INSTITUTE	**FACULTY OF TECHNOLOGY**
PROGRAM	**BACHELOR OF TECHNOLOGY (MECHANICAL ENGINEERING)**
SEMESTER	**2**
COURSE TITLE	**MATRIX ALGEBRA AND VECTOR SPACE**
COURSE CODE	**01MA0103**
COURSE CREDITS	**5**

Objective:

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

2 This subject aims to provide fundamentals of matrix algebra and vector calculus. The topics delivered in the paper are essential for almost all science and engineering disciplines.

Course Outcomes: 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 Calculate the problems of electrical and mechanical engineering, applied mechanics etc. using system of linear equations

3 Employ 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.

Pre-requisite of course:DIFFERENTIAL AND INTEGRAL CALCULUS

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	2	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**Matrix Algebra - I** Definitions of some basic types of Matrices, Row Echelon form and Reduced Row Echelon form, Consistency of system of linear equations by Gauss Elimination and Gauss Jordan Method, Rank by row operation and determinant , Inverse of matrix by Gauss Jordan Method	9

Contents : Unit	Topics	Contact Hours
2	**Matrix Algebra - II** Eigen values and Eigen vector of matrix, AM and GM of Matrix, Cayley-Hamilton theorem, Diagonalization, Orthogonally Diagonalization, Quadratic forms, Value class (Nature), Index and Signature of Quadratic form, Canonical forms	11
3	**Vector Space** Euclidean Vector Space, Vector space, Subspace, Linear Dependence and Independence of Vectors , Linear Combination, Span, Basis and dimension of vector space, Inner product spaces and their properties	11
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	9
5	**Improper Integrals** Improper integrals of type I and type – II, Convergence of Improper integrals	2
Total Hours		**42**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Tutorial - 1 Matrix Algebra - I** Tutorial - 1 Matrix Algebra - I	4
2	**Tutorial - 2 Matrix Algebra - II** Tutorial - 2 Matrix Algebra - II	4
3	**Tutorial - 3 Vector Space** Tutorial - 3 Vector Space	4
4	**Tutorial - 4 Vector Calculus** Tutorial - 4 Vector Calculus	4
5	**Tutorial - 5 Improper Integrals** Tutorial - 5 Improper Integrals	2
6	**Tutorial - 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.	10
Total Hours		**28**

Textbook :

1 Introduction to Linear Algebra with Application, Jim Defranza , Tata McGraw Hill., 2008

Textbook :

2 Elementary Linear Algebra, Applications version, Anton and Rorres, Wiley India Edition., 2009

References:

1 Elementary Linear Algebra, Elementary Linear Algebra, Ron Larson, Cengage Learning, 2010

2 Linear Algebra and its Applications, Linear Algebra and its Applications, David C. Lay, Pearson Education, 2007

3 Linear Algebra: A first course with Applications in MATLAB, Linear Algebra: A first course with Applications in MATLAB, Larry E. Knop, CRC Press. Suggested, 2009

4 Advanced Engineering Mathematics, Advanced Engineering Mathematics, Erwin Kreyszig, Wiley Publication 10th ed, 2011

5 Higher Engineering Mathematics, Higher Engineering Mathematics, B.S.Grewal, Khanna publishers, 2012

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as 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 / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	20.00	30.00	15.00	10.00	5.00

Instructional Method:

1 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.

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

3 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

3 nptel.ac.in/courses/111108066/

4 http://tutorial.math.lamar.edu/