattern		
Sr. No.	Details of the Evaluation	Weightage
1.	University Examination	100%

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)

SARDAR PATEL UNIVERSITY
Vallabh Vidyanagar, Gujarat
(Reaccredited with 'A' Grade by NAAC (CGPA 3.25)
Syllabus with effect from the Academic Year 2021-2022

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

*****