Course Code: 1BMACS101   **Course: Applied Mathematics-I for Computer Science & Engineering Stream**

Credits: 4   **L:T:P:S: 3:2:0**
SEE: 50% Marks   **CIE: 50% Marks**
SEE Hours: 3 Hrs   **Max. Marks: 100**

Prerequisites if any	None
Learning objectives	The goal of the course (**1BMACS101**) is to 1. **Familiarize** the importance of calculus associated with one variable and multi variable for computer science and engineering. 2. **Understand** the geometry of linear transformations and its applications. 3. **Develop** the knowledge of Linear Algebra to solve the system of equations.

Course Outcomes:
On the successful completion of the course, the student will be able to

	Course Outcomes	Bloom's level
CO1	Apply the concepts of multivariable calculus to compute derivatives, optimize functions and analyse their applications in computer science engineering.	Understand, Apply, Analyse
CO2	Apply the concepts of vector spaces, discuss linear transformations and construct orthonormal basis.	
CO3	Application of diagonalization and singular value decomposition in dimensionality reduction.	
CO4	Develop familiarity with modern mathematical tools namely SCILAB/PYTHON/MATLAB and stimulates creative problem solving through experiential learning.	

Mapping with POs and PSOs:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11		PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	3	-	-	-	-	-	-	1		-	-	-	-
CO2	3	2	3	3	-	-	-	-	-	-	1		2	1	-	-
CO3	3	2	3	3	-	-	-	-	-	-	1		2	1	-	-
CO4	3	2	-	-	3	-	-	-	-	-	1		-	-	-	-

Strong: 3   Medium: 2   Low: 1

Course Content

	Module – 1 Calculus-I	No. of Lecture Hours	No. of Tutorial Hours	Self-Learning Hours
1.1	Partial differentiation, total derivative.	2	1	
1.2	Differentiation of composite functions, Jacobian.	2		
1.3	Statement of Taylor's series expansion for two variables.	1		
1.4	Statement of Maclaurin's series expansion for two variables.	1	1	
1.5	Maxima and minima for the function of two variables.	2		
	Module – 2 Linear Algebra-I			
2.1	Vector Spaces, The Nullspace.	2	1	
2.2	Solving AX=0 and RX=0, the Complete Solution to AX=b.	2		
2.3	Independence, Basis and Dimension.	2	1	
2.4	Dimension of four Fundamental Subspaces.	2		
	Module – 3 Linear Algebra-II			
3.1	Linear Transformations.	2	1	
3.2	The Matrix of Linear Transformations.	2		
3.3	Orthogonality of the four Subspaces.	1		
3.4	Orthonormal Bases, Projections.	1	1	
3.5	Gram-Schmidt Method, Continuous linear transformations.	2		
	Module –4 Linear Algebra-III			
4.1	Determinants and some of its properties, Introduction to eigenvalues and eigenvectors.	2	1	
4.2	Diagonalization of a Matrix.	2		
4.3	Complex matrices-Hermitian and Unitary Matrices.	2	1	
4.4	Triangular form with Unitary matrices.	2	1	
	Module –5 Linear Algebra-IV			
5.1	Similarity transformations.	2	1	
5.2	Singular value decomposition.	2	1	
5.3	Least square solutions.	2		
5.4	PCA, Regression analysis.	2	1	
	Total No. of Lecture Hours	40		
	Total No. of Tutorial Hours		12	
	Total No. of Self learning Hours			0

Textbooks:

1. **B.S.Grewal**: "Higher Engineering Mathematics", Khanna publishers, 44th Ed., 2021.
2. **E.Kreyszig**:"Advanced Engineering Mathematics", John Wiley & Sons, 10th Ed., 2018.

Reference Books:

1. **B. V. Ramana:** "Higher Engineering Mathematics" McGraw-Hill Education, 11th Ed., 2017
2. **Srimanta Pal & Subodh C. Bhunia**: "Engineering Mathematics" Oxford University Press, 3rd Ed., 2016.
3. **Tom Apostol** "Calculus: One variable calculus with an introduction to Linear Algebra", Vol. 1, Wiley publications, 2nd edition, 2007.
4. **Tom Apostol** "Calculus: Multi-Variable Calculus and Linear Algebra with applications to differential equations and Probability, Vol.2, Wiley publications, 2nd edition, 2007.
5. **William Stallings:** "Cryptography and Network Security" Pearson Prentice Hall, 6th Ed., 2013.

Online Resources:

1. https://www.youtube.com/watch?v=ixDGaEqWuA0
2. https://www.youtube.com/results?search_query=nptel+linear+algebra