Applied Mathematics – I
(CSE allied branches)

Contact Hours/ Week:	3:2:0:0	Credits:	04
Total Lecture Hours:	40Hours Theory + 20Hours Tutorial	CIE Marks:	50
Course Code:	AMS1	SEE Marks:	50

Course objectives: This course will enable students to:	
1.	**Familiarize**theimportanceofcalculus of scalars and vectors associatedwithonevariable andmultivariablearising inengineering.
2.	**Demonstrate**theuse of LinearAlgebratosolvethesystemofequations.
3.	**Utilize**vectorspacesand lineartransformations to model and solve problems in Computer Science and Engineering.
4.	**Utilize** a modern tool MATLAB for computation and visualization.

Module I: Calculus

Partial differentiation, total derivative, differentiation of composite functions, Jacobian, Statement of Taylor's and Maclaurin's series expansion for two variables. Maxima and minima for the function of two variables.

(8 Hours Theory+4 Hours Tutorial)

Module II: Vector Calculus

Scalar and vector fields, Gradient, directional derivatives, divergence and curl - physical interpretation, solenoidal vector fields, irrotational vector fields and scalar potential.
Introduction to polar coordinates and polar curves.
Curvilinear coordinates: Scale factors, base vectors, Cylindrical polar coordinates, Spherical polar coordinates, transformation between cartesian and curvilinear systems, orthogonality.

(8 Hours Theory+4 Hours Tutorial)

Module III: System of Linear Equations, Eigen Values and Eigen Vectors

Elementary row transformation of a matrix, Echelon form, rank of a matrix. Consistency and solution of system of linear equations: Gauss elimination method, Gauss Jordan method. Applications: Traffic flow.
Eigenvalues and Eigenvectors, diagonalization of the matrix, modal matrix.

(8 Hours Theory+4 Hours Tutorial)

Module IV: Vector Space

Vector spaces: definition and examples, subspace: definition and examples. Linear Combinations, linear span, linearly independent and dependent sets, basis and dimension, row space and column space of a matrix, Coordinates vector, inner products and orthogonality.

(8 Hours Theory+4 Hours Tutorial)

Module V: Linear Transformation

Definition and examples, algebra of linear transformations, matrix of a linear transformation. Singular, non-singular linear transformations and invertible linear transformations. Rank and nullity of linear transformations, Rank-Nullity theorem.

(8 Hours Theory+4 Hours Tutorial)

TEXT BOOKS		
1	B. S. Grewal	Higher Engineering Mathematics, Khanna Publishers, 44thEd., 2021.
2	Gilbert Strang	Linear Algebra and its Applications, Cengage Publications, 4th Ed., 2022.
3	Seymour Lipschutz and Marc Lipson	Linear Algebra, Schaum's outlines series, 4th Ed., 2008.

REFERENCE BOOKS		
1	V. Ramana	Higher Engineering Mathematics, McGraw-Hill Education, 11th Ed., 2017.
2	N. P Bali and Manish Goyal	A Textbook of Engineering Mathematics, Laxmi Publications, 10th Ed., 2022.
3	James Stewart	Calculus, Cengage Publications, 7thEd., 2019.
4	David Poole	Linear Algebra, a modern introduction, Cengage publishers, 4th Ed., 2014.
5	David C Lay	Linear Algebra and its Applications, Pearson Publishers, 4th Ed., 2018.
6	Gareth Williams	Linear Algebra with applications, Jones Bartlett Publishers Inc., 6th Ed., 2017.

Course Outcomes: Upon completion of this course the student will be able to:	
CO1	**Apply** the concepts of multivariable calculus in applications of computer science engineering and implementation using MATLAB.
CO2	**Apply** the concept of vector calculus to verify the vector as solenoidal or irrotational. Demonstrate the use of curvilinear coordinates. Implementation using MATLAB.
CO3	**Apply** matrix theory for solving the system of linear equations, compute eigenvalues and eigenvectors and implementation using MATLAB.
CO4	**Identify** the characteristic parameters ofthevectorspaces.
CO5	**Demonstrate**theuseoflineartransformation inthecomputer science and engineering stream.

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								