

**MATHEMATICS-II**  
**(LINEAR ALGEBRA & VECTOR CALCULUS)**  
**BE 2<sup>nd</sup> SEMESTER (ALL BRANCHES)**  
**SUB CODE: - CC101B**  
**Teaching Scheme (Credits and Hours)**

Teaching scheme				Total Credit	Evaluation Scheme					Total
L	T	P	Total		Theory		Mid Sem Exam	CIA	Pract.	
Hrs	Hrs	Hrs	Hrs		Hrs	Marks	Marks	Marks	Marks	
03	02	00	05	05	03	70	30	50	00	150

**LEARNING OBJECTIVES:**

The objective of this course is

- To present the foundations of many basic Mathematical tools and concepts related Engineering.
- To provide a coherent development to the students for the courses of various branches of Engineering like Control Theory, Circuits and Networks, Digital Logic design, Fluid Mechanics, Machine Design etc
- To enhance the student's ability to think logically and mathematically.
- To give an experience in the implementation of Mathematical concepts which are applied in various field of Engineering.

**Outline of the Course:**

Unit No	Topics
	<b><u>Linear Algebra with applications</u></b>
1	Matrix Theory and Application of Matrices
2	Eigen value and Eigenvector and Applications
3	Vector Space
4	Linear Transformation
	<b><u>Vector Calculus</u></b>
5	Vector differential Calculus
6	Vector Integral Calculus

**Total hours (Theory): 45**

**Total hours (Tutorial): 30**

**Total hours: 75**

**Detailed Syllabus**

Unit No	Topics	Lectures (Hours)	Weight age
	<b><u>Linear Algebra with applications</u></b>		
1	<b>Matrix Theory and Application of Matrices:</b> Definition and Special Types of matrices, Determinant, Rank, Inverse, Row Echelon Form and Reduce Row Echelon Form, Homogeneous and nonhomogeneous System of linear equation, Caley- Hamilton Theorem, <b>Applications:</b> Solution of System of linear equations, Linear dependence and Linear Independence.	07	15%
2	<b>Eigen value and Eigenvector:</b> Definition, Properties, Diagonalization, Algebraic multiplicity, Geometric multiplicity, Similarity of Matrices. <b>Applications:</b> Quadratic form, Bilinear Form, Canonical Form.	06	15%
3	<b>Vector Space:</b> Vectors in $R^n$ , Definition, Subspace, Linear Combination, Linear dependence and Linear Independence of vectors, Span, Basis, Reduction and Extension to Basis, Dimension, Change of Basis, Rank Nullity Theorem Column space, Row space and Null space.	09	20%
4	<b>Linear Transformation:</b> Definition, Basic Properties, Linear Transformation as Rotation, Reflection, Expansion, Contraction, Shear, Projection, Matrix of Linear transformations, Kernel, Range, Change of Basis and Similarity, Rank Nullity Theorem.	09	20%

	<b>Vector Calculus</b>		
<b>5</b>	<b>Vector differential Calculus:</b> Tangent vector, normal vector, vector differentiation, Gradient, Curl, divergence and their geometrical meaning, Solenoidal vector, Irrotational vector, Conservative field.	07	15%
<b>6</b>	<b>Vector Integral Calculus:</b> line Integral, Surface integral, Volume Integral, Green's Theorem, Stokes Theorem and Gauss Divergence Theorem.	07	15%
<b>Total</b>		<b>45</b>	<b>100%</b>

#### **Instructional Method and Pedagogy (Continuous Internal Assessment (CIA) Scheme)**

- Two Faculties will be covering the syllabus in each branch for 3 hours in a week. In Tutorial, class must be divided into two subclasses & faculties will be solving or assigning the problem of the subject in each subclass.
- Attendance is compulsory in lectures and Tutorial which carries 05 Marks.
- At regular intervals assignments is given. In all, a student should submit all assignments of 30 marks each.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries 05 Marks.
- Viva Voce will be conducted at the end of the semester of 10 Marks.
- One internal exam of 30 marks is conducted as a part of internal theory evaluation.

#### **Students Learning Outcomes:**

At the end of the course

- The students will be able to think logically and mathematically in any field of engineering.
- The students will gain an experience in the implementation of Mathematical concepts which are applied in various field of Engineering.

#### **Text Books:**

- Advance Engineering Mathematics** by E Kreyszig, 8<sup>th</sup> edition, Willey India.
- Elementary linear Algebra with Application** by H Anton, 9<sup>th</sup> edition, Willey India.

#### **Reference Books:**

- (1) **Thomas Calculus** by M D Weir, Joel Hass and F R Giordano, 11<sup>th</sup> Edition, Pearson Education.
- (2) **Calculus** by T M apostol, Vol.II, 2<sup>nd</sup> Edition, Willey India.
- (3) **Single and Multivariable Calculus** by Hughes-Hallett, Gleason, McCallum, 3<sup>rd</sup> Edition, John Willey and Son.

#### **List of Tutorials**

<b>Sr. No</b>	<b>Tutorial Content</b>
1	Assignments on “ <b>Matrix Theory and Application of Matrices</b> ”.
2	Problem solving on “ <b>Eigen value and Eigenvector and Applications</b> ”.
3	Problems solving on “ <b>Vector Space</b> ”.
4	Assignments on “ <b>Linear Transformation</b> ”.
5	Assignments on “ <b>Vector differential Calculus</b> ”.
6	Problem solving on “ <b>Vector Integral Calculus</b> ”.