**COEP Technological University**

**Department of Mathematics**

**( MA- ) Matrix Algebra, Calculus and Probability**

F.Y. B.Tech. Semester I (ENTC, ELECT, INSTRU)

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. Row and Column rank. Solutions of Systems of linear equations using Gauss Elimination method, Rank and Nullity, Eigen Values and Eigen Vectors.

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

**[8L+4T+4S]**

**Unit II: Integral Calculus:**

Double integrals in Cartesian and polar co-ordinates, iterated integrals, change of variables, triple integrals in Cartesian, spherical and cylindrical co-ordinates, substitutions in multiple integrals, Applications to Area, Volume, Moments, and Center of Mass. Vector differentiation, gradient, divergence and curl, line integral and arc length parameterization, surface integrals, path independence, statements, and illustrations of theorems of Green, Stokes and Gauss, applications.

**S:** Area, Volume, Moments, and Center of Mass. **[12L+6T+6S]**

**Unit III: Probability:**

Mean, median, mode, standard deviation, combinatorial probability, joint and conditional probability. Probability distributions, Binomial distribution, Poisson distribution, Normal distribution, exponential distribution.

**S:** Joint and conditional probability, exponential distribution.

**[8L+4T+4S]**

**Text Book:**

* Advanced Engineering Mathematics (10th edition) by Erwin Kreyszig, Wiley Eastern Ltd.

**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.
* Ross S.M., Introduction to probability and statistics for Engineers and Scientists (8th Edition), Elsevier Academic press, 2014.
* Ronald E, Walpole, Sharon L. Myers, Keying Ye, Probabilty and Statistics for Engineers and Scientists (9th Edition), Pearson Prentice Hall, 2007.

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

1. **define** matrices, linear equations, and determinants, **recall** basics of probability theory,probability distribution, **recall** basic concepts of linear algebra, **recall** double / triple integrals, vector differentiation, vector integration, define gradient, divergence and curl.
2. **understand** basic concepts such as linear dependence / independence of vectors, rank, nullity, concepts of probability, probability distributions, **understand** basic concepts of co-ordinate systems, iterated integrals, gradient, divergence and curl, differentiate and interprete vector valued functions.
3. **analyze** and **calculate** eigen values, eigen vectors, rank, nullity of a matrix, **evaluate** probability of compound events, **find** probabilities using standard distributions, **evaluate** multiple integrals, **find** area / mass / volume using multiple integrals, **evaluate** line integrals and surface integrals.
4. **prove** theorems, **apply** Green’s / Stoke’s / Divergence theorem to different type of problems.
5. **apply** concepts of Matrix Algebra, Calculus and Probability 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.