

**APPLIED MATHEMATICS-II
(CIRCUIT BRANCHES)**

Contact Hours/ Week:	3+2	Credits:	4
Total Lecture Hours:	40+20	CIE Marks:	50
Course Code:	AME2	SEE Marks:	50

Course objectives:	
This course will enable students to:	
1.	Familiarize the importance of Integral calculus and Vector calculus.
2.	Develop the numerical schemes to solve algebraic, transcendental and differential Equations
3.	Demonstrate the use of Laplace Transform to solve initial value problems
4.	Utilize a modern tool MATLAB for computation and visualization.

Module I: Integral Calculus and its Applications	
Multiple Integrals: Evaluation of double and triple integrals, change of order of integration, changing to polar coordinates. Area and volume using double and triple integrals. Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.	
8 Hours Theory + 4 Hours Tutorial	
Module II: Vector Calculus and its Applications	
Vector Differentiation: Scalar and vector fields, gradient of a scalar field, directional derivatives, divergence of a vector field, solenoidal vector, curl of a vector field, irrotational vector, physical interpretation of gradient, divergence and curl and scalar potential. Vector Integration: Line integrals, Statement of Green's and Stokes' theorem without verification problems.	
8 Hours Theory + 4 Hours Tutorial	
Module III: Numerical Methods-1	
Solution of algebraic and transcendental equations: Regula-Falsi method and Newton-Raphson method. Finite Differences and Interpolation: Forward and backward differences, Interpolation, Newton forward and backward interpolation formulae, Newton's divided difference interpolation formula and Lagrange's interpolation formula. Numerical Integration: Trapezoidal rule, Simpson's 1/3 rd rule and Simpson's 3/8 th rule.	
8 Hours Theory + 4 Hours Tutorial	
Module IV: Numerical Methods-2	
Numerical solution of ordinary differential equations of first order and first degree: Taylor's series method, Modified Euler's method, Runge-Kutta method of fourth order and Milne's predictor corrector method and Adam-Bashforth predictor-corrector method.	
8 Hours Theory + 4 Hours Tutorial	
Module V: Laplace Transform	
Laplace transform (LT): Definition and Formulae of Laplace Transform, LT of elementary functions. Properties–linearity, scaling, shifting property, differentiation in the s domain, division by t. LT of periodic functions, square wave, saw-tooth wave, triangular wave, full and half wave rectifier, Heaviside Unit step function. Inverse Laplace Transforms: Definition, properties, evaluation using different methods, and applications to solve ordinary differential equations.	
8 Hours Theory + 4 Hours Tutorial	

TEXT BOOKS		
1.	B.S. Grewal	Higher Engineering Mathematics, Khanna Publishers, 44 th Ed., 2021.
2.	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10 th Ed., 2018.
3.	M.K. Jain, S.R.K. Iyengar and R.K. Jain	Numerical Methods for Scientific and Engineering Computation, New Age International Publishers, 8 th Ed., 2022.

REFERENCE BOOKS		
1.	B.V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11 th Ed., 2017.
2.	Srimanta Pal & Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3 rd Ed., 2016,
3.	N. P. Baliand Manish Goyal	A textbook of Engineering Mathematics, Laxmi Publications, 10 th Ed., 2022.
4.	H. K. Dassand Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3 rd Ed., 2014.
5.	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3 rd Ed., 2011.
6.	Richard L. Burden, Douglas J. Faires and A. M. Burden	Numerical Analysis, 10 th Ed.,2010, Cengage Publishers.
7.	S.S. Sastry	Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5 th Ed., 2012.

Course Outcomes:	
Upon completion of this course the student will be able to:	
CO1	Apply the concepts of integral calculus to model and solve problems in engineering applications using MATLAB.
CO2	Apply the concept of vector calculus to verify the vector as solenoidal or irrotational. Demonstrate the use of line integral, Greens and stokes theorem. Implementation using MATLAB.
CO3	Apply numerical techniques to solve algebraic and transcendental equations and to perform interpolation and numerical integration. Implementation using MATLAB.
CO4	Apply appropriate numerical methods to find approximate solutions of ordinary differential equations and implementation using MATLAB.
CO5	Apply the Laplace transform method to solve initial value problem and implement using MATLAB

Course Articulation Matrix														
		POs											PSOs	
		1	2	3	4	5	6	7	8	9	10	11	1	2
COs	CO1	3	1			1								
	CO2	3	1			1								
	CO3	3	1			1								
	CO4	3	1			1								
	CO5	3	1			1								

Level 3 - Highly Mapped, Level 2 - Moderately Mapped, Level 1 – Low Mapped