21UMAC100	Engineering Mathematics-I	(3-2-0) 4

Contact Hours: 39

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: 1.Differentiation of function
2. Integration of function.
3. Matrices and Determinant.

Contents:

Unit-I

Differential Calculus-1:-

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).

Self Study: Centre and circle of curvature (formulae only).Applications to Evolute. Demonstrate curves and properties using Geogebra. **7L + 1T**

Unit-II

Differential Calculus-2:-

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

Partial differentiation: Euler's theorem, Total derivatives, Differentiation of composite functions. Maxima and Minima for a function of two variables, Jacobians and properties (without proof).

Self Study: Method of Lagrange's multipliers with one subsidiary condition. Demonstrate Taylor's and Maclaurin's series expansions for one variable and indeterminate forms using Geogebra. **7L + 1T**

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.

Self Study: Applications to find Area and Volume. **7L + 1T**

Unit-IV

Beta ,Gamma functions & Ordinary Differential Equations of first order:-

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

Ordinary Differential Equations of first order:-

Bernoulli's equation, Exact differential equations. Orthogonal trajectories (Cartesian curves) Applications of ODE's: R-C circuit

Self Study: Orthogonal trajectories(Cartesian curves). Applications of ODE's: R-C circuit. **7L + 1T**

Unit-V

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

Self Study: Test for consistency for system of linear equations. **6L + 1T**

Reference Books:

1. **B.S. Grewal**: Higher Engineering Mathematics, Khanna Publishers, 44th Ed., 2017.
2. **E. Kreyszig**: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed.(Reprint), 2016.
3. **B.V.Ramana:** "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.