**COEP Technological University**

**Department of Mathematics**

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

F.Y. B.Tech. Semester I (MECH, META, MFS, ROBOTICS)

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:** **Matrix Algebra:**

Properties of Matrices and Determinants; Solutions of Systems of linear equations using Gauss Elimination method; Rank of matrix; Eigen Values and Eigen Vectors.

**S:** Properties of Matrices and Determinants **[6L+3T+3S]**

**Unit II: Univariate Calculus:**

Functions of single variable; Limits: Standard limits and methods of evaluation, L-Hospital’s Rule; Continuity and Differentiability; Extreme Values of Functions, The Mean Value Theorems, Evaluation of Definite and improper integrals and their properties, Beta and Gamma Function.

**S:** Beta and Gamma Function. **[9L+4T+4S]**

**Unit III:** **Numerical Methods:**

Numerical solutions of linear and nonlinear algebraic equations: Bisection method and Newton-Raphson method, Integration by Trapezoidal and Simpson’s rules.

**S:** Integration by Simpson’s rules **[5L+2T+2S]**

**Unit IV:** **Probability:**

Mean, median, mode, standard deviation, combinatorial probability, probability distributions: binomial distribution, Poisson distribution, normal distribution, exponential distribution.

**S:** exponential distribution. [**8L+4T+4S]**

**Text Book** **:**

* Advanced Engineering Mathematics (10th edition) by Erwin Kreyszig, Wiley Eastern Ltd
* Thomas’ Calculus (14th edition) by Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education.

**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, **state** formula of numerical method, **define** beta and gamma functions.
2. **understand** basic concepts such as rank, concepts of probability, probability distributions, extreme values.
3. **analyze** and **calculate** eigen values, eigen vectors, rank of a matrix, **evaluate** probability of compound events, **find** probabilities using standard distributions, **find** extreme values, **evaluate** definite integrals, **find** numerical solutions.
4. **prove** theorems, **apply** numerical methods to solve integrations.
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.