Course No.	Course Name	L-T-P - Credits	Year of Introduction
MA201	LINEAR ALGEBRA AND COMPLEX ANALYSIS	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

COURSE OBJECTIVES

- To equip the students with methods of solving a general system of linear equations.
- To familiarize them with the concept of Eigen values and diagonalization of a matrix which have many applications in Engineering.
- To understand the basic theory of functions of a complex variable and conformal Transformations**.**

Syllabus

Analyticity of complex functions-Complex differentiation-Conformal mappings-Complex integration-System of linear equations-Eigen value problem

Expected outcome .

At the end of the course students will be able to

(i) solve any given system of linear equations

(ii) find the Eigen values of a matrix and how to diagonalize a matrix

(iii) identify analytic functions and Harmonic functions.

(iv)evaluate real definite Integrals as application of Residue Theorem

(v) identify conformal mappings(vi) find regions that are mapped under certain Transformations

Text Book:

Erwin Kreyszig: Advanced Engineering Mathematics, 10^{th} ed. Wiley

References:

1.Dennis g Zill&Patric D Shanahan-A first Course in Complex Analysis with Applications-Jones&Bartlet Publishers

2.B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.

3.Lipschutz, Linear Algebra,3e **(** Schaums **Series)**McGraw Hill Education India 2005

4.Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	<u>Complex differentiation Text 1[13.3,13.4]</u> Limit, continuity and derivative of complex functions	3	
	Analytic Functions	2	
	Cauchy–Riemann Equation(Proof of sufficient condition of analyticity & C R Equations in polar form not required)-Laplace's Equation	2	
	Harmonic functions, Harmonic Conjugate	2	15%
II	<u>Conformal mapping: Text 1[17.1-17.4]</u> Geometry of Analytic functions Conformal Mapping,	1	
	Mapping $w = z^2$ conformality of $w = e^z$.	2	15%

	The mapping $w = z + \frac{1}{z}$ Properties of $w = \frac{1}{z}$ Circles and straight lines, extended complex plane, fixed points	1	
	Special linear fractional Transformations, Cross Ratio, Cross Ratio property-Mapping of disks and half planes	3	
	Conformal mapping by $w = \sin z$ & $w = \cos z$ (Assignment: Application of analytic functions in Engineering)	3	
	FIRST INTERNAL EXAMINATION		
III	Complex Integration. Text 1[14.1-14.4] [15.4&16.1] Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method	2	15%
	Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof)	2	
	Cauchy's Integral Formula- Derivatives of Analytic Functions(without proof)Application of derivative of Analytical Functions	2	
	Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof)	2	
	Laurent's series (without proof)	2	
IV	Residue Integration Text 1 [16.2-16.4] Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functions	2	15%
	Residue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem.	4	
	Evaluation of Real Integrals (i) Integrals of rational functions of $\sin\theta$ and $\cos\theta$ (ii)Integrals of the type $\int_{-\infty}^{\infty} f(x)dx$ (Type I, Integrals from 0 to ∞) (Assignment : Application of Complex integration in Engineering)	3	
	SECOND INTERNAL EXAMINATION		
V	Linear system of Equations Text 1(7.3-7.5)		20%
	Linear systems of Equations, Coefficient Matrix, Augmented Matrix	1	
	Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it.	5	

	Linear independence-rank of a matrix Vector Space-Dimension-basis-vector space**R**^{3} Solution of linear systems, Fundamental theorem of non-homogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only	2 1	
VI	Matrix Eigen value Problem Text 1.(8.1,8.3 &8.4) Determination of Eigen values and Eigen vectors-Eigen space Symmetric, Skew Symmetric and Orthogonal matrices –simple properties (without proof) Basis of Eigen vectors- Similar matrices Diagonalization of a matrix-Quadratic forms- Principal axis theorem(without proof) (Assignment-Some applications of Eigen values(8.2))	 3 2 4	20%
END SEMESTER EXAM			

QUESTION PAPER PATTERN:

Maximum Marks : 100 Exam Duration: 3 hours

The question paper will consist of 3 parts.

Part A will have 3 questions of 15 marks each uniformly covering modules I and II. Each question may have two sub questions.

Part B will have 3 questions of 15 marks each uniformly covering modules III and IV. Each question may have two sub questions.

Part C will have 3 questions of 20 marks each uniformly covering modules V and VI. Each question may have three sub questions.

Any two questions from each part have to be answered.