KU6DSCMAT303: COMPLEX ANALYSIS

Semester	Course Type	Course Level	Course Code	Credits	Total Hours
VI	DSC	300-399	KU6DSCMAT303	4	60

Learning Approach (Hours/ Week)			Marks Distribution			Duration of ESE (Hours)
Lecture	Practical/ Internship	Tutorial	CE	ESE	Total	
4		1	30	70	100	2

Course Description

This course is to introduce the notion of Complex functions, Analytic functions, Complex integrals and to discuss the various method for evaluating complex integrals.

Course Prerequisite

Real calculus and line integrals.

Course Outcomes

CO No.	Expected Outcome	Learning Domains
1	Comprehends Analytic Function, Cauchy–Riemann Equations. Laplace's Equation.	Understand
2	Understand Exponential Function, Trigonometric Functions, Hyperbolic Functions, Logarithmic functions and General Power of complex numbers	Understand
3	Evaluate line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula and derivatives of analytic functions	Understand
4	Understand convergence of Sequences and Series of complex functions	Understand
5	Understand power series, functions given by power series, Taylor series, Maclaurin's Series and Laurent Series	Understand

6	Understand singularities and zeros of complex functions	Understand
7	Understand residue integration method and integrate real integrals	Apply

Mapping of Course Outcomes to POs							
	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CO 1	✓		✓			✓	✓
CO 2	✓		✓			✓	✓
CO 3	✓		✓			✓	✓
CO 4	✓		✓			✓	✓
CO 5	✓		✓			✓	✓
CO 6	✓		✓			✓	✓
CO 7	✓		✓			✓	✓

COURSE CONTENTS

Contents for Classroom Transaction

MODULE	UNIT	DESCRIPTION	HOURS
I		**Complex Functions and Analyticity**	**14**
	1	Derivative. Analytic Function	
	2	Cauchy–Riemann Equations, Laplace's Equation	
	3	Exponential Function	
	4	Trigonometric and Hyperbolic Functions. Euler's Formula	
	5	Logarithm. General Power. Principal Value	

II	**Complex Integration**		**14**
	1	Line Integral in the Complex Plane	
	2	Cauchy's Integral Theorem	
	3	Cauchy's Integral Formula	
	4	Derivatives of Analytic Functions	
III	**Power Series, Taylor Series**		**14**
	1	Sequences, Series, Convergence Tests	
	2	Power Series	
	3	Functions Given by Power Series	
	4	Taylor and Maclaurin Series	
IV	**Laurent Series, Residue Integration**		
	1	Laurent Series	**13**
	2	Singularities and Zeros. Infinity	
	3	Residue Integration Method	
V	**Teacher Specific Module**		**5**
	Directions		
	Complex Numbers and Their Geometric Representation, Polar Form of Complex Numbers. Powers and Roots (Essential reading book sections :13.1, 13.2)		2
	Uniform Convergence (Essential reading book Sections :15.5)		1
	Residue Integration of Real Integrals (Essential reading book section:16.4)		2

Essential Readings

1. E. Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley.

Reference Distribution

Module	Unit	Reference No	Sections	Remarks
I	1	1	13.3	
	2	1	13.4	
	3	1	13.5	
	4	1	13.6	
	5	1	13.7	
II	1	1	14.1	
	2	1	14.2	
	3	1	14.3	
	4	1	14.4	
III	1	1	15.1	
	2	1	15.2	
	3	1	15.3	
	4	1	15.4	
IV	1	1	16.1	
	2	1	16.2	
	3	1	16.3	

Suggested Readings

1. J.W. Brown and R.V. Churchil, Complex Variables and Applications (7^{th} edition), McGraw-Hill
2. S.S. Sastry, Engineering Mathematics, Vol 2 (4th edition), PHI
3. W. Rudin, Real and Complex Analysis (3rd edition), Tata McGraw-Hill
4. L.V. Ahlfors, Complex Analysis (3rd edition), McGraw-Hill
5. J.B. Conway, Functions of One Complex Varible (2nd edition), Springer
6. S. Ponnusamy, Foundations of Complex Analysis (2nd edition), Narosa.

Assessment Rubrics

Evaluation Type		Marks
End Semester Evaluation		**70**
Continuous Evaluation		**30**
a)	Test Paper *	12
b)	Assignment	12
c)	Seminar, Viva-Voce	6
Total		**100**

* A student has to appear for at least two written tests. Average mark of best two tests is to be considered for internal mark.