Course Title: TRANSFORM CALCULUS, FOURIER SERIES AND NUMERICAL TECHNIQUES			
Course Code: P18MA31	Semester: III	L:T:P:H: 4:0:0:4	Credits: 4-0-0
Contact Period-Lecturer: 52Hrs. Exam: 3Hrs		Weightage:CIE:50%; SEE:50%	

(Common to All Branches)

Course Content

Unit-1

Numerical Methods-I: Finite differences**:** Forward and Backward differences,Gregory-Newton forward and backward interpolation formulae, Newton's divided difference formula, Lagrange's interpolation formula and inverse interpolation formula. (All formulae without proof) – Problems only

Central differences: Gauss Forward and Backward difference formulae, Sterling's, and Bessel's formulae (All formulae without proof) – problems.

Self-Study Component: Problems using Everett's formula in Central differences

10 Hours

Unit-2

Numerical differentiation using Newton's forward and backward interpolation formulae, Newton's divided difference formula and Sterling's formula (All formulae without proof)- problems only and Applications to Maxima and Minima of a tabulated function.

Numerical integration: Newton- Cotes quadrature formula, Trapezoidal rule, Simpson's (⅓) rd. rule, Simpson's (⅜)th rule, Boole's rule and Weddle's rule (All rules without proof)- Illustrative problems.

Self-Study Component: DeriveNewton- Cotes quadrature formula.

10 Hours

Unit-3

Fourier series: Periodic functions, Euler's formula, Dirichlet's conditions. Discontinuous functions, even and odd functions, functions of arbitrary intervals. Half–range Fourier series expansions, complex form of Fourier series, Practical harmonic analysis- Illustrative examples from engineering field.

Self-Study Component: Derivations of Euler's formulae

11 Hours

Unit-4

Fourier Transforms: Infinite Fourier transforms-properties. Fourier sine and cosine transforms, properties. Inverse infinite Fourier and inverse Fourier sine & cosine transforms – Illustrative examples.

Difference equations and Z-transforms: Definition, Z-transform of standard functions, linearity property, damping rule, shifting rules, initial value theorem and final value theorem (All rules and theorems without proof). Inverse Z – transforms. Difference equations- basic definitions. Application of Z-transforms to solve difference equations.

Self-Study Component: Convolution theorem, Parseval'sidentities related problems.

10 Hours

Unit-5

Partial differential equations (PDE's):

Formation of PDE by eliminating orbitrary constants and functions. Solution of non-homogeneous PDE by the method of direct integration. Solutions of homogeneous PDE involving derivative with respect to one independent variable only (both types with given set of conditions). Method of separation of variables (first and second order equations). Solution of the Lagrange's linear PDE's of the type: $Pp + Qq = R$.

Applications of PDE's:
One- dimensional wave and heat equations (No derivation), and various possible solutions of these by the method of separation of variables. D'Alembert's solution of wave equation. Two dimensional
Laplace's equation (No derivation)–various possible solutions. Solution of all these equations with specified boundary conditions (Boundary value problems). Illustrative examples from engineering field.
Self-Study Component: Finding the solution of non-linear equations of first order: Char pit's Method -simple problem.

11 Hours

Text Books:
1. Higher Engineering Mathematics: B.S. Grewal, Khanna Publishers, New Delhi, 42nd Ed. 2012.
2. Advanced Engineering Mathematics: - E. Kreyszig, John Wiley & Sons, 6th Ed.2007.

References:
1. Advanced Modern Engineering Mathematics: - Glyn James, Pearson Education Ltd., 3rd Ed., 2007.
2. Advanced Engineering Mathematics: Peter V O' Neil Thomson, Brooks/Cole, 5th edition, 2007.
3. Higher Engineering Mathematics: - B.V. RAMANA, McGraw Hill Education, 2007

Note: - Eachunit contains **two** full questions of **20 marks** each. Students are required to Answer any fivefull questions choosing at least **one** full question from each unit.

Course Articulation Matrix

Mapping of Course Outcomes (CO) with Program Outcomes (POs) and Program Specific Outcomes (PSOs)

Sem: 3	Course code : P18MAT31	Title : Engineering Mathematics –III										
CO's	Statement	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
CO-1	Apply forward, backward difference formulae and central differences formulae in solving interpolation- extrapolation problems in engineering field.	1	2	-	-	-	-	-	-	-	-	-	-
CO-2	Numerical differentiation and integration rules in solving engineering where the handling of numerical methods are inevitable	2	2	-	-	-	-	-	-	-	-	-	-
CO-3	Apply the knowledge of periodic function, Fourier series, complex Fourier series, Fourier sine/cosine series of a function valid in different periods. Analyze engineering problems arising in control theory/fluid flow phenomena using harmonic analysis.	3	3	-	-	-	-	-	-	-	-	-	-

CO-4	Understand complex/infinite Fourier transforms, Fourier sine and Fourier cosine transforms with related properties Analyze the engineering problems arising in signals and systems, digital signal processing using Fourier transform techniques. Define Z-transforms& find Z-transforms of standard functions to solve the specific problems by using properties of Z-transforms. Identify and solve difference equations arising in engineering applications using inverse Z–transforms techniques.	2	3	-	-	-	-	-	-	-	-	-	-
CO-5	Define Partial Differential Equations (PDE's),order, degree and formation of PDE's and, to solve PDE's by various methods of solution Explain one - dimensional wave and heat equation and Laplace's equation and physical significance of their solutions to the problems selected from engineering field.	2	3	-	-	-	-	-	-	-	-	-	-