Subject Code: 01MA0103
Subject Name: Matrix Algebra and Vector Space
B. Tech. Year - I (Semester - 2)

Objective : This subject aims to provide fundamentals of matrix algebra and vector calculus. The topics delivered in the paper are essential for engineering graduate level course.

Credits Earned : 5 Credits

Course Outcome :
After completion of this course, student will be able to
1. Apply vectors in higher dimensional space in experimental data, graphical images, civil and mechanical systems
2. apply System of linear equations in solving the problems of electrical and mechanical engineering, applied mechanics etc.
3. Apply the concept of Eigen values and vectors in various field of engineering like control theory, vibration analysis, quantum mechanics etc.
4. Understand the key role of vector integral calculus in finding flux in vector field, finding potential function, etc.

Teaching and Examination Scheme :

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks			Practical Marks		
THEORY	TUTORIAL	PRACTICAL	C	ESE(E)	IA	CSE	Viva (V)	Term Work (TW)	
3	2	-	5	50	30	20	25	25	150

Content:

Sr. No.	Content	Total Hrs.
1	**Matrix Algebra - I:** Definitions of some basic types of Matrices, Row Echelon form and Reduced Row Echelon form, Rank by row operation and determinant, Consistency of system of linear equations by Gauss Elimination and Gauss Jordan Method, Inverse of matrix by Gauss Jordan Method.	09
2	**Matrix Algebra -II:** Eigen values and Eigen vector of matrix, AM and GM, Cayley- Hamilton theorem, Diagonalization, Orthogonally Diagonalization, Quadratic form, Value class (Nature), Index and Signature of Quadratic form, Canonical forms.	12

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3	**Vector space:** Vector space, Subspace, Linear dependence and independence of vectors, Span, Basis and dimension of vector space, Inner product spaces and their properties.	12
4	**Vector calculus**: Recall the concept of vector algebra, Scalar and vector functions, gradient Divergence and Curl, directional derivatives, Conservative vector fields, Irrotational and Solenoidal function. Line integrals, Path Independence of Line Integrals, Concept of surface integrals, Green's theorem, Stoke's theorem and Divergence theorem.	10
5	**Improper integrals:** Improper integrals of type I and type – II, Convergence of Improper integrals.	02
6	**Application of Linear Algebra by MATLAB:** Introduction to MATLAB, some basic MATLAB command related to Matrices, Row Echelon form and Reduced Row Echelon form, Rank of Matrix, Solution of system of Linear equation, Inverse of Matrix, Characteristic polynomial of Matrix, Eigen value and Eigen vector of Matrix, Power of Matrix.	**To be covered in Tutorial hours**

Distribution of Theory Marks

R Level	**U** Level	**A** Level	**N** Level	**E`** Level	**C** Level
20	**30**	**25**	**15**	**10**	**--**

Legends: R: Remember**; U:** Understand**; A:** Apply**; N:** Analyze**; E:** Evaluate**; C**: Create

1. To determine energy band gap of semiconductor by four probe method
2. To determine energy band gap of semiconductor by resistivity-temperature method
3. To determine carrier concentration of a given semiconductor by Hall effect
4. To determine divergence of LASER beam

Reference books :

1. Introduction to Linear Algebra with Application, Jim Defranza, Daniel Gagliardi, Tata McGraw- Hill.
2. Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition.
3. Advanced Engineering Mathematics, Erwin Kreysig, Wiley Publication.
4. Elementary Linear Algebra, Ron Larson, Cengage Learning.
5. Calculus, Volumes 2, T. M. Apostol, Wiley Eastern.
6. Linear Algebra and its Applications, David C. Lay, Pearson Education.
7. Linear Algebra: A first course with Applications in MATLAB, Larry E. Knop, CRC Press.

List of Open Base Software / learning website:

1. http://mathworld.wolfram.com/

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2. http://en.wikipedia.org/wiki/Math

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