1/4 B.Tech. FIRST SEMESTER
ENGINEERING MATHEMATICS-I

CS 1T2 **Required** **Credits: 4**
Lecture: 4 periods/week **Internal assessment: 20+10=30 marks**
Tutorial: 1 period /week **Semester end examination: 70 marks**

Course context and overview:A presentation of mathematical methods useful in engineering practice. The course covers analytical and numerical techniques used in linear algebra, the numerical solution of nonlinear equations, the foundations of vector and tensor algebra and an introduction to vector operators. Also covered are methods of polynomial and trigonometric interpolation and approximation, numerical solution methods for initial and boundary value problems for ordinary differential equations and an overview of the fundamentals of probability and statistics including random variables, density and distribution functions and hypothesis testing.

Prerequisites: -

Objectives:

1. To achieve skills in differential, integral, vector calculus this will enable them to solve engineering problems.
2. To get introduction to the concepts of Laplace transforms its applications to various problems.

Learning Outcomes:

The Student will be able to

1 Solve ordinary differential equations of first, higher order and solve problems of growth and decay also find orthogonal trajectories of given family of curves.
2. Find Laplace transforms, inverse Laplace transforms of the given functions and able to apply Laplace transforms to solve differential equations with initial conditions.
3. Recall mean value theorems to prove inequalities and able to find maxima, minima of functions of two variables.
4. Apply double integrals to find area of the given region, triple integrals to find volume of the solids.
5. Determine gradient of scalar point functions and curl, divergence of vector point functions. Also able to apply Stoke's theorem, Gauss divergence theorem and Green's theorem to evaluate line and surface integrals.

UNIT – I

Differential equations of first order and first degree – exact, linear and Bernoulli. Applications to Newton's Law of cooling, Law of natural growth and decay, orthogonal trajectories.

UNIT – II

Non-homogeneous linear differential equations of second and higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, e^{ax} V(x), xV(x)

UNIT – III

Laplace transforms of standard functions –Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function.

UNIT – IV

Inverse Laplace transforms– Convolution theorem - Application of Laplace transforms to ordinary differential equations Partial fractions.

UNIT – V

Generalized Mean Value theorem (without proof) Functions of several variables – Maxima and Minima of functions of two variables with constraints and without constraints.

UNIT – VI

Multiple integrals - double and triple integrals – change of variables – Change of order of Integration.

UNIT – VII

Vector Differentiation: Gradient- Divergence- Curl and their related properties of sums-products- Laplacian and second order operators.

UNIT - VIII

Vector Integration - Line integral – work done – Potential function – area- surface and volume integrals Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (Without proof) and related problems.

Learning Resources

Text Books:

1. Higher Engineering mathematics by B.S. Grewal
2. Textbook of Engineering Mathematics, N.P.Bali. Laxmi Publications (P) Ltd.
3. Engineering Mathematics, B. V. Ramana , Tata Mc Graw Hill