III Semester (2019-20)

18UMAC300	Engineering Mathematics-III	(3 - 0 - 0) 4 : 39 Hrs.

Contact Hours: 39

Course Learning Objectives:

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

Description of the course outcomes: At the end of course the students will be able to

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

Content

Chapter I

Laplace Transforms: Definition and Properties. Laplace transform of elementary functions. Laplace transforms of Periodic functions and unit-step function – problems.
Inverse 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**

Chapter 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**

Chapter 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**

Chapter 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**

Chapter 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**

Text 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 et al: Engineering Mathematics, Oxford University Press, 3rd Edition, 2016.

Reference books:

1. C. Ray Wylie, Louis C. Barrett : "Advanced Engineering Mathematics", 6th Edition, McGraw-Hill Book Co., New York, 1995.
2. S. S. Sastry, Introductory Methods of Numerical Analysis, Prentice Hall of India, 4th Edition 2010.
3. B. V. Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. N. P. Bali and Manish Goyal : A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2014.
4. Veerarajan T., "Engineering Mathematics for First year", Tata McGraw-Hill, 2008.
5. Thomas G.B. and Finney R.L."Calculus and Analytical Geometry" 9th Edition, Pearson, 2012.

Web links and Video Lectures:

http://nptel.ac.in/courses.php?disciplineID=111.
http://www.class-central.com/subject/math(MOOCs).
http://academicearth.org/.
VTU EDUSAT PROGRAMME – 20.

COs	**Description of the course outcomes:** At the end of course the students will be able to	**Mapping to POs (1-12)**		
		Mastering 3	**Moderate 2**	**Introductory 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 numerical methods.		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		9	10	11	12	13	14	15
Mapping Level	1.2	1.3													

1. Introductory (Slight) 2. Reinforce (Moderate) 3.Mastering (Substantial)