Course Code	EM308
Course Title	Complex Analysis
Credits	2
Prerequisites	EM202
Compulsory/ Optional	Optional

Aims : At the end of the course all students are able to demonstrate a thorough knowledge of fundamental concepts in complex analysis so that they will be able to apply the theory of holomorphic functions in engineering applications

Intended Learning Outcomes :

At the end of the course, students should be able to;

- Evaluate contour integrals by use of Cauchy's Integral theorems
- Represent complex functions in Taylor and Laurent Series and identify domains of convergence.
- Classify singularities of a complex function.
- Evaluate real integrals using residue calculus and apply these methods in finding integral transforms such as Inverse Laplace, Fourier and Hilbert transforms.
- Apply the Argument Principle and Roche's theorem to locate roots of polynomial equations.
- To construct simple conformal mappings and apply conformal mapping to solve problems from engineering

No	Topic	Time Allocation/ hours			
		L	T	P	A
1	**Complex Series** : Power series, Taylor series and Laurent series	4	1		
2	**Theory of Residues:** Singularities and classification, Residue theorem, Calculation of residues,	4	1		
3	**Calculus of Residues** : Evaluation of real definite integrals trigonometric, improper Integrals, poles on the real line, principal values, integration on branch cuts	4	1		
4	**Applications of Calculus of Residues** Applications to integral transforms Fourier, Inverse Laplace and Hilbert transforms.	4	1		
5	**Principle of the Argument:** Argument principle, Rouche's theorem, and stability of systems	4	1		
6	**Conformal Mappings:** Complex mapping functions, Riemann's mapping theorem, General transformations, Linear transformation, Bilinear transformation, Selected special transformations, Inverse transformations, Schwarz-Christoffel transformation, Applications	6	1		
	Total	26	4		

Note: L – Lectures, T – Tutorials, P – Practicals, A – Assignments

References:

- E.B.Staff and A.D.Snider ,Fundamentals of Complex Analysis with applications to engineering and science, Pearson 3rd edition
- Elias Stein & Rami Shakarchi ,Complex Analysis(2003),Princeton(2003)
- R.V.Churchill &J.W.Brown, Complex variables and applications, 9th edition, McGraw-Hill.

Assessment	Percentage Mark
In-course Tutorials/Quizzes Mid Semester Examination	20 30
End-Semester	50