18UMAC100	Engineering Mathematics-I	(3-2-0) 4

Contact Hours: 52

Course Learning Objectives (CLOs):

This course will enable students to master the basic tools of differential & integral calculus, differential equations and elementary Linear algebra and become skilled to formulate, solve and analyze science and engineering problems.

Course Outcomes (COs):

Description of the Course Outcome: At the end of the course the student will be able to:		Mapping to POs(1-12)		
		Substantial Level (3)	Moderate Level (2)	Slight Level (1)
CO 1	**Apply** the knowledge of calculus to solve problems related to polar curves, curvature and its applications in determining the bentness of a curve.			1,2
CO 2	**Learn** partial differentiation to calculate rates of change of multivariate functions, solve problems related to composite functions, Jacobians and application such as maxima and minima.			1,2
CO 3	**Apply** the concept of multiple integration and their usage in computing the area and volumes.		1,2	
CO 4	**Compute** the solution of system of equations, Eigen values and Eigen vectors and their applications.		1,2	
CO 5	**Solve** first order linear differential equations analytically using standard methods and analyze engineering applications.		1,2	

POs	1	2	3	4	5	6	7	8	9	10	11	12
Mapping Level	1.6	1.6	-	-	-	-	-	-		-	-	-

Pre-requisites: A basic course on: 1.Differentiation of functions.
2. Integration of functions.
3. Matrices and Determinants.

Contents:

Unit-I

Differential Calculus-1:

Review of elementary calculus, Polar curves-angle between the radius vector and tangent, angle Between two curves, Pedal equation. Curvature and radius of curvature-Cartesian and polar forms(without proof).Centre and circle of curvature (formulae only).

Self Study: Applications to Evolute. **10L + 2T**

Unit-II

Differential Calculus-2:

Taylor's and Maclaurin's series expansions for one variable (statements only).Indeterminate forms $(\frac{0}{0}, \frac{\infty}{\infty}, 0\times\infty, \infty-\infty, 0^0, \infty^0, 1^\infty)$.

Partial differentiation; Euler's theorem, Total derivatives, Differentiation of composite functions. Maxima and Minima for a function of two variables, Method of Lagrange's multipliers with one subsidiary condition. Jacobians and properties(without proof).

Self Study: Application to Errors and Approximations. **8L + 2T**

Unit-III

Integral Calculus:

Multiple Integrals: Evaluation of double integrals (direct examples and with region given. Evaluation of double integrals by change of order of integration and changing into polar co-ordinates. Evaluation of Triple integrals.

Beta and Gamma functions: Definitions, Relation between Beta andGamma functions.

Self Study: Applications to find Area and Volume. . **8L + 2T**

Unit-IV

Elementary Linear Algebra: Rank of a matrix- Row Echelon form. Solution of system of linear equations – consistency. Gauss-elimination method, Gauss-Seidel iterative method and LU-decomposition method. Eigen values and Eigen vectors- Rayleigh's power method. Diagonalization of a square matrix of order two.

Self Study: Elementary operations of matrices using MATLAB. **8L + 2T**

Unit-V

Ordinary Differential Equations of First Order:

Leibnitz's linear equation, Bernoulli's equation, Exact and reducible to exact differential equations. Orthogonal trajectories. Applications of ODE's to R-C circuit and L-R circuits.

Self Study: Applications of ODE's to Newton's law of cooling **8L + 2T**

Reference Books:

1. **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 44th edition, 2017.

2. **E. Kreyszig**: Advanced Engineering Mathematics, John Wiley & Sons, 10th edition (Reprint), 2016.

3. **B.V.Ramana:** Higher Engineering Mathematics, 11th edition, Tata McGraw-Hill, 2010.