

23MAT102	COMPLEX ANALYSIS AND LAPLACE TRANSFORMS	L	T	P	C	
[Common to AEROSPACE,AGRI,AUTO,BME,CIVIL,ECE,EEE,FT,MECH,MCT]		3	1	0	4	
COURSE OBJECTIVES:						
<ul style="list-style-type: none"> To develop the standard techniques of complex variable theory so as to enable the student to apply them with confidence, in application areas such as heat conduction, elasticity, fluid dynamics and flow the of electric current. To make the student appreciate the purpose of using transforms to create a new domain in which it is easier to handle the problem that is being investigated. 						
UNIT I	VECTOR CALCULUS					12
Derivatives: Gradient and Directional derivatives – Divergence and Curl of a vector field – Solenoidal and Irrotational of a vector – Green’s, Gauss divergence and Stoke’s theorems (statements only) – Verification of theorems and application in evaluating line, surface and volume integrals.						
UNIT II	ORDINARY DIFFERENTIAL EQUATIONS					12
Higher order linear differential equations with constant coefficients – Method of variation of parameters – Homogenous equation of Euler’s and Legendre’s type – Solution of system of simultaneous linear first order differential equations with constant coefficients.						
UNIT III	COMPLEX DIFFERENTIATION					12
Derivatives of $f(z)$ – Analytic function – Cauchy-Riemann Equations – Harmonic function – Harmonic conjugate – Construction of Analytic function – Conformal Mapping – Mapping by functions: $w = z + c$, cz , $1/z$ – Bilinear transformations – Application to flow problems.						
UNIT IV	COMPLEX INTEGRATION					12
Cauchy’s integral theorem – Cauchy’s integral formula – Taylor’s series – Zeros of an analytic function – singularities – Laurent’s series – Residues – Cauchy Residue theorem .						
UNIT V	LAPLACE TRANSFORMS					12
Definition, properties, existence conditions – Transforms of elementary functions – Shifting theorem – Transforms of derivatives and integrals – Periodic functions – Initial and final value theorem – Inverse transforms – Application to solution of linear second order ordinary differential equations with constant coefficients.						
		L:45	T:15	P: 0	Total: 60 Periods	
TEXT BOOKS						
T1	Kreyszig.E, Advanced Engineering Mathematics, John Wiley and Sons, 10 th Edition, New Delhi 2016.					
T2	Grewal.B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 44 th Edition, 2018.					
REFERENCES						
R1	Bali. N.P, Goyal. M. and Watkins. C., Advanced Engineering Mathematics, Firewall Media (An imprint of Lakshmi Publications Pvt. Ltd.), New Delhi, 7 th Edition, 2009.					
R2	G.B.Thomas, Calculus, 12 th Edition, Pearson Education India, 2015.					

R3	Jain. R.K. and Iyengar. S.R.K., Advanced Engineering Mathematics, Narosa Publications, New Delhi, 5th Edition, 2016.
R4	Peter V.O Neil, "Advanced Engineering Mathematics", 7 th Edition, Cengage learning India Pvt Ltd, New Delhi, 2012.
R5	Srimanta Pal, Subodh C Bhunia, "Engineering Mathematics", Oxford University Press, 2015.
COURSE OUTCOMES	
At the end of the course students should be able to	
CO 1	Evaluate gradient, divergence and curl and solve engineering problems involving cubes, rectangular parallelepipeds by applying various integral theorems.
CO 2	Compute the higher order linear differential equations with various methods and apply them in some physical situations.
CO 3	Discuss the analyticity, construct the analytic function and transform complex functions from z-plane to w-plane graphically by using conformal mapping.
CO 4	Identify real and complex integrals over suitable closed path using various integral theorems.
CO 5	Apply the mathematical principles on Laplace transforms and would provide them the ability to formulate and solve some of the physical problems of engineering.

COs	Mapping of Programme Outcomes / Programme Specific Outcomes													
	(1/2/3 indicates Correlation Levels) 1- Slight(Low) 2- Moderate (Medium) 3-Substantial (High)													
	CO-PO Mapping											CO-PSO Mapping		
	P01	P02	P03	P04	P05	P06	P07	P08	P09	P010	P011	PS01	PS02	PS03
CO1	3	3						2			2			
CO2	3	3						2			2			
CO3	3	3						2			2			
CO4	3	3						2			2			
CO5	3	3						2			2			