GANPAT UNIVERSITY

FACULTY OF ENGINEERING & TECHNOLOGY

Programme	Bachelor of Technology	Branch/Spec.	Computer Science and Business Systems (CSBS)
Semester	II	Version	1.0.0.0
Effective from Academic Year	2026-27	Effective from the batch admitted in	July 2026
Course Code	2BSC1109	Course Name	Linear Algebra
Course Category	Basic Science Courses (BSC)		

Teaching Scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	03	01	00	00	04	Theory	50	50	100
Hours	03	01	00	00	04	Practical	0	0	0

Pre-requisites:

Basic knowledge of matrix and function.

Course Outcomes

COs	Description
CO1	Solve system of linear equations using matrix methods and determinants.
CO2	Apply decomposition methods to solve system of linear equations.
CO3	Construct orthonormal basis and use it for QR decomposition of a matrix and solve eigen value problems.
CO4	Apply Singular Value Decomposition and Principal Component Analysis in analyzing data

Theory Syllabus

Unit	Content	Hours
1	Introduction to Matrices and Determinants; Solution of Linear Equations; Cramer's rule; Inverse of a Matrix.	8
2	Vectors and linear combinations; Rank of a matrix; Gaussian elimination; LU Decomposition; Solving Systems of Linear Equations using the tools of Matrices.	9
3	Vector space; Dimension; Basis; Orthogonality; Projections; Gram-Schmidt orthogonalization and QR decomposition.	12
4	Eigenvalues and Eigenvectors; Positive definite matrices; Linear transformations; Hermitian and unitary matrices;	9
5	Singular value decomposition and Principal component analysis (Non-credit and optional); Introduction to their applications in Image Processing and Machine Learning (one or two classes).	7

Practical and Self Learning Content

None

Text Books

1	Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers

Reference Books

1	Advanced Engineering Mathematics, (Seventh Edition), Peter V. O'Neil, Cengage Learning.
2	Advanced Engineering Mathematics, (Second Edition), Michael. D. Greenberg, Pearson
3	Introduction to linear algebra, (Fifth Edition), Gilbert Strang, Wellesley-Cambridge Press
4	Applied Mathematics (Vol. I & II), P. N. Wartikar & J. N. Wartikar, Pune Vidyarthi Griha Prakashan

5	Digital Image Processing, R C Gonzalez and R E Woods, Pearson
6	https://machinelearningmastery.com/introduction-matrices-machine-learning/
ICT/MOOCs Reference	
1	https://www.youtube.com/watch?v=LsqAW-Fth3Y
2	https://onlinecourses.nptel.ac.in/noc26_ma42/preview
3	https://www.youtube.com/watch?v=dnqXGwSF6Bk
4	https://www.youtube.com/watch?v=V7DjbWINlNk

Mapping of COs, POs, and PSOs														
COs	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	3	3	0	0	0	0	0	0	0	0	1	3	2	2
CO2	3	2	0	0	0	0	0	0	0	0	2	1	2	1
CO3	3	2	0	0	0	0	0	0	0	2	2	2	2	2
CO4	2	2	0	0	0	0	0	0	0	2	2	2	3	1

Bloom's Taxonomy Level				
Unit	**Unit Title**	**Aligned COs**	**Learning Hours**	**BTL Level**
1	Unit 1	CO 1	8	U
2	Unit 2	CO 2	9	E
3	Unit 3	CO 3	12	E
4	Unit 4	CO 3	9	E
5	Unit 5	CO 4	7	E

Note:

- Version 1.0.0.0 (First Digit= New syllabus/Revision in Full Syllabus, Second Digit=Revision in Teaching Scheme, Third Digit=Revision in Exam Scheme, Forth Digit= Content Revision)
- 1 Hour Lecture = 1 Credit, 1 Hour Tutorial = 1 Credit, 2 Hours Practical = 1 Credit, 2 Hours Internship/Project/Seminar = 1 Credit
- Bloom's Taxonomy Level (BTL): R: Remember, U: Understand, A: Apply, N: Analyze, E: Evaluate, and C: Create