

**Subject Code: 01MA0101**

**Subject Name: Engineering Mathematics -I**

**B.Tech. Year – I (Sem I)**

**Objective:**

A good Engineer has to have an excellent background of Mathematics. Engineering Mathematics is one of the essential tools for learning Technology, Engineering and Sciences. This course lays the foundation for engineering mathematics in subsequent semesters, so that students get a sound knowledge and important aspects of the course.

**Credits Earned: 5 Credits**

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

- Understand the basic concepts vector theory and its applications.
- Apply the knowledge of matrices in graph theory, cryptography, solving linear problems in various branch of engineering.
- Apply the concept of Eigen values and vectors in various field of engineering like control theory, vibration analysis, quantum mechanics etc.
- Apply concept of partial differential equation in solving various core engineering problems.
- Understand the importance of partial derivative and its application to solve problems involving conservation of mass, conservation of momentum, 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)	
4	2	-	5	50	30	20	25	25	150

**Contents:**

<b>Unit</b>	<b>Topics</b>	<b>Contact Hours</b>
1	<b>Vector space:</b> Vector space, Linear independence of vectors, Basis and dimension of vector space, Inner product spaces and their properties.	7
2	<b>Matrix Algebra - I:</b> Rank and nullity of a matrix, Determination of rank by row operation, Triangular matrices and triangularization of matrices by Gauss-elimination process, Gauss-Jordan method for computing inverse, Consistency of system of linear equations.	7
3	<b>Matrix Algebra-II:</b> Determinant and their properties, Cofactor expansion of $n \times n$ determinant, Eigen values and eigen vector of matrix, Cayley - Hamilton theorem, Quadratic and Canonical forms, special matrices viz Symmetric, Skew-symmetric, Hermitian, skew-Hermitian, Orthogonal and Unitary matrices and their properties.	7
4	<b>Expansion of functions:</b> Concept of Expansion of functions, Taylor's series expansion, Maclaurin's series expansion	7
5	<b>Partial differentiation:</b> Partial derivatives, Euler's theorem with corollaries and their applications, Implicit differentiation, Chain rule, Total differentials.	7
6	<b>Applications of Partial differentiation:</b> Errors and approximations, Tangent plane and normal line to a surface, Constrained optimization using Lagrange's multiplier, Jacobian.	7
	<b>Total Hours</b>	<b>42</b>

**Recommended Textbooks:**

1. M. D. Weir *et al*: Thomas' Calculus, 11<sup>th</sup> Ed., Pearson Education, 2008.
2. Stewart James: Calculus Early Transcendental, 5<sup>th</sup> Ed., Thomson India, 2007
3. Wylie & Barrett: Advanced Engineering Mathematics, Mc graw Hill pub.
4. Greenberg M D: Advanced Engineering Mathematics, 2nd ed., Pearson
5. B.S.Grewal: Higher Engineering Mathematics, 43<sup>rd</sup> ed., Khanna publishers

6. Erwin Kreyszig , Advanced Engineering Mathematics, 9/e, JOHN WILEY & SONS, INC
7. H. K. Dass, Advanced Engineering Mathematics, S Chand Publishing..

**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 on the basis of continuous evaluation of students in the laboratory and class-room.
- c. Practical examination will be conducted at the end of semester for evaluation of performance of students 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>