	salary of their department.	
7.	Develop a correlated subquery to list customers who have placed	
	more than one order.	
8.	Implement and demonstrate the use of constraints such as	
	PRIMARY KEY, FOREIGN KEY, UNIQUE, NOT NULL, and	
	CHECK in an SQL table.	

Suggested Reference Books:

- 1. Ramez Elmasri & Shamkant B. Navathe, Fundamentals of Database Systems, Pearson, 7th Edition, 2016.
- 2. Abraham Silberschatz, Henry Korth, and S. Sudarshan, Database System Concepts, McGraw-Hill, 6th Edition, 2010.
- 3. C.J. Date, An Introduction to Database Systems, Pearson, 8th Edition, 2003.
- 4. Hector Garcia-Molina, Jeffrey Ullman, and Jennifer Widom, Database Systems: The Complete Book, Pearson, 2nd Edition, 2008.
- 5. Pramod J. Sadalage& Martin Fowler, NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence, Addison-Wesley, 2013.

DSE123 Linear Algebra

Semester: II	Course Title: Linear Algebra	Credit: 4
Course No.: DSE123		(3 T + 1 P)

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

CO	COGNITIVEABILITIES	COURSEOUTCOMES			
CO 1	REMEMBERING	Describe the concept of the algebra of matrices and			
		elementary row operations, calculate the rank of the matrix,			
		and analyze the consistency of a linear system.			
CO 2	UNDERSTANDING	Explain the concept of Eigenvalues and Eigenvector			
		evaluate thediagonalization of matrices and quadratic &			
		bilinear forms.			
CO 3	APPLYING	Discuss the basics of Vector spaces.			
CO 4	ANALYSING	Describe and use the linear transformation and evaluate			
		nullity and kernel.			
CO 5	EVALUATING	Explain the range and kernel and the basic introduction of			
		Inner product spaces and orthogonal and orthonormal			
		vectors.			
CO 6	CREATING	Describe the application of rank, Eigenvalues, Eigenvectors,			
		and Gram-Schmidt orthogonalization.			

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5
CO 1	1	2	-	-	-
CO 2	-	1	1	-	-
CO 3	1	1	1	-	-
CO 4	-	-	-	1	-
CO 5	-	-	1	1	-
CO 6	-	-	-	-	-

Unit No	Detailed Syllabus	Teaching
I I	Matrix AnalysisCourse introduction and properties of Matrices, Elementary row operations, and Echelon form of a matrix.Rank of a Matrix, Normal form of a Matrix, Gauss-Jordan Method:Inverse of a Matrix by elementary operations.Application of Rank: System of linear homogeneous and non- homogeneousequations, Theorems on the consistency of a system of linear equations.Eigen-values, Eigenvectors, and characteristic equations of a matrix.Cayley Hamilton theorem and its application, Diagonalization.Quadratic forms, Matrix of quadratic forms, Bilinear forms, Matrix of bilinear forms.	Hours 15
Π	 Vector space and Linear Transformations Vector Space, Vector Subspaces and Linear Span, Linear Independence, and Linear Dependence, Basic Results on Linear Independence. Linear Transformations, Results on Linear Transformation. Linear operators, Invertible Linear Transformations. Matrix of a Linear Transformation, Matrix of the sum and product of linear transformations. Linear transformation of a Quadratic Form and its theorems. 	15
III	Orthogonality Inner Product Space (definition and examples), Cauchy- Schwartz inequality. Orthogonal and orthonormal vectors, Orthogonal and orthonormal bases Gram-Schmidt Process.	15
IV	 Practical Component Algebra of Matrices, Echelon form of a Matrix, Rank of a Matrix. System of Equations, Eigenvalues, eigenvectors. Matrix of a Quadratic form. Matrix of a Bilinear form. Cayley Hamilton Theorem. Linear dependence and linear independence of vectors, Linear Transformation. Inner Product Space Orthogonal Vectors. Orthonormal Vectors, Gram-Schmidt Process. 	15

Suggested Reference Books:

- 1. Strang G, Linear Algebra and its Applications, 3 Edition, Thomson.
- 2. Krishnamurthy V, Mainra V P, Arora J L, An introduction to Linear Algebra.
- 3. Lipshutz S, Lipson M, Linear Algebra, 3rd edition, Schaum's Outline series.
- 4. Kreyszig E, Advanced Engineering Mathematics, John Wiley & sons.