

Applied Mathematics–II (CSE allied branches)

Contact Hours/ Week:	3:2:0:0	Credits:	04
Total Lecture Hours:	40Hours Theory + 20Hours Tutorial	CIE Marks:	50
Course Code:	AMS2	SEE Marks:	50

Course objectives:

This course will enable students to:

1.	Understand and quantify the errors.
2.	Develop the numerical chem. is to solve transcendental and differential equations.
3.	Demonstrate the application of interpolation.
4.	Utilize a modern tool MATLAB for computation and visualization.

Module I: Introduction to Numerical Methods

Errors and their computation: Round off error, Truncation error, Absolute error, Relative error and Percentage error.

Solution of algebraic and transcendental equations: Bisection, Regula-Falsi, Secant and Newton-Raphson methods.

(8 Hours Theory+4 Hours Tutorial)

Module II: Numerical Solutions for System of Linear Equations

Norms: Vector norms and Matrix norms-L1, L2 and L_∞ , Ill conditioned linear system, condition number.

Solution of system of linear equations: Gauss Seidel method and LU-decomposition method.

Eigenvalues and Eigen vectors: Rayleigh power method, Jacobi's method.

(8 Hours Theory+4 Hours Tutorial)

Module III: Interpolation

Finite differences, interpolation using Newton Gregory forward and Newton Gregory backward difference formulae, Newton's divided difference. Lagrange interpolation formulae, piecewise interpolation-linear and quadratic.

(8 Hours Theory+4 Hours Tutorial)

Module IV: Differential Equations of First and Higher Order

Linear and Bernoulli's differential equations. Exact and reducible to exact differential equations with integrating factors on $\frac{1}{N} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$ and $-\frac{1}{M} \left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x} \right)$. Homogeneous and non-homogeneous differential equations of higher order with constant coefficients. Inverse differential operators – e^{ax} , $\sin(ax+b)$, $\cos(ax+b)$ and x^n .

(8 Hours Theory+4 Hours Tutorial)

Module V: Numerical Integration and Numerical Solution of Differential Equations

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

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.

(8 Hours Theory+4 Hours Tutorial)

TEXT BOOKS		
1	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.
2	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 5 th Ed., 2023.
3	B. S. Grewal	Higher Engineering Mathematics, Khanna Publishers, 44 th Ed., 2021.

REFERENCE BOOKS		
1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11 th Ed., 2017.
2	N. P Bali and Manish Goyal	A Textbook of Engineering Mathematics, Laxmi Publications, 10 th Ed., 2022.
3	S. S. Sastry	Introductory Methods of Numerical Analysis, PHI Learning Private Limited, 5 th Ed. 2012.
4	Steven V. Chapra and Raymond P. Canale	Applied Numerical Methods with Matlab for Engineers and Scientists, McGraw-Hill, 3 rd Ed., 2011.
5	Richard L. Burden, Douglas J. Faires, A. M. Burden	Numerical Analysis, 10 th Edition., 2010, Cengage Publishers.

Course Outcomes:	
Upon completion of this course the student will be able to:	
CO1	Apply numerical techniques to solve algebraic and transcendental equations and implementation using MATLAB.
CO2	Apply analytical and numerical techniques to solve system of linear equations and implementation using MATLAB.
CO3	Apply numerical techniques to perform interpolation and implementation using MATLAB.
CO4	Apply analytical techniques to solve ordinary differential equations and implementation using MATLAB.
CO5	Apply numerical technique for integration and IVP 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								