

MUFFAKHAM JAH COLLEGE OF ENGINEERING & TECHNOLOGY
(UGC Autonomous Institution)

Course Code	Course Title					Core/Elective	
25BS212MT	COMPLEX VARIABLES, FOURIER SERIES AND FOURIER TRANSFORMS Branch: B.E. (ECE)					Core	
Prerequisite	Contact hours per week				CIE	SEE	Credits
MDC, DENM	L	T	D	P	40	60	3
	3	0	0	0			

Course Objectives: To learn

1. Understand Limit, Continuity and Analyticity of complex variables.
2. Apply Cauchy's theorem and Cauchy's integral formula.
3. Apply Residue theorem and understand Bilinear transformation.
4. Perform Fourier series for a given range.
5. Perform Fourier sine and cosine transformations.

Course Outcomes: After learning the contents of this course, the student must be able to

1. Examine analyticity in Cartesian and Polar forms.
2. Evaluate contour integrals of functions of complex variables.
3. Evaluation of real integrals using complex variables.
4. Obtain the Fourier series for a given function.
5. Obtain the Fourier sine and cosine transformations.

Unit-I: Complex Variables: Limit and Continuity of a function $f(z)$, Derivative of $f(z)$, Analytic functions, Cauchy – Riemann Equations (Both Cartesian and Polar forms), Harmonic functions.

Unit-II: Complex integration: Cauchy's theorem, Extension of Cauchy's theorem, Cauchy's integral formula, Generalized Cauchy's integral formula, Taylor's series of $f(z)$, Laurent's series of $f(z)$.

Unit-III: Residues and Transformations: Zeros of an analytic function, Singularities of an analytic function, Residues, Residue theorem, Evaluation of real integrals using Residue theorem, Bilinear transformation.

Unit-IV: Fourier Series: Even and Odd functions, Dirichlet's conditions, Expansion of a function for a given range $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2l)$, $(-l, l)$, Half-range sine and cosine series.

Unit-V: Fourier Transforms: - Fourier sine transforms, Fourier cosine transforms, Finite Fourier sine transforms, Finite Fourier cosine transforms - simple illustrations.

Suggested Reading:

1. B. S. Grewal, Higher Engineering Mathematics, Khanna Publication 43rd Edition, 2014.

2. R. K Jain, S.R.K Iyengar, Advanced Engineering Mathematics, Narosa Publication. 4Th Edition, 2014.
