18UMAC300	Engineering Mathematics-III	(3 - 0 - 0) 3

Contact Hours: 39

Course Learning Objectives (CLOs):

To have an insight into Laplace transforms, Fourier series, Fourier transforms, Difference equations andZ-transforms. To develop the proficiency in variational calculus and solving ODE's arising inengineering applications, using numerical methods.

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	Transform the given function using Laplace/Fourier transforms depending on the nature of engineering applications.			1
CO-2	Express periodic function as a Fourier series and obtain the various harmonics of the Fourier series expansion for the given numerical data.			1,2
CO-3	Solve difference equations using Z-transform.			1
CO-4	Solve first and second order ordinary differential equations arising in engineering problems using single step and multistep numericalmethods.		1,2	
CO-5	Determine the extremals of functional using calculus of variations and solve problems arising in engineering.			1,2

POs	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Mapping Level	1.2	1.3	-	-	-	-	-	-		-	-	-

Pre-requisites: A basic course on differentiation and integration of function.

Contents:

Unit-I

Laplace Transforms: Definition and Properties. Laplace transform of elementary functions. Laplace transforms of Periodic functions and unit-step function problems. **Laplace Transforms**: Inverse Laplace transform - problems, Convolution theorem(without proof) to find the inverse Laplace transform and problems, solution of linear differential equations using Laplace transform. **8 Hrs.**

Unit-II

Fourier Series: Periodic functions, Dirichlet's condition. Fourier series of periodic functions of period 2π and arbitrary period. Half- range Fourier series. Practical harmonic analysis, examples from engineering field. **8 Hrs.**

Unit-III

Fourier Transforms: Infinite Fourier transforms, Fourier sine and cosine transforms. Inverse Fourier transforms. Simple problems.

Z-Transforms and Difference Equations: Z-transform- definition, Standard Z-transforms, Damping and shifting rules, Initial value and Final value theorems (without proof) with problems. Inverse Z-transform. Simple problems. Difference equations-basic definition. Application of Z-transform to solve Difference equation. **8 Hrs.**

Unit-IV

Numerical Solutions of Ordinary Differential Equations (ODE's): Numerical solution of ODE's of first order and first degree-Taylor's series method, Modified Euler's method. Runge–Kutta method of fourth order, Milne's predictor and corrector method (No derivations of formulae).Problems. **7 Hrs.**

Unit-V

Numerical Solution of Second Order ODE's: Runge-Kutta method and Milne's predictor and Corrector method. (No derivations of formulae).

Calculus of Variations: Variation of function and functional, variational problems, Euler's equation (without proof), Geodesics (plane), hanging chain problems.**8 Hrs**

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. Srimanta Pal et al: Engineering Mathematics, Oxford University Press, 3rd edition, 2016.