



# C. U. SHAH UNIVERSITY, WADHWAN CITY.

Faculty of: **Sciences & Life Sciences**

Course: **Bachelor of Science (Mathematics)**

Semester: **I**

Subject Code: **MAM202-1C**

Subject Name: **Linear Algebra & Complex Analysis**

Sr. No	Category	Subject Code	Subject Name	Teaching hours/ Week			Credit hours	Credit Points	Evaluation Scheme/ Semester								Total
				Th	Tu	Pr			Theory				Tutorial / Practical				
									Continuous and Comprehensive Evaluation		End Semester Exams		Internal Assessment		End Semester Exams		
									Marks	Marks	Marks	Duration	Marks	Duration	Marks	Duration	
2	MAJOR-II	MAM202-1C	Linear Algebra & Complex Analysis	3	-	2	5	4	10	Assignment	50	2	25	1	-	-	100

## Course Objective :

The main objectives of this course are

- The definitions of matrix and types of matrices.
- Algebra of matrices.
- Methods to solve system of linear equations.
- Eigen value and Eigen vectors of matrices.

## COURSE CONTENTS

### Course Outline for Theory

UNIT	COURSE CONTENT	TEACHING HOURS
<b>I</b>	Introduction to Determinants and Matrices, different types of Matrices, theorems on matrices, elementary operations on matrices, Row Echelon & Reduced Row Echelon form of a Matrix, Solution of system of linear equations, solving system of linear equations simultaneously, Inverse of Matrix, Rank of Matrix, Matrix inversion using RRE form. Characteristic equation of a matrix and Cayley-Hamilton theorem and its use in finding inverse of matrix, Eigen value and Eigen vector of square matrices, eigenvalue of special type of matrices, Diagonalization of matrix.	<b>15</b>
<b>II</b>	Complex numbers, Polar form of complex number. De'Moivre's theorem, nth roots of a complex number, Fundamental theorem of algebra (statement only), Multiple roots and test for multiplicity.	<b>15</b>
<b>III</b>	Expansions of $\cos n\theta$ , $\sin n\theta$ , $\tan n\theta$ in terms of $\cos \theta$ , $\sin \theta$ , $\tan \theta$ respectively ( $n \in N$ ). Expansion of $\cos^n \theta$ , $\sin^n \theta$ in a series of cosines or sines of multiple angles of $\theta$ ( $n \in N$ ). Expansion of $\cos \theta$ , $\sin \theta$ , $\tan \theta$ in terms of $\theta$ . Exponential, circular and hyperbolic functions.	<b>15</b>

## Course Outline for Practical

SR. NO	COURSE CONTENT	Lab Hours
1	RE and RRE form and rank of a matrix, Inverse of a matrix	30
2	Problems based on eigen values and eigen vectors and Diagonalization	
3	Cayley- Hamilton's Theorem and its applications.	
4	Descarte's rule of sign, Relation between roots and coefficients.	
5	Solution of cubic equations (Cardan's method), Solution of biquadratic equations (Ferari's method)	
6	Algebra of Complex numbers, De'Moivre's theorem.	
7	Expansions of $\cos n\theta$ , $\sin n\theta$ , $\tan n\theta$ in terms of $\cos \theta$ , $\sin \theta$ , $\tan \theta$ respectively ( $n \in N$ ).	
8	Expansion of $\cos^n \theta$ , $\sin^n \theta$ in a series of <i>cosines</i> or <i>sines</i> of multiple angles of $\theta$ ( $n \in N$ ).	

### TEACHING METHODOLOGY:

Conventional method (classroom blackboard teaching)

ICT Techniques

Teaching through the classroom

Variety of learning styles and tools (PowerPoint presentations, audio-visual resources, e-resources, seminars, workshops, models)

### LEARNING OUTCOME:

After the successful completion of the course, students will be able to

- Solve systems of linear equations.
- Manipulate matrix algebra and determinants.
- Evaluate Eigen values and Eigen vectors.
- Understand the concepts of complex numbers and some complex functions.

### Arrangement of lectures duration and practical session as per defined credit numbers:

Units	Lecture Duration (In Hrs.)		Calculation of Credits (In Numbers)		Total Lecture Duration	Credit Calculation
	Theory	Practical	Theory	Practical	Theory+ Practical	Theory+ Practical
Unit – 1	15	30	3	1	45+30	4
Unit – 2	15					
Unit – 3	15					
<b>TOTAL</b>	<b>45</b>	<b>30</b>	<b>3</b>	<b>1</b>	<b>75</b>	<b>4</b>

Evaluation:

Theory Marks	Practical Marks	Total Marks
75	25	100

## REFERENCE BOOKS:

1. Advanced Engineering Mathematics', **E. Kreyszig**, *New Age International Publishing Co.*
2. 'Complex Variables and Applications', **R. V. Churchill, J. W. Brown**, *McGraw-Hill Book Co.*
3. Elementary Linear Algebra', **Howard Anton and Chris Rorres**, *Wiley Pub.*
4. A Textbook of Matrices', **Shanti Narayan and P. K. Mittal**, *S. Chand and Co.* New Delhi.
5. 'Higher Engineering Mathematics, Thirty-fifth edition', **B. S. Grewal**, *Khanna Publication.*