20UMAC200	Engineering Mathematics-II	(3-0-0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

The purpose of the course is to facilitate the students with concrete foundation of, ordinary and partial differential equations, Laplace transforms, infinite series and numerical methods enabling them to acquire the knowledge of these mathematical tools.

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	**Explain** various physical models through higher order differential equations and solve such linear ordinary differential equations.		1,2	
CO-2	**Solve** problems on partial differential equations by method of separation of variables and Numerical methods.		1,2	
CO-3	**Transform** the given function using Laplace transforms depending on the nature of engineering applications.			1
CO-4	**Describe** the applications of infinite series and **obtain** series solution of ordinary differential equations.		1,2	
CO-5	**Apply** the knowledge of numerical methods to fit an interpolating curve to the experimental data and **obtain** solution of transcendental equation and use numerical methods for engineering application.			1,2

POs	1	2	3	4	5	6	7	8	9	10	11	12

Mapping Level	1.6	1.4	-	-	-	-	-	-		-	-	-

Pre-requisites: 1.Differentiation of function.
2. Integration of function.

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Contents:

Unit-I

Differential Equations of Higher Order:

Second order linear ODE's with constant coefficients-Inverse differential operators, Method of Variation of Parameters; Legendre's homogeneous equations. Applications to oscillations of a spring and L-C-R circuits.

Self Study: Cauchy's homogeneous equations. **7L+ 1T**

Unit-II

Partial Differential Equations (PDE's):

Formation of PDE's by elimination of arbitrary constants / functions. Solution of PDE by variable separable method. Derivation of one dimensional heat and wave equations and solution of wave equation by the method of separation of variables. Numerical solution of Laplace equation by Five-point formula and Diagonal formula.

Self Study: Solution of heat equation by the method of separation of variables. **7L+ 1T**

Unit-III

Laplace Transforms:

Definition and Properties. Laplace transform of elementary functions.

Laplace transforms of Periodic functions and unit-step function–problems. **7L+ 7T**

Unit-IV

Inverse Laplace Transforms

Inverse Laplace transform-problems with standard , Convolution theorem(without proof) to find the inverse Laplace transform and problems.

Self study: Solution of linear differential equations using Laplace transform. **6L+ 1T**

Unit-V

Vector Calculus:-

Vector Differentiation: Scalar point function and vector point functions. Gradient, Directional Derivative; Curl and Divergence-physical interpretation. Solenoidal and irrotational vectors. Illustrative problems.

Vector Integration: Line integrals, Surface integrals and volume integrals. Green's theorem, Gauss divergence theorem (only statements). Illustrative example. **7L+ 1T**

Self study: Stoke's theorem.

Unit-V

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. **Srimanta Pal, Subodh Chandra Bhunia:** Engineering Mathematics ,Oxford university Press,2015.
4. **B.V.Ramana**: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.