Detailed Syllabus
III Semester (2018-19)

15UMAC300	**Engineering Mathematics-III (4 - 0 - 0) 4 : 52 Hrs.**

Course Learning Objectives:

Learn to represent a periodic function in terms of sine and cosine. Learn the concepts of a continuous and discrete integral transform in the form of Fourier and Z-transforms. Learn the concepts of calculus of functions of complex variables. Learn the concept of consistency, method of solution for linear system of equations and Eigen value problems. Understand the concepts of PDE and its applications to engineering.

Course outcomes:

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	Express periodic function as a Fourier series.		1	
CO-2	Describe Fourier transform and its properties.		1	
CO-3	Define and describe Z transforms and properties and solve difference equations using Z transform.		1	
CO-4	Explore analytical functions and properties and describe Bilinear transformations.		1	
CO-5	Solve set of linear equations. Estimate rank, eigen value and eigen vectors as applied to engineering problems.		1,2	
CO-6	Construct and solve partial differential equation resulting from one dimensional heat equation and wave equation.		1,2	

POs	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12	PO-13	PO-14	PO-15
Mapping Level	2	2													

1 -> Introductory (Slight); 2 -> Reinforce (Moderate); 3 -> Mastering (Substantial)

Contents:

1) Fourier Series and Fourier Transform

Fourier series, Fourier series of Even and Odd functions, exponential form of the Fourier series, half range Fourier series, practical harmonic analysis.
Infinite Fourier transform, Infinite Fourier sine and cosine transforms, properties of Inverse transform, Convolution theorem, Parseval's identity for Fourier transform, Fourier Sine and Cosine transform. **14 Hrs.**

2)Z–Transform

Basic definitions of z-transform, transform of standard forms, linearity property, damping rule, shifting rule, initial and final value theorems, Inverse z-transforms (Partial Fraction method), convolution theorem, applications of z-transforms to solve difference equations. **6 Hrs.**

3)Complex variables

Functions of complex variables, Analytic function, Cauchy-Riemann equations in cartesian and polar coordinates, Consequences of Cauchy-Riemann equations, Construction of analytic functions. Conformal Transformations: Standard transformation $w = z^2$, $w = e^z$, $w = z + \frac{a^2}{z}$ (only theoretical discussions). Bilinear Transformation. **10 Hrs.**

4) Linear Algebra

Rank of a matrix by elementary transformations, solution of system of linear equations-Gauss-Elimination method,Gauss-Seidel method and L-U decomposition method. Eigen values and Eigen vectors. Rayleigh's power method to find the largest Eigen value and the corresponding Eigen vector. Application to Electric circuits, spring mass system, parachutist problem. **12Hrs.**

5)Partial Differential equations

Formulation of PDE by elimination of arbitrary constants/functions, Solution of Lagrange's equations. Solution of non-homogeneous PDE by direct integration, solution of homogeneous PDE involving derivative with respect to one independent variable only. Solution of First and Second order PDE by method of separation of variables. Derivation of one dimensional heat and wave equations, solutions by variable separable method, as applied to engineering problems.

10Hrs.

Reference Books:

1. Kreyszig E., Advanced Engineering Mathematics, 8th Edn, John Wiley & sons, 2003.
2. B. S. Grewal – Higher Engineering Mathematics – Khanna Publishers – 40th edition – 2007.
3. Lathi B. P, Modern Digital and Analog Communication System, 2nd edition, pp. 29-63.
4. Chapra S C and Canale R P, Numerical methods for Engineers, 5th edition, TATA McGraw- Hill, 2007.