MATHEMATICS - I
(Common to all Branches)

Course Code: 15BM1101

L	T	P	C
3	1	0	4

Course Outcomes:

At the end of the Course, Student will be able to:

CO 1 Develop the ability to solve linear differential equations of higher order and use the knowledge gain to certain engineering problems

CO 2 Appraise the Laplace transform technique and use it to solve various engineering problems.

CO 3 Apply the techniques of multivariable differential calculus to determine extrema and series expansions etc. of functions of several variables.

CO 4 Extend the concept of integration to two and three dimensions and support it through applications in engineering mechanics.

CO 5 Generalize calculus to vector functions and interpret vector integral theorems.

UNIT-I (10 Lectures)

ORDINARY DIFFERENTIAL EQUATIONS:

Linear differential equations of higher order with constant coefficients, Method of Variation of parameters, Linear differential equations with variable coefficients (Cauchy's homogeneous linear equation only).

APPLICATIONS OF LINEAR DIFFERENTIAL EQUATIONS:

Orthogonal trajectories, Models on R-L-C circuits, Newton's law of cooling.

(13.1-13.7, 13.8(1), 13.9(1), 12.3, 12.5, 12.6)

UNIT-II (10 Lectures)

LAPLACE TRANSFORMS:

Laplace transform of elementary functions, properties, Transforms of periodic functions, Transforms of derivatives and integrals, Multiplication by t^n, division by t, evolution of integrals by Laplace transforms.

INVERSE TRANSFORM:

Introduction, Finding inverse transforms by the method of partial fractions, other methods of finding Inverse Transform, Convolution theorem, Unit step function, and Unit impulse function.

APPLICATION OF LAPLACE TRANSFORMS:

Initial and Boundary Value Problems.

(21.1-21.5, 21.7-21.15, 21.17, 21.18)

UNIT-III (10 Lectures)

PARTIAL DIFFERENTIATION:

Total derivative, change of variables, Jacobians, Taylor's theorem for functions of two variables.

APPLICATIONS OF PARTIAL DIFFERENTIATION:

Maxima and Minima of functions of two variables, Lagrange method of undetermined multipliers.

(5.5 –5.7, 5.9, 5.11, 5.12)

UNIT -IV (10 Lectures)

MULTIPLE INTEGRALS:

Introduction to Non-Cartesian Coordinates, Double integrals, Change of order of integration, Double integral in polar co-ordinates, Triple integrals, Change of variables in double integrals, Change of variables in triple integrals. Simple Applications of Multiple Integrals**:** Area enclosed by plane curves.

(7.1- 7.5, 7.7)

UNIT-V (10 Lectures)

VECTOR DIFFERENTIATION:

Differentiation of vectors, scalar and Vector point functions. Gradient of a scalar field and directional derivatives - Divergence and curl of a Vector field and its physical interpretation.

VECTOR INTEGRATION:

Line integral, Circulation, work done, surface and volume integrals, Vector integral theorems: Green's, Stoke's and Gauss Divergence theorems (without proofs) and related problems.

(8.1, 8.4- 8.7, 8.10-8.17)

TEXT BOOK:

1. Dr. B.S.Grewal *"Higher Engineering Mathematics"*, 42nd Edition, Khanna Publishers, 2012.

REFERENCE BOOKS:

1. Kreyszig E, "*Advanced Engineering Mathematics*", 8th Edition, John Wiley, Singapore, 2001.
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
3. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th Edition, Cengage Learning, 2011.