Subject Code: 01MA0103

Subject Name: Matrix Algebra and Vector Space

B.Tech. Year – I (Sem : II)

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 Outcomes: After completion of this course, student will be able to..

➢ Apply vectors in higher dimensional space in experimental data,

   graphical images, civil and mechanical systems.
➢ apply System of linear equations in solving the problems of electrical and mechanical engineering, applied mechanics etc.
➢ Apply the concept of Eigen values and vectors in various field of engineering like control theory, vibration analysis, quantum mechanics etc.
➢ Understand the key role of vector integral calculus in finding flux in vector field, finding potential function, etc.

Teaching and Examination Scheme

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial/ Practical Marks		Total Marks
Theory	Tutorial	Practical		ESE (E)	Mid Sem (M)	Internal (I)	Viva (V)	Term work (TW)	
3	2	-	5	50	30	20	25	25	150

Contents:

Unit	Topics	Contact Hours
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
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
	Total Hours	**45**

Recommended Textbooks:
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.

Suggested Theory distribution:

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
20%	20%	30%	15%	10%	5%

Instructional Method:

a. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc .

b. The internal evaluation will be done based on continuous evaluation of students in the laboratory and class -room.

c. Practical examination will be directed toward the completion of semester for assessment of performance of understudies in laboratory.

d. Students will use supplementary resources such as online videos, NPTEL videos, e-courses, Virtual Laboratory

Supplementary Resources:

1. http://mathworld.wolfram.com/
2. http://en.wikipedia.org/wiki/Math