Applied Mathematics-I
(Circuit Branches)

Contact Hours/ Week:	3+2	Credits:	4
Total Lecture Hours:	40+20	CIE Marks:	50
Course Code:	AME1	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Familiarize** the importance of calculus associated with one variable and multivariable arising in engineering.
2.	**Analyze** and solve engineering problems by applying Ordinary Differential Equations.
3.	**Demonstrate** the use of analytical and numerical methods to solve the system of linear equations.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I: Differential Calculus
Polar curves, angle between the radius vector and the tangent, angle between the polar curves, pedal equations. Curvature and radius of curvature in Cartesian, polar, parametric and pedal forms.
8 Hours Theory + 4 Hours Tutorial
Module II: Power Series Expansions, Indeterminate Forms and Multivariable Calculus
Statement and problems on Taylor's and Maclaurin's series expansion for one variable. Indeterminate forms – L'Hospital's rule. Partial Differentiation: Partial differentiation, total derivative - differentiation of composite functions, Jacobian, Maxima and minima for a function of two variables.
8 Hours Theory + 4 Hours Tutorial
Module III: Ordinary Differential Equations (ODE) of First Order and First Degree and Nonlinear ODE
Exact and reducible to exact differential equations. Integrating factors on $\frac{1}{N}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ and $\frac{-1}{M}\left(\frac{\partial M}{\partial y} - \frac{\partial N}{\partial x}\right)$ only. Linear and Bernoulli's differential equations. Orthogonal trajectories, L-R and C-R circuits. Non-linear differential equations: Introduction to general and singular solutions, solvable for p only, Clairaut's equations, reducible to Clairaut's equations.
8 Hours Theory + 4 Hours Tutorial
Module IV: Ordinary Differential Equations of Higher Order
Higher-order linear ODEs with constant coefficients, homogeneous and non-homogeneous equations - e^{ax}, sin(ax+b), cos(ax+b), x^n only. Method of variation of parameters, Cauchy's and Legendre's homogeneous differential equations. L-C-R circuits.
8 Hours Theory + 4 Hours Tutorial
Module V: Linear Algebra
Elementary transformations on a matrix, Echelon form, rank of a matrix, consistency of system of linear equations. Gauss elimination, Gauss–Seidel method to solve system of linear equations. Eigen values and Eigen vectors of a matrix, Rayleigh power method to determine the dominant Eigen value of a matrix.
8 Hours Theory + 4 Hours Tutorial

TEXT BOOKS		
1.	B.S. Grewal	Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2021.
2.	E. Kreyszig	Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2018.
3.	Gilbert Strang	Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.
REFERENCE BOOKS		
1.	B.V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017.
2.	Srimanta Pal and Subodh C. Bhunia	Engineering Mathematics, Oxford University Press, 3rdEd., 2016.
3.	N. P. Bali and Manish Goyal	A text book of Engineering Mathematics, Laxmi Publications, 10thEd., 2022.
4.	H. K. Das and Er. Rajnish Verma	Higher Engineering Mathematics, S. Chand Publication, 3rdEd., 2014.
5.	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.

Course Outcomes:
Upon completion of this course the student will be able to:

CO1	Apply the knowledge of calculus to solve problems related to polar curves and implementation using MATLAB.
CO2	Apply the concept of partial differentiation to compute rate of change of multivariate functions and implementation using MATLAB.
CO3	Apply the analytical methods to solve first order and first-degree differential equations and implementation using MATLAB.
CO4	Apply the analytical methods to solve higher order differential equations and implementation using MATLAB.
CO5	Apply matrix theory for solving the system of linear equations, compute Eigenvalues and Eigenvectors 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								

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