Applied Mathematics – II
(Mechanical Engg.)

Contact Hours/ Week:	3+2	Credits:	04
Total Lecture Hours:	40+20	CIE Marks:	50
Course Code:	AMM2	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.	**Analyze** and solve engineering problems by applying OrdinaryDifferential Equations.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I- Integral Calculus

Multiple Integrals: Definition, Evaluation of double and triple integrals, evaluation of double integrals by change of order of integration, changing into polar coordinates. Applications to find Area and Volume by double integral.

Beta and Gamma functions: Definitions, properties, relation between Beta and Gamma functions.

8 Hours

Module II-Partial Differential Equations (PDE)

Formation of PDEs by elimination of arbitrary constants and functions. Solution of non-homogeneous PDE by direct integration. Homogeneous PDEs involving derivatives with respect to one independent variable only. Method of Separation of variables. Application of PDE: Derivation of one-dimensional heat equation and wave equation.

8 Hours

Module III–VectorCalculus

Scalar and vector fields. Gradient, directional derivative, divergence and curl-physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.

Vector Integration: Line integrals, work done by a force and flux. Statement of Green's theorem and stoke's theorem and problems without verifications.

8 Hours

Module IV–NumericalMethods-1

Solution of algebraic and transcendental equations: Regula – Falsi and Newton-Raphson methods. Interpolation: Finite differences, Interpolation using Newton's forward and backward difference formulae, Newton's divided difference formula and Lagrange's interpolation formula.

Numerical integration: Trapezoidal, Simpson's $1/3^{rd}$and$3/8^{th}$rules.

8 Hours

Module V- 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, Milne's predictor-corrector formula andAdams-Bashforth predictor-corrector method.

8 Hours

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. RajnishVerma	Higher Engineering Mathematics, S. Chand Publication, 3^{rd}Ed., 2014.
5.	Ray Wylie, Louis C. Barrett	Advanced Engineering Mathematics, Mc Graw Hill Book Co., New York, 6^{th}Ed., 2017.
6.	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3^{rd}Ed., 2011.
7.	Richard L. Burden, Douglas J. Faires and A. M. Burden	Numerical Analysis, 10^{th}Ed., 2010, Cengage Publishers.
8.	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 analytical methods to solve partial differential equations.
CO3	**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.
CO4	**Apply** numerical techniques to solve algebraic and transcendental equations and to perform interpolation and numerical integration. Implementation using MATLAB.
CO5	**Apply** appropriate numerical methods to find approximate solutions of ordinary differential equations and implementation 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								