**COEP Technological University**

**Department of Mathematics**

**( MA- ) Linear Algebra**

F.Y. B.Tech. Semester I (Computer)

Teaching Scheme Examination Scheme

Lectures: 2 hrs / week Internal Test : 20 marks

Tutorials: 1 hr / week Tutorials: 20 marks

Self-study: 1 hr /week End Sem. Exam: 60 marks

**Unit I:** **Matrices and linear equations:**

Basic properties of matrices, row operations and Gauss elimination, Determinants, and their basic properties; Basic concepts in linear algebra: vector spaces, subspaces, linear independence and dependence of vectors, bases, dimensions. Row and Column spaces; rank; Applications to systems of linear equations.

**S:** basic properties of matrices, row operations, Determinants, and their basic properties

 **[10L+5T+5S]**

**Unit II:** **Linear mappings**:

Representation by matrices, rank-nullity theorem, Eigen values, Eigen vectors and their basic properties.

**S:** basic properties of Eigen values, Eigen vectors  **[8L+4T+4S]**

**Unit III:** **Inner product spaces**:

Orthogonality, Gram-Schmidt process, Diagonalization of special matrices, Geometric applications of Linear transformation, quadratic forms.

**S:** Geometric applications of Linear transformation, quadratic forms **[8L+4T+4S]**

 **Text Book** **:**

* Elementary Linear Algebra (Sixth Edition) by R. Larson and D. Falvo, Houghton Mifflin Harcourt Publishing company, Boston, New York.

**Reference Books** **:**

* Advanced Engineering Mathematics (10th edition) by Erwin Kreyszig, Wiley Eastern Ltd.
* Linear Algebra (3rd edition) by Serge Lang, Springer.
* Linear Algebra and its applications (4th edition) by Gilbert Strang, Cengage Learnings (RS).
* Elementary Linear Algebra (10th edition) by Howard Anton and Chris Rorres, John Wiley, and sons.

-----------------------------------------------------------------------------------------------------------------**Outcomes :** Students will be able to

1. **define** matrices, linear equations, and determinants, **recall** basic vector algebra.
2. **understand** basic concepts such as vector spaces, linear dependence / independence of vectors, basis and linear maps.
3. **analyze** and **calculate** eigen values, eigen vectors, rank nullity of a matrix / linear map.
4. **prove** theorems, **apply** Gram-Schmidt process on inner product spaces, diagonalize special matrices.
5. **apply** concepts of linear algebra to various problems including real life problems.

**Note 1 :**

* To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
* To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
* To measure CO3, questions will be based on applications of core concepts.
* To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
* To measure CO5, some questions may be based on self-study topics and also comprehension of unseen passages.

**Note 2 :**

 All the Course outcomes 1 to 3 will be judged by 75% of the questions and outcomes 4 and 5

 will be judged by 25 % of questions.